STAKEHOLDER PERCEPTIONS OF THE VIABILITY OF A FULLY REMOTE APPRENTICESHIP DELIVERY SYSTEM PRE-COVID-19 WITH UPDATES MID-PANDEMIC: A QUALITATIVE EXPLORATORY STUDY

by

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God, the Father of my Lord Jesus Christ, who gave this opportunity to me.

Robert, my husband, partner, and best friend.

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ABBREVIATIONS

DOL. Department of Labor

F2FADS. Face-to-face apprenticeship delivery system

FRADS. Fully remote apprenticeship delivery system

IEG. Independent evaluation group

LSC. Large systems change

OJI/OJT. On the job instruction/training

RTI/RTL. Related technical instruction/learning

SDEF. Service Delivery Evaluation Framework

WFH. Work from home

ABSTRACT

This study explores the perceptions of critical stakeholders as to the viability of a fully remote apprenticeship delivery system (FRADS), as well as its ability to serve as a functionally equivalent path of inclusion for access-limited populations. One of the first recorded pedagogical models, apprenticeship was also one of the first to be regulated. The effectiveness of the method of training a novice to enter the adult world of work through apprenticeship is undisputed, when it is conducted in a manner approximate to that from which it derived: a process that occurs over time, with continuous interaction between novice and expert. Despite millennia of practice, and a few emerging programs called Virtual Apprenticeships, the critical real-time skills-based mentoring component (on the job instruction/training, or OJI/OJT) of the modern apprenticeship is still only carried out fully in face-to-face programs. With the move to work-from-home (WFH) resulting from the global COVID-19 pandemic of 2020, assessing the viability of a FRADS is timely. This qualitative exploratory study is a first step in the discussion. Bounded by the parameters of the U.S. Certified Apprenticeship Guidelines for Registered Apprenticeships and the constructs of viability and functional equivalence, participants of three critical stakeholder groups—policy makers, service managers, and front-line service workers—offer their pre-pandemic perceptions of the construct of a FRADS. Guided by the work of Jahoda, et al., (1957), Northrop (1949,1959), and Swedberg (2018), this qualitative exploratory methodology identified perceptual data points that are then compared against a framework of viability derived from IEG's *Service Delivery Evaluation Framework* (Caceres, et al., 2016). And, because this represents a large systems change (LSC), I included aspects of Weiner's (2009) *Organizational Readiness for Change*—valance and efficacy—as additional indicators of potential viability. Stakeholders examined key components of IEG's evaluative criteria applied to a face-to-face apprenticeship as a functionally equivalent, technology-mediated apprenticeship delivery system. Additional stakeholder perceptions, mid-pandemic, along with a review of scholarly articles, media reports, and Department of Labor statistics concerning the impact of the WFH mandates foreground the gap a purposeful FRADS might fill. Analysis of some of the findings are represented in a preliminary process map.

Keywords: apprenticeship, fully remote apprenticeship delivery system, FRADS, access-limited populations, exploratory research, large systems change, LSC.

CHAPTER 1. INTRODUCTION

The myriad global manifestations, considered apprenticeship, are indicative of the complexity of the task of taking a tried and true one-on-one model of apprenticeship and expanding it, under governmental supervision, to serve hundreds of thousands of learners across multiple cultures. That the U.S. has struggled with this is evident in its current status among Western nations. Despite numerous initiatives over the past 200 years, the U.S. system of apprenticing its labor supply falls far short of other countries such as Germany and the United Kingdom. The longevity of apprenticeship as a process, with only minor modification, speaks to the success of the model. But, despite centuries as primarily a model of learning (Fuller & Unwin, 2009), the vehicle of delivery remains largely unchanged—the practical knowledge/skills component of U.S. apprenticeships is delivered face to face. This proviso of proximity poses a barrier for some individuals—to the apprenticeship system and therefore to its benefits. It appears this aspect of the current system of apprenticeship may be ripe for enhancement, and could provide the vehicle to help further expand apprenticeships in the U.S., as well as to previously unrecruited, access-limited populations.

1.1 Background

A decade ago, (Quartaro et al., 2009) contended the current face-to-face apprenticeship delivery system (F2FADS) was inadequate—unable to reach all populations of potential apprentices. That this is still the case is corroborated by the U.S. Jobs Outlook at the end of July, 2020 (Bureau of Labor Statistics, 2020a): While 6.6 million jobs were unfilled, and 16.3 million Americans unemployed, American apprenticeships represented less than 4.5% (300,000) of active employment opportunities (US Bureau of Labor Statistics, 2020a).

A review of the literature revealed little change in the apprenticeship model of learning since the earliest recorded references in the 1754 B.C. Code of Hammurabi (Hammurabi by King, 1915). Apprenticeship is one of the first recorded pedagogical models and is also one of the first to be regulated. The effectiveness of the method of training a novice to enter the adult world of work through apprenticeship is undisputed, when it is conducted in a manner similar to that from which it derived: a process that occurs over time, with sustained interaction between novice and

expert. The literature does include models of cognitive apprenticeship (Collins, Brown, & Newman, 1987; Edmondson, 2005) and even a model for electronic cognitive apprenticeship (Wang & Bonk, 2001). There are also descriptions of remote training centers and virtual clinical observations (Canadian Apprenticeship Forum, 2019; Stalmeijer, et al., 2009). Yet, an extensive search revealed no model using technology to mediate the remote skills-based apprenticing of a novice by an expert in full apprenticeship fashion with systematic synchronous interaction between expert and apprentice. And, while technologies continue to improve both in scope and function, prior to the COVID-19 pandemic, the literature was only beginning to closely examine the application of technologies to apprenticeship—an advancement that could potentially increase reach and help provide the training requisite for the placement of many of America's unemployed.

Historically, changes in labor needs, technology, and/or economic upsurges brought attention back to apprenticeship, and the pre-COVID-19 market conditions were no different. Pandemics and the resulting economic downturn, on the other hand, have historically sounded a death knell to apprenticeship initiatives, at least for a time. For example, the bubonic plague of 1348-49 (also known as the Black Death or Great Pestilence) economies to a halt. Today, we know that fleas passed the disease from rats to humans; but, in the 14th Century, lacking knowledge, safeguards, and treatments, the impact was profound. Within the first months after infecting a region, the plague had killed 30-45% of the population—some within 3-4 days, many within hours of contracting the disease. Originating in China, the plague moved across Europe via trade routes, reaching Germany, France, and England in 1348. Worst hit were the poor, as their crowded conditions and poor nourishment significantly decreased any chances there might have been of survival. Of some comfort is the ultimate result of the pandemic. Orphaned children were given over to masters for apprenticing in the absence of their fathers to train them in the family businesses, thus increasing the number of those apprenticed and often providing a path to a better livelihood. The enormous loss of skilled labor also helped change the balance of power, as competition increased the demand for apprentices resulting in increased wages (Harrison, 1985; Smail, 1996). Similarly, the AIDS epidemic in South Africa resulted in the creation of a program of learnerships (a form of apprenticeships) as deaths rose in the mines at a rate of eight (8) workers to every one (1) (Mbeki, 2014).

In like manner, the emergency transition to remote work/work from home (WFH) resulting from the COVID-19 pandemic, has created a unique opportunity for a FRADS and highlights the

need for such a delivery system. This study is timely as it captured pre-COVID perceptions of the viability of a FRADS, as well as their observations, suggestions, and concerns in the months following the U.S. lockdown. In addition, in an effort to give a broad picture of the mid-pandemic environment, research studies and media reports related to WFH have been included. The purpose of this research is to initiate a conversation about a fully remote apprenticeship delivery system (FRADS), and so to move the construct toward serious consideration by exploring and reporting on the perceptions of critical stakeholders as to the viability of a FRADS and its potential to serve as a functionally equivalent alternative and path of inclusion for access-limited populations. We know that we can teach/train online; but, can we apprentice someone successfully in the fullest sense of the word? This study, conducted in the months prior to the COVID-19 pandemic (with follow-up mid-pandemic), is a first step in the exploration.

1.1.1 Path to Adulthood

Apprenticeship has long been a globally accepted path to full-time long-term employment and thus to the financial independence associated with adulthood (Bynner, 2010; Jacoby, 2017; E. Smith & Kemmis, 2013; Symonds, et al., 2011). As early as the eighteenth century B.C., the process of passing knowledge and skills from an expert to a novice apprentice has been well documented—the novice physically shadowing, observing, and emulating the expert, receiving daily instruction and correction while taking on more and more responsibility until attaining a verifiable level of expertise (Hammurabi by King, 1915, No.188-189; Rogoff, 1990; Romiszowski, 1999). In its purest form, apprenticeship also serves as a means of entrance into the community of practice (CoP) which contributes to the long-term growth and development of the individual members, and has been inextricably tied to the face-to-face apprenticeship experience (Lave & Wenger, 1991). A well-designed, fully-remote apprenticeship delivery system (FRADS) could facilitate the participation of individuals in a proven model of learning with an embedded mechanism to promote inclusion in the company culture and the broader CoP. In addition, a FRADS has the potential to reach and include currently unrecruited, access-limited populations (See Section 1.3.1).

1.1.2 My Personal Interest Driving this Study

For five years I worked as Director of Academic Programming & Services for a midwestern agency serving first generation students, mostly from the inner-city. My students' parents sacrificed for the dream of their children attending college— even agreeing to stay in our school district for thirteen years while their children participated in our program. The majority of my students participated in every opportunity we presented them, such as weekly in-school group meetings to learn about life skills and the path to college and career, weekly one-on-one mentoring sessions, tutoring as needed, early testing, college visits, job shadowing opportunities, and summer camps.

As I became more and more embedded in my student's lives, I learned they faced many obstacles to creating a successful future: e.g., lack of transportation; the need of the family for a translator or child care provider, and/or supplemental wage earner; parental fear of their children losing their cultural identity and/or suffering harm; socio-emotional conditions that make face-to-face interaction difficult and/or painful; and/or fees associated with internet access, training/testing expenses (such as SAT/ACT course fees) that are eclipsed by the basic necessities of life. While our agency began to provide some of the funding and transportation for student's participation in college and career path activities, I saw that many of the better career positions required travel or relocating. As the apprenticeship movement began to build momentum, I found my students, while qualified, would never have the opportunity to participate in apprenticeship due to the face-to-face constraints of the current apprenticeship delivery system (F2FADS). And, because apprenticeship is a path to permanent employment (Bray, 1912), those same individuals may be precluded from securing permanent jobs as well.

I have chosen the term "access-limited" populations to individuals who make up this potential workforce. Access-limited individuals, then, are those who encounter impairments, barriers, or constraints that impede their ability to participate fully in common opportunities, such as American apprenticeship. These individuals are often overlooked because of the nature of the factors that limit their access. For example, no federal law specifically addresses family responsibilities discrimination (FRD). Federal protections can be found under Title VII of the Civil Rights Act of 1964, the Family and Medical Leave Act, the Equal Pay Act, the Americans with Disabilities Act, and ERISA; and, some states and locales also have protections in place ("Family responsibilities discrimination - Workplace fairness," 2020). But, human resource personnel

during the hiring process are expected to choose candidates who can consistently perform, and may try to ascertain an applicant's level of responsibilities or access to transportation without implying discrimination based on these factors. In reality, access-limited individuals are far more likely to lack dependable transportation, and thus to be excluded from employment consideration (Fletcher, et al., 2010; Hess, 2005; Karpman, 2019). See Section 1.3.1 for additional information on access-limited populations.

1.1.3 Labor Potential (Pre-COVID-19)

Some access-limited individuals are categorized by the United States Bureau of Labor Statistics (BLS) as "marginally attached". These are individuals who currently want a job but have not actively sought work in the past four (4) weeks. Others may be "discouraged workers" who: 1) believe no jobs are available that match their skillset or circumstances; or, 2) could not find work; or, 3) lacked schooling or training; or, 4) who were discriminated against because of age or some other factor. Other "marginally attached" individuals include those with: poor health, school or family responsibilities, transportation problems, or other reasons they cannot find work. Individuals already included under ADA protection comprise only 13% of this larger group of potential workers with access-limiting constraints. To review the complete report, please see https://www.bls.gov/news.release/empsit.htm.

In November 2019, the Bureau of Labor Statistics (BLS) reported that approximately 1.246 million people were currently wanting a job; while another 25 million people were employed only part-time. When an individual desires full-time employment and/or is trained for a higher paying position than what they currently hold, they are considered *under-employed*. 4 million people were employed only part-time in November 2019 (falling into this category), citing economic reasons—slack work, inability to find full-time employment and unfavorable business conditions . Over 21 million Americans cited non-economic reasons for their part-time status, such as problems with childcare, family/personal obligations, schooling, and limits on earnings due to retirement or social security benefits (https://www.bls.gov/news.release/empsit.t08.htm). 95.634 million are unemployed but reported they do not want a job. The complete report can be found at: https://www.bls.gov/news.release/empsit.t16.htm) (United States Department of Labor, 2019). It might be interesting in the future to look more closely at this group to find out to what extent, if any, the face-to-face requirements of employment contribute to their decision not to seek work.

If apprenticeship opportunities are increased, and a fully remote apprenticeship delivery system becomes available, it is possible that individuals that are not usually recruited (nor likely to respond to an employment post because of an access-limiting constraint) might enter the labor pool.

1.2 Defining Critical Constructs

Before proceeding, it is important to note several defining constructs.

1.2.1 Access-limited populations

Many studies have turned the spotlight on marginalized populations, and rightfully so. These are individuals who experience social and/or economic exclusion, often due to oppression or stigmatization. These populations include the disabled, the poor, and the vulnerable (Caceres et al., 2016; Montesanti, 2013). For purposes of this study, we are viewing the construct in a slightly expanded way so as to include individuals who, while marginalized because of the nature of the current apprenticeship delivery system, may bear none of the identifying marks of oppression or stigma.

A variety of circumstances can limit an individual's access to apprenticeship (see Figure 1 below). On one end of the continuum are those individuals with physical, emotional, and/or developmental disability. These situations are addressed in most cases by Title 1 of the American's with Disabilities Act (see https://www.ada.gov/ada_title_I.htm), and recognized by most employers as requiring special consideration. Individuals facing socio-cultural obstacles, socio-emotional constraints, or socio-economic barriers receive less consideration as economics are often considered only in cases of special scholarship/grant opportunities, and culture may only be considered in some cases as a part of affirmative action. Some neurological conditions are protected under Title 1; but, individuals with social interaction (socio-emotional) issues, such as those which are situationally triggered, are less likely to receive assistance (Business Management Daily Editors, 2009; United States District Court Southern District of Ohio Western Division, 2009). But, these barriers (and others) can effectively preclude an individual from participating in face-to-face apprenticeships. On the far right end of the continuum are those individuals with limited access due to geographical constraints (i.e., residency in remote areas of the country, in

small towns or the inner-city, lacking ability to travel or move for any of a number of reasons including family responsibilities and lack of dependable transportation).

ACCESS-LIMITATION CONTINUUM

Impairment	Barriers	Constraints
physical	socio-cultural	geographic
emotional	socio-economic	transportation
mental	socio-emotional	

Table 1 (Above): On the far left of the continuum are ADA defined disabilities. In the middle, barriers that while very real, may be less noted and understood. And, on the far right are geographic constraints such as remote locations, or simply a lack of transportation which can occur even in the inner-city.

Figure 1. Examples of Access-limited Populations.

Because many opportunities that are off-limits to access-limited individuals are taken for granted by the general population, the long-term impact of limited access to apprenticeship may not be recognized and/or understood. Consistent with access limitations, many individuals experience financial insufficiency and decreased career opportunity and/or mobility. And, where opportunity for full-time employment is tied to and/or enhanced by access to apprenticeship, access-limited populations are inadvertently marginalized (Lerman, 2014).

The U.S. Department of Labor demonstrated its commitment to equal access to apprenticeship in a 2016 rule that expanded the scope of protected bases against discrimination (Department of Labor Employment and Training Administration, 2016). But, while broader legal provisions are in place, logistical and socio-cultural challenges remain. This study does not focus on any particular group of access-limited individuals; and it is understood some groups would require a very personalized approach to the technology(ies) and processes. It is my hope, however, that in foregrounding the inability of the current U.S. face-to-face apprenticeship system to facilitate access for all, and in garnering expert perceptions of the requirements of a viable FRADS model, a suitable, functionally equivalent alternative might become reality.

1.2.2 Large Systems Change

Waddell et al. (2015) discuss the complexity of large systems change (LSC) derived from the breadth of engagement and the depth of relationships. Transformation is form of LSC. It can be forced, supporting, paternalistic, or co-created. When we think of the transformation of large systems, we think of values and overarching principles, multiple interacting systems and sub-systems, governments, societies and multiple types of players, all undergirding organizational structures and rules of engagement. Rather than tweaks to an existing system, transformation derives from "new ways of understanding what is possible and acting on them" (Waddell, et al., 2015, p. 8). Transformational change goes beyond manipulation of things that currently exist; and, is global in nature.

Interconnected systems/sub-systems are made up of many and varied institutions, people groups, and diverse locations. Within these systems/sub-systems, are hierarchies of power, as well as multi-faceted physical and organizational structures. In transformational change, the relationships must be carefully navigated with respect for the historical while guiding toward the envisioned. The changes occur between and within a highly interconnected web of entities, driven by an equally complex, simultaneous shift in the lens through which related parties view the world—a corporate "fundamental revisioning of what is possible and ways of sensemaking" (Waddell, et al., 2015, p. 7). At some point, through confrontation or collaboration; structures, relationships, mindset, and fundamental principles move such that they are forever changed.

As we consider the environment in which apprenticeship finds itself, we can see that remote work was forced upon employers by the pandemic. Stakeholders prior to the pandemic expressed concern that transformational change could be difficult at best and might possibly require the retiring of the guard to effect. This was based on their experiences presenting the opportunities associated with apprenticeship to employers. The circumstances of the 2020 COVID-19 pandemic, however, forced many employers to reconsider their mindset toward remote work (Akala, 2020; Bartik et al., 2020; Bashshur et al., 2020; Felstead & Henseke, 2017). It is in this mid-pandemic environment, that a transformational change may now be possible through supportive and co-creative efforts in partnership with those same employers.

1.2.3 Service Delivery Design and Accountability

IEG (Independent Evaluation Group) is a research team which includes Susan Caceres and Robert Yin. IEG's *Service Delivery Evaluation Framework (SDEF)* (see Table 1 below) has been developed as an in-house tool to assist the World Bank Group (WBG) in evaluating the goods and services delivery systems the WBG helps fund. Service delivery describes a system of actions carried out by public or private organizations to move a supply of critical goods and/or services to needy end users, called "citizen beneficiaries" (Caceres et al., 2016, p. 1). While initially designed as an evaluation system, the IEG team notes that the framework is applicable at any stage of the service delivery life cycle (planning, design, operations, maintenance, and monitoring), using a logic model (theory of change) that can function for both design and analysis (Bichelmeyer & Horvitz, 2011; Yin, 2017).

1.2.4 Fully Remote Apprenticeship Delivery System

When I first presented to stakeholders, a FRADS was an unrealized and unstudied construct. Therefore, it was important to define for this study what is meant by a fully remote apprenticeship delivery system (FRADS). A fully remote apprenticeship is one that uses technology as the vehicle (delivery system) to mediate the face-to-face relationship and daily activities of the workplace mentor (expert), the apprentice (novice), the workgroup/team, and the CoP, providing synchronous non-propinquitous contact through which the apprenticeship model of learning can/will be conducted. Thus, the delivery system bringing the apprenticeship service to the novice apprentices should be fully virtual rather than face to face. The model of apprenticeship itself remains unchanged in nature, objectives, content, and expected outcomes.

Because apprenticeship is a situated learning experience, but, in the case of a FRADS, it is mediated by a fully remote delivery system, the cognitive apprenticeship model can help inform the activities expected to occur. Six instructional methods integral to a cognitive apprenticeship were identified by Collins et al. (1987): modeling, coaching, scaffolding, articulation, reflection, and exploration. (Bonk & Kim, 1998) added four additional strategies: questioning, task structuring, feedback on performance, and direct instruction. These ten instructional methods helped form the basis of comparison of functional equivalency in this study. In addition, Lave & Wenger (1991) discuss the critical importance in situated learning of the process of

Table 1. IEG 2016 Service Delivery Evaluation Framework (Caceres et al., 2016) with coding for purposes of this study.

Enabling Conditions	Inputs	Service Delivery Implementation	Service Outputs	Service Outcomes
EC-PEA: Political Economy Analysis	IN-F Funding (e.g., capital, operation, maintenance)	SDI-SDM Service Delivery Model	Related to Service Delivery Activity:	Related to Service Use:
EC-L Leadership	IN-HC Human Capital (e.g., service providers and managers)	SDI-CGPC Central Government Provision or Contracting	SOP-SPP Service Provider Performance	SOC-CoS Coverage of Service
EC-PD Policy Development	IN-Tech Technology	SDI-DGPC Decentral Government Provision or Contracting	SOP-SM Service Monitoring	SOC-QoS Quality of Service
EC-CD Capacity Development	Service Delivery Design:	SDI-H Hybrid between Central and Decentral Government Provision or Contracting	SOP-SQC Service Quality Control	SOC-AoS Affordability of Service
EC-B Budgeting	IN-SDD-ICB Identification of citizen beneficiaries	SDI-PPP Public Private Provision	SOP-MFA Mechanism for Accountability (e.g., report cards, complaint resolution)	SOC-RoS Reliability of Service
EC-R&L Regulatory and Legal	IN-SDD-NA Needs analysis (beneficiaries, providers, managers, existing SD model)	SDI-PSP Private Sector Provision		SOC-SoCB Satisfaction of Citizen Beneficiaries
EC-DS Data Systems	IN-SDD-E2EIP End-to-end implementation planning	SDI-CDP Citizen-directed Provision (e.g., CDD, voucher)		SOC-SSBO Sector-specific Beneficiaries Outcomes
EC-SC Supply Chain	IN-SDD-EoSS Establishment of service standards	SDI-OINP Other Innovative Provision		SOC-S Sustainability of the Service Beyond Initial Project Periods
EC-CPS Country Procurement Systems	IN-SDD-POM Plan for operation and maintenance	SDI-OIMP Other Implementation Processes		
EC-PFM Public Financial Management	IN-SDD-DMIS Development of Monitoring and Improvement system			
*EC-R-V Valance	IN-SDD-DFL Design of feedback loops (e.g., accountability)			
*EC-R-E Efficacy				
*Weiner, 2009				

Lessons Learned about Service Delivery Model

Feedback Loop

legitimate peripheral participation. This is the phenomenon in which an apprentice participates with other practitioners, developing knowledge and skills through the interactions, while moving toward "full participation in the sociocultural practices of the community" (p. 29); and is ultimately fully integrated into the broader community of practice (CoP).

1.2.5 Feasibility versus Viability

A thing is deemed feasible when it is able to exist in reality based on the factors that are necessary to creation—such as finances, resources, and infrastructure (composite of entries in Merriam Webster's Dictionary, 2018). E-learning exemplifies the feasibility of the construct of a fully remote instructional delivery system. Twenty years ago, bandwidth, hardware, storage, and software limitations precluded access to some forms of virtual learning. This is not the case today. From MOOCs to virtual campuses to systems designed specifically for e-learning in isolated villages of the Amazon (Trucano, 2014). Academia is adopting online and virtual learning technologies to improve delivery of services (Bae et al., 2015; Bridger, 2014; Evergreen Education Group, 2015). Business, industry, the public and non-profit sectors all are evidencing a similar trend in consumer-focused innovation (Herzlinger, 2018). Advances in technology, training and education, and increased access to data have set the stage for change. Innovative business modeling—the way businesses are structured (or structure) the delivery of services, including ever increasing "work from home" or "remote" positions (Bell, 2012; Felstead & Henseke, 2017; Zott & Amit, 2010)—and the growth in consumer adoption of virtual solutions also indicate the environment may be favorably disposed to the application of a virtual environment to the apprenticeship model (Bourrie, et al., 2015; Herzlinger, 2018; Lee & Dafney, 2016; Rogers, 2003).

The construct of viability carries with it not only the capacity to exist (feasibility), but the ability to succeed, grow, and to thrive as well. It connotes sustainability and even effectiveness (Merriam Webster's Dictionary, 2018). So, while something may be in fact feasible, viability carries a higher burden of proof. The technological advances that have helped fuel the virtual training and remote employment movement are augmented by a number of factors, such as efficiency and accessibility initiatives (Anaraki, 2004; Herzlinger, 2018; Kasraie & Kasraie, 2010; McKinsey & Company, 2017; The World Bank Group, 2015; Michael Trucano, 2014). Even before the pandemic, the increased affordability of technology(ies), coupled with the positive reports of remote employee effectiveness and productivity, mirrored an increased organizational

interest in exploring virtual solutions to address capacity and logistical constraints (Castell, 2017). Industries, such as health care and psychology (long known for expert supervision of resident students), began experimenting with remote oversight as part of progressive academic/instructional initiatives (Feinstein & Yager, 2013; Wearne et al., 2015). The success of virtual learning in the higher grade levels, and the seeming success of the COVID-19 WFH experiment (Banjo et al., 2020) evidenced by the recent movement by major employers to extend or make permanent WFH are undeniable (Akala, 2020; Berliner, 2020; McLean, 2020; Zumbach & Marotti, 2020). These demonstrate the feasibility of delivering instruction remotely and working remotely. But, what about the viability of delivering the face-to-face on-the-job-training (OJT) experience of an apprenticeship as a virtual experience?

1.2.6 Functional Equivalence

As in legal, business, and economic translation, the use of functional equivalence as a means of comparison can be helpful when looking at diverse instructional systems in which absolute equivalents may be lacking. Functional equivalence in the field of translation means that the functional equivalent has the same function as the source concept (García González, 2017). Using this as a standard of comparison, stakeholders in this study were asked to evaluate aspects of a proposed fully remote apprenticeship delivery system (FRADS) based on the intended function of corresponding aspects of a face-to-face apprenticeship delivery system (F2FADS).

For example, in a F2FADS environment, a mentor is physically accessible to an apprentice —modeling, instructing, monitoring, coaching, questioning/responding, assessing, scaffolding, correcting, encouraging. Tasks are structured, performance evaluated, and feedback given. Students are asked to reflect on their experience, and to explore new applications of the learning constructs. In lieu of these methods and activities, stakeholders were asked their perceptions of the ability of a FRADS to fulfill these various functions of the mentor/apprentice relationship with the same degree of effort, quality, and effectiveness of a F2FADS.

1.3 Purpose of the Study

When I began this study in 2017, a search of the literature failed to return any discussion of the construct of fully remote apprenticeship(s). Even today, little has been written in other than the area of cognitive apprenticeships. What is known is that in many countries, the current face-to-face delivery system fails to provide for access-limited individuals (Storen, 2011). This study explored the perceptions of critical stakeholders as to the viability of fully remote apprenticeships as a functionally equivalent alternative to the current face-to-face delivery system; and examined whether such a delivery system might provide a vehicle of inclusion for access-limited individuals to apprenticeship and the corresponding community of practice. In addition, I describe the environment of (and mindset toward) U.S. apprenticeship pre/mid-pandemic; and provide a basis for the development of a first generation FRADS process map, including the components requiring especial attention. The challenges and potential benefits of such a system are also identified.

1.4 Significance

It was expected that a preliminary model might emerge from this study that would provide the basis for further empirical study of fully remote apprenticeship delivery systems. In addition, it was expected that a technology-mediated, fully remote apprenticeship delivery system could create an inclusive pathway through which access-limited populations could move into full-time, long-term employment.

1.5 Implications

For researchers, viewing a fully remote apprenticeship delivery system through the eyes of a diverse group of stakeholders, adds rich insight to our understanding of the apprenticeship model in general while providing deeper understanding of the evolutionary path apprenticeship might take to become a more inclusive 21st century pedagogical model. The exploration of changes to the delivery system exposed some concerns, challenges, and potential for improvement to the traditional apprenticeships offered today. In addition, constraints of a fully remote apprenticeship delivery system are elucidated, while critical mediating and moderating factors and perceived benefits have been enumerated, which may inform future research studies. The IEG Service Delivery Evaluation Framework protocol (Caceres et al., 2016) has been slightly modified to create

a checklist appropriate to a FRADS, providing a form of *rubric of viability* against which to compare emerging themes. While IEG states the framework is suitable for all phases of service delivery—including design—this study introduces it very early (with permission of the Authors), during the initial conceptualization/ideation stage, using it to discern gaps, and to serve as an indicator of potential viability. With minor changes, it can be used to evaluate a FRADS should one be implemented.

In synthesizing these perceptions of key experts (federal and state government, industry, 3rd party providers, consultants in LSC, higher education, and technology and educational technology experts), it was expected that if the concept of a FRADS was carefully examined and positively received, the components critical to the design of a model would be revealed—the core nature and structure required for effectiveness. This study, then, serves as a first step for stakeholders toward conceiving a model for testing purposes, providing empirical data (relevant factors/variables/considerations) useful for moving the conversation and construct forward. While it is possible the discussion of a fully remote apprenticeship has been raised among stakeholders in informal, private settings, this research moves the discussion to a public forum, extending the boundaries of the debate to invite participation by all stakeholder groups and interested parties. It may also help flesh out a model that can be proposed to citizen beneficiaries in order to make their voice(es) known. This greater level of involvement will facilitate the likelihood that the delivery system will go "beyond output and outcome" to create an accountable, accessible, and satisfactory system and experience, that meets end-user expectations, based on a thorough needs analysis (Kim, 2012).

In practice, it is possible that industry involvement may increase if a cost-effective, easy to implement vehicle becomes available for providing and administering apprenticeships. It is also possible, that while this study focuses on the United States, because of the universality of apprenticeship across nations (Fuller & Unwin, 2011), important access-limiting issues of a global nature (e.g., logistical access) may be foregrounded. With the requirements, challenges, priorities, possible instructional design/development considerations, and external constraints identified, a system and process for effectively reaching access-limited populations on a global level may become available and this study will contribute to the global understanding of fully remote apprenticeship delivery in general. Finally, because logistical accessibility has proven challenging on many levels in various arenas, this study may contribute to the discussion in other unrelated

areas, such as providing general education to the access-limited, or increasing involvement of this disenfranchised group in the global forum(s).

Finally, in relation to natural disrupters, this study spans the time period prior to and mid-pandemic. Some stakeholder insights mid-pandemic are included, as are policy changes, statistical data, and news articles that show the potential capacity of a FRADS to bring about transformational change in the global delivery and scope of apprenticeships.

1.6 Research Questions

Traditional apprenticeships require a face-to-face practical skills component (on-the-job training or OJT) which precludes participation for some access-limited populations. This study explored the perceptions of critical stakeholders as to the viability of a fully remote apprenticeship delivery system and critical factors associated with its success, by asking the questions:

1. What is necessary to ensure the viability of a Fully Remote Apprenticeship Delivery System (FRADS)?
2. What concerns must be addressed if a FRADS is to be functionally equivalent to the current face-to-face apprenticeship delivery system (F2FADS)?
3. What are the critical factors associated with deploying a Fully Remote Apprenticeship Delivery System (FRADS) as a path of inclusion for access-limited populations.

1.7 Research Design

Exploratory studies are "preliminary analysis" and aid in the development of hypotheses or propositions (Privitera, 2017; Yin, 2017, p. 10). Thus, an exploratory study is well suited to helping illuminate the perceptions of critical stakeholders who could be instrumental in the deconstruction and then development of a fully remote apprenticeship program, providing a basis for further research and/or modeling. This is, as (Yin, 2017) explains, a "constructivist approach" from a "relativist perspective", "attempting to capture the perspectives of different participants and focusing on how their different meanings illuminate" the topic (p. 16).

In 2018-19, 14 stakeholders—experts in their respective field and associated in various ways with U.S. apprenticeship and/or a fully remote apprenticeship delivery system as an

instructional model—were interviewed as to their perceptions relating to the viability of a fully remote apprenticeship delivery system (FRADS). Topics ranged from enabling conditions such as policy and infrastructure, to large systems change; from technical components of the apprenticeship system to factors impacting learning and integration into the corporate culture and broader community of practice (CoP). The interviews were coded for emerging themes as well as against a proven *rubric* of viability (Caceres et al., 2016). All quotes used in the final report were sent to the stakeholders for member checking along with the original transcripts. Quotations were edited where requested. A summary of any follow-up calls and email exchanges mid-pandemic are included in the Chapter 5, Discussion. In addition, an executive summary will be sent to every stakeholder.

1.7.1 Theoretical Framework

In this study, I utilized IEG's definition of service delivery, many of the components of the SDEF framework (used to evaluate the viability of service delivery programs that are funded by the World Bank), and a modified version of their Analytical Protocol to: a) aid in participant selection; b) ensure integral interview questions were included, properly worded, and scoped; and, c) as a tool in secondary analysis. In addition, in *Readiness for Organizational Change*, Weiner (2009) reports that half of unsuccessful large-scale organizational change efforts are attributed to "failure to establish sufficient readiness" (p. 2). Because FRADS represents a large systems change, I included Wiener's indicators of readiness as an enabling condition located within the IEG SDEF framework (see Table 1, IEG 2016 Service Delivery Evaluation Framework, p. 19).

IEG defines service delivery as a "series of highly localized actions by agents in public agencies or private enterprises to provide needed goods and services to citizen beneficiaries" (Caceres et al., 2016, p. 1). A comprehensive service delivery plan includes everything that is required to initiate and provide a service to an end-user. In the IEG SDEF, the end-user is the citizen beneficiary, in this case the apprentices; and the stakeholders are the individuals and/or groups who partner to provide the services. These stakeholders include governments and policy makers, as well as service providers—both those who create and manage the direct and indirect service provisions and those who work on the front-lines directly with the citizen beneficiaries. When looking at the framework, it becomes clear that some elements are enabling conditions and work in the background, such as the political environment, public policies, and regulations;

leadership, data and financial systems; and procurement and parts of the supply chain systems. All of these provide the infrastructure integral to housing a service delivery system. Inputs include the resources that undergird the system such as funding, human capital, technology, and a solid end-to-end service delivery design predicated on meeting the needs and expectations of the citizen beneficiaries with well-defined service standards and operational/maintenance plans.

It is within such an environment of favorable enabling conditions and adequate resources/inputs that a well-designed service delivery system may be implemented. The method of implementation may vary, and a plan may be supported by any combination of public and/or private funding. In the case of the common good with underserved citizenry, goods and/or service delivery often involves governmental provisioning or support; but, citizen-directed provisioning is also used in circumstances where it is deemed the best method of meeting the need(s)—such as in the cases of vouchers (Caceres et al., 2016).

The IEG framework includes outputs directly related to the delivery activity itself, such as performance monitoring, accountability and quality control; and, provides for outcomes related to use of the service(s), such as extent of coverage and the quality and reliability of the services provided as well. Feedback loops provide input for tweaking the system to increase levels of satisfaction and outcomes specific to the target sectors (such as the poor or in the case of this study, potential apprentices/access-limited individuals). A final, but, critically important consideration is the sustainability of the system, which is dependent on a right assessment of enabling conditions, the reliability of the inputs, a solid design, and proper implementation of the service delivery system with careful monitoring, accountability, and appropriate timely response.

1.7.2 Assumptions

In designing this study, I made certain assumptions to help direct the research process and provide rationale for my actions (Yin, 2017). I first assumed, based on my experience in technology and online education, that fully remote apprenticeships are at least feasible in concept, and (after an extensive literature review) I concluded that a discussion as to the viability of using them in certain instances is warranted. Further, I assumed that stakeholders already involved in the apprenticeship pipeline would be interested in exploring the construct as an alternative to the current apprenticeship delivery system—never considering the possibility of a pandemic. In addition, I assumed that interviewing critical stakeholders within the U.S. apprenticeship system

would provide a rich preliminary picture of the overall perceptions of viability and receptivity to the construct. Based on the literature, this study also presupposes that the current system is inadequate, as it fails to fully provide a path of inclusion for access-limited populations. Finally, it is assumed that access-limited populations may be interested in participating in apprenticeship opportunities if such opportunities are made more accessible, and that these individuals would benefit from a pathway to full-time employment and membership in the Community of Practice.

1.7.3 Scope

This study is limited to the United States registered apprenticeship system. Because of this, components considered critical to apprenticeship systems in other parts of the world may not be included in the discussion. State Apprenticeship programs may have different requirements and therefore require modifications to any model. In addition, this study did not explore the recent Industry Recognized Apprenticeships, but, feedback from stakeholders is included in the discussion relevant to certifications.

1.8 Summary

In this first chapter, I introduced the concepts of a fully remote apprenticeship delivery system, functional equivalence, and access-limited populations. I gave a brief review of the background and reasons for this study. I discussed the construct of feasibility versus viability, and provided an overview of my research design. I also delineated the significance and implications of this study, and ended by revealing my assumptions, and the limitations and scope of the study. Chapter Two provides an in-depth history of apprenticeship as a model of learning, demonstrating the holistic nature of the model and the seeming immutability of the historical delivery system. Chapter Three describes the design of this qualitative exploratory study, including participant selection, instrument design and implementation, the interview protocol, and plan of analysis. In Chapter Four, I reveal the findings produced by analysis. And, Chapter Five contains a discussion of the key findings, juxtaposed against theory and practice. Finally a preliminary FRADS process map is introduced.

CHAPTER 2. LITERATURE

2.1 Apprenticeship: A Holistic History of a Complex System

The ancient practice of facilitating a child's transition to adulthood (Symonds et al., 2011) by apprenticing them as a novice to a level of skilled expertise for purposes of employment has met both favor and disregard; evolving over time from a simple, yet effective method of skill transference to the highly specialized instructional institution it is in many countries today (Jacoby, 2017). While the methodology of apprenticeship has undergone evaluation and process refinement and vocational education has been added in many cases to create a more holistic educational experience, the essence of the traditional model remains fundamentally unchanged. It is true that cognitive apprenticeships have assumed a legitimate position by expanding the construct in jurisdiction and implementation to include those instructional practices that help manifest, situate and universalize decontextualized, abstract constructs. But, the essence of apprenticeship as a model of learning remains true to its roots—conceptual and practical impartation through observation and modeling, scaffolded by just-in-time (JIT) coaching, with increasing independence promoted through fading (Collins, et al., 1991). It is in implementation, unfortunately, that modern apprenticeships often fail to achieve desired outcomes (Smith & Kemmis, 2013).

Apprenticeship is considered the way we " learn most naturally" (Collins et al., 1987, p. 23), and is recognized globally as a legitimate framework for skills development (Fuller & Unwin, 2011). To understand the intent, design, practice, and future potential of formal apprenticeships situated in today's technologically driven information age, this paper takes a chronological world-systems view of apprenticeship, locating it within the larger world-economy impacted by the political centers (Wallerstein, 2006); looking at the historical progression and socio-cultural evolution; touching on its epistemological roots as a pedagogical model, as well as its place within learning and instructional design theory; briefly describing its current manifestation in the EU, Germany, the United Kingdom, Australia, Canada and the United States; and, finally, briefly considering the potential for future iterations.

2.2 Apprenticeship Defined

In recounting the history of the labor structure regarded now as apprenticeship, as it has evolved over time, the best place to begin may be with the definition; recognizing that beyond the historical and theoretical model, outside forces (such as economic, political, socio-cultural, legal, institutional, and instructional systems) bear impact on the final manifestation. Although usually positioned within labor, apprenticeship is "primarily a model of learning" (Fuller & Unwin, 2009). While the exact wording varies by source, the essence of the concept of apprenticeship lies in its being a pedagogical method of passing an acquired (and practical) skill from one person, the expert or master, to another, a novice or apprentice. It is implied that the desired end is employability, a hallmark of adulthood (Smith & Kemmis, 2013). The apprentice shadows the expert—watching, questioning, engaging in instruction, performance or practice, feedback, reflection, and correction, being progressively tasked with greater responsibility for the successful completion of the valued activity and overall process, until such time as the apprentice becomes (and is deemed) expert in his/her own right (Rogoff, 1990; Romiszowski, 1999). This process is a form of situated cognition identified as "legitimate peripheral participation" (Lave & Wenger, 1991) in which the "newcomer to a community of practice (CoP) develops into a full participant" as h/she develops competence in the activities of the community (Driscoll, 2005, p. 165).

The most recent definition of apprenticeship in the United States may be that contained within a presidential executive order: "The term 'apprenticeship' means an arrangement that includes a paid-work component and an educational or instructional component, wherein an individual obtains workplace-relevant knowledge and skills" (Executive Office of the President, 2017). Thus, an apprentice must be paid, receive instruction, and attain competencies (knowledge and skills) relevant to a particular type of work as it is performed in the workplace.

2.3The Evolution of the Design

It is important to note the changes in the way apprenticeships were administered over the years. While retaining the one-to-one quality of apprenticeship, many factors played into the manifestation of the model over time and in different parts of the world.

2.3.1 Skilled Craftmanship and Economics.

Initially, skilled craftsmanship passed only from parent to child, thus ensuring the livelihood and social status of the family line (Collins et al., 1991). It is important to note that when parents were apprenticing their own children, competencies beyond those required for the craft were being imparted—language, thought processes, personal and moral convictions, reasonings, rationale, understandings (some crucial to work ethic), world view, and the numerous other knowledge, skills, abilities, and attitudes that make up the culture and knowledge base of the immediate family. It was primarily the trade skill/craftsmanship of a master paired with the purpose of passing that skill to a novice, however, that birthed the apprenticeship model of knowledge/skill transfer we know today.

At what point some parents first thought to seek a better life (defined largely by economic stability) for their children by arranging for them to learn a skilled craft under the tutelage of an extended family (clan) member or non-familial artisan, is unknown; but, the practice led to the formal method of indenturing of children as young as four years of age (Griffin, 2013). It might be argued that this transmutation of competency and work, from a part of a child's enculturation into family life and adulthood, to skill attainment for economic purposes (labor), may have inadvertently stripped the concept of work ethic of its moral imperative, resulting in the creation of an environment with the potential for abuse. It was in fact the abuse of this new system of education/training that propagated an adversarial (rather than symbiotic) relationship between master and apprentice, giving rise to the need for legal protections for both parties (de la Croix, et al., 2016). The earliest known record of the legal oversight of the master/apprentice relationship found in the Babylonian Code of Hammurabi, dating to 1754 B.C. (lines 188 and 189), infers the prior existence of informal arrangements, recognizes the adoptee status of the apprentice, and addresses the legal responsibility of the master to train the novice in a craft (Hammurabi by King, 1915):

> 188. If an artizan has undertaken to rear a child and teaches him his craft, he can not be demanded back.
>
> 189. If he has not taught him his craft, this adopted son may return to his father's house.

2.3.2 Early Apprenticeships

While the Hammurabi Code documents the earliest known governance of the apprenticeship relationship, the custom of apprenticing a novice to a master, widely practiced for centuries by many cultures, was not restricted to the crafting arts. For example, Hebrew Scriptures dating back to 400 B.C. record apprenticeships of prophets and priests (1 Kings 19:1 through 2 Kings 2:15; 1 Samuel 1:1 through 7:15, The King James Version), Egyptian accounts mention apprenticeship into the craft of embalming (Herodutos, 2010), and the art of philosophy and reason passed from Socrates to Plato via an form of apprenticeship using the Socratic/dialectic method to direct and frame learning through "discourse and reflection". This approach, when combined with the early Roman model of "education as vocational training" informed the development of what we now know as the cognitive apprenticeship (Collins et al., 1991; Hammond et al., 2001). Apprenticeship then *serves* at the same time it guides and directs industry, and is occupation, position, and role neutral, meaning it can be used on any level, in any industry, as a learning model (Fuller & Unwin, 2011).

The Medieval period (500-1500 AD) apprenticeships, most notably in Europe and England, weighed strongly in favor of the masters. The often unfair practices experienced by the poor and so aptly embedded in the terminology used (i.e., master-apprentice), were supported by the instructional practices modeled by the Roman Catholic Church and propagated through its schools and universities during the twelfth century AD. Information was unidirectional—transmitted to learners with no regard for potential interaction in the form of input, modification or process improvement on the part of the novice (Hammond et al., 2001).

The earliest known use of the term *apprentice* emanates from the word *aprentís*, (1300's AD, Old French for learner) and includes the concept of indenture—one person being bound to another in a legal, contractual arrangement for the purpose of learning a skilled trade (Merriam-Webster, 1983). This formal transaction was usually contingent upon the payment of a *premium* by the family of the would-be apprentice. The arrangement included a specified period of time as well as the terms of service and compensation, with the apprentice receiving room and board in lieu of a standard wage. The price paid was based on several factors, including the financial means of the parents, the reputation of the master, the level of skill required, the availability of apprenticeships, and the desirability of the profession based on its status and potential future earnings. The expected number of years of training and degree of demand(s) on the master also

played into the fees and contractual details (de la Croix et al., 2017; Minns & Wallis, 2013), and most of these criteria remain today. In England, poor children indentured as apprentices by their parents, at an average age of twelve years old, were often treated as little more than slaves, living under the harshest conditions and performing various types of labor beyond that for which they were indentured (Griffin, 2013)This practice runs counter to what Lave & Wenger (1991) recommend as a "legitimate peripheral" participatory practice, as they strongly warn against conditions that place "newcomers in deeply adversarial relations with masters…in exhausting over-involvement in work; or in involuntary servitude rather than participation" as it serves to "distort, partially or completely the prospects of learning in practice" (p. 64). Sadly, it would be centuries before the voice of reason would enter the conversation. Craft guilds (similar to trade associations of today) emerged in the early twelfth century to help regulate the various trades; but the plight of the children was secondary to regulating the number of craftsmen and ensuring the integrity of the craft by requiring the exclusive hiring of apprentices for the skilled trades, shunning anyone who left an apprenticeship without completing the full term (Harrison, 1985).

2.3.3 Socio-cultural Influences on Design

de la Croix et al. (2016) contend that it is the way that countries organized their apprenticeship system that determined the effectiveness of the apprenticeships, the level of innovation, and the country's eventual industrialization. Of the four institutions they identified—the nuclear family, clan, gild (guild), and market—China, India and the Middle East relied predominantly on the clan for training of novices, with informal agreements regulating the relationships among the extended families. Western Europe, on the other hand, moved very early (as early as 500 AD) from reliance solely on the nuclear family to a guild system, bypassing the clans, and thereby fostering invention and innovation in a system that brought diverse knowledge and techniques together. It is probably not coincidental that the greatest technological innovation occurred where market forces were strongest, such as in Britain and the Netherlands. By the end of the Middle Ages, due to waning effectiveness, the guild system had been replaced with formal governmental regulation in a number of industries (de la Croix et al., 2016).

In 1583, the United Kingdom instituted The *Statute of Artificers* to legally protect the skilled artisans/craftsmen by setting the minimum required number of years of apprenticeship at seven and the maximum ages of males and females at 24 and 21 respectively. Unfortunately, the

Statute inadvertently created an unjust system in which the poorest children could be (and often were) kept on far past seven years, because they were apprenticed at an early age and not required to be released until they were in their twenties (Griffin, 2013; Harrison, 1985). It is perhaps at this stage that apprenticeship became an informal agent of the state—incorporated into programs and policies to help achieve the broader goals of labor and economics (Fuller & Unwin, 2011).

2.3.4 Apprenticeship in England during the Industrial Revolution 1760-1840

While guilds, markets, and innovative technology were certainly precipitators of industrialization in England, the early mechanical inventions were at first embraced by the artisans, especially in the textile industry where mall enhancements in equipment capabilities, such as Kay's flying shuttle in 1733 and Hargreave's spinning Jenny (1760's), gave rise to small home-based cottage businesses with up to four looms or spinning wheels per home; thus, increasing the artisans' output and with it their household income. Even initial efforts at automation only served to further the craftsman's position because waterpower was readily accessible in the countryside and could be used to generate the needed electricity. It was not many years, however, before the introduction of the steam engine changed the landscape forever, enabling large manufacturing plants to locate within the highly populated cities where they could fully utilize the lesser technological changes and labor pools on a massive scale (Harrison, 1985).

It is a tribute to the spirit of the skilled craftsmen that many chose to retain their independence, while searching for ways to be competitive. Whether the pushback was an attempt to remain competitive, or to fight back against unfair governance, to intervene in behalf of poor children, or, simply the recognition that certain crafts requiring less skill (such as shoemaking and tailoring) could be mastered in far less than seven years, is open to debate; but, informal two-year apprenticeships began to be offered in increasing numbers after the passing of the *Statute of Artificers*, effectively creating a new category of worker—viewed as higher in status than an unskilled laborer, but disdained by more highly skilled artisans. This adaptive change in a small segment of the complex system of apprenticeship produced a ripple effect throughout the system as a whole. As labor markets shifted, many apprentices in industries still requiring a seven-year apprenticeship began leaving their masters prior to the ending of their contracts (Wallis, 2008), effectively shifting the balance of power to the workers, and giving rise to a movement to reconsider the term limits of even the most highly skilled apprenticeships. Voices of discontent

coupled with an increasingly organized system of social activism in behalf of the apprenticed children facilitated the repeal of the most restrictive portions of the *Statue of Artificers* in 1814 (Griffin, 2013), and fed the fire of this new form of apprenticeship across the United Kingdom just as automation began to rapidly advance. In this environment, the newly defined short-term apprenticeship served laborers well—allowing them to more easily transition to the automated machinery that was rapidly replacing the demand for their handiwork, as well as to move back and forth between factory labor and their craft based on market conditions and the needs of their family (Harrison, 1985).

It may have been this ever so slight elevation in status, or the taste of freedom whetting the soul that stirred the hearts of the workers and produced a secondary phenomenon among the working class—the expression of a desire to enjoy the higher things in life, including participation in culture and education. While we may view apprenticeship as a pedagogical model, it was this desire of the apprentice(s) to offer the world more than mere labor that set the stage for the entry of educators into the system; although, not until well into the eighteenth century. Forty years later in 1810, a network of schools was formed in England, distinctly fit to the needs of apprentices. Classes were scheduled around the workday, and included content pertinent to the profession, as well as the basic courses. By the end of the Industrial Revolution, poor children, both urban and rural, once deprived of even the basics of reading and writing were becoming literate (Griffin, 2013). This model of customized learning is still a hallmark of the British system today (Champion & Marrs, 2017).

2.4 Practice Does Not Necessarily Make Perfect

Through thousands of years of use, apprenticeship remained a model of learning, but, at times it failed to fit the changing times.

2.4.1 Setting the Stage for a Market System

By the mid-1800's, skilled master craftsmen were being replaced with manufacturing foremen, the home with the plant. The United States was comparatively young and many of the U.S. craftsmen were first or second-generation immigrants without the benefit of extended family or clans. Required skillsets were changing along with the social structure. Industrialization had left

its mark on the economy and the apprenticeship system, and philosophy and educational psychology were beginning to play a role in the cultural metamorphosis. Descartes (1596-1650), Locke (1632-1704), Rousseau (1712-1778), and Kant (1724-1804) had planted the seeds of learning theory that recognized the mind as separate from the body, and the individual as a participant in the process of knowledge transfer, rather than merely a recipient (Hammond et al., 2001). Herbart (1776-1842) presented a learner-centered paradigm—influenced by Pestalozzi's (1746-1827) concept of learner autonomy—in which a student, bound only by "the work", is given freedom to exercise and express h/her own will; guided by the instructor towards realizing h/her full potential (Kim, 2015).

By 1906, Educators in England had begun instituting learning environments that worked around the hours the children were in the shops—night schools and specialized curriculum aimed at language and mathematics literacy—revealing the beginnings of an emerging emphasis on the individual as a whole person (Griffin, 2013). However, the publication of *Boy Labour and Apprenticeship* proved the major catalyst of change (Bray, 1912). Bray's description of the times is eerily reminiscent of our own nightly news, lamenting the dangers of urban life and the urgency of the need for reform to thwart the "further degeneration of the youth" (p. vi). It was in this chaotic social, economic, and pedagogical environment that England and the U.S. emerged from the task-centered mindset of the Industrial Revolution crippled by failing apprenticeship systems with serious identity issues. Bray boldly called for the establishment of a "true apprenticeship system" (p. 11) under the "guardianship of the state" (p. 37) that met three conditions: 1) adequate supervision of both body and conduct until a child reached the age of 18; 2) training both in work and citizenship; and, 3) preparation for and provision of "reasonable prospects for permanent employment" (p. 75)—in essence a path to adulthood.

2.4.2 The U.S. Response

Employers had long held the upper hand in apprenticeship agreements, and just as the apprentices in England had begun to form their own informal systems of two-year apprenticeships, the American apprentices refused to remain in servitude forever. The transformation to a climate that truly advanced worker-rights took nearly a century, with employer associations, governmental bodies, and unions emerging by industry in response to the misuse/abuse of and by youthful apprentices. Like England, as the Industrial Revolution came to a close, the plight of the

apprentices began to be foregrounded as more and more novices at various stages of their training chose to leave their positions without completing the terms of their indenture. Rather than reforming the dysfunctional system, however, employers, needing to fill the escalating labor demands fueled by the Industrial Revolution, had responded with what Senge (1990) calls "shifting the burden"; opting to bring on cheaper labor—women and children and skilled craftsmen from Europe—whom they could quickly train for specific tasks rather than offering apprenticeships. This movement derived from several factors: 1) The inability to enforce the terms of indenture if an apprentice left without fulfilling their part of the contract (leaving more and more employers who had invested heavily in an apprentice without a skilled worker); 2) The remnants of the Colonial system of indenture that required the employer to assume parental rights; and 3) The employers' aversion to any form of oversight. While the shifting of the burden did meet the immediate need for relatively unskilled labor, it merely addressed symptoms (as Senge predicts) rather than attending to the underlying problem of growing a stable, well-trained, and contented labor force; and resulted ultimately in increasingly declining levels of skilled labor (Jacoby, 1991).

2.4.3 Low Points: The Catalyst for Change

At an all-time low of 44,000 U.S. apprenticeships in 1880, the economics and legalities of the employer/employee relationship (such as ensuring the amount and quality of the training) had still not been adequately addressed, and issues centering on apprenticeships accounted for six percent of all strikes in New York by 1887 (Jacoby, 1991). While Jacoby goes on to contend that market conditions could/should keep employers in check because of the impact of unfair practices on the company's reputation, U.S. employees preferred to entrust themselves to the labor unions to act in their behalf rather than relying on the markets. The strengthening of the union(s) during this period brought renewed hope for employees, evidenced by the number of available apprenticeships growing to 140,000 by 1920, just in time for the Great Depression.

In 1914, two years after Bray's book came on the scene and just a few years before the U.S. entered WWI, Charles Prosser, protégé to David Snedden, contributed legislative recommendations to the Commission on Aid to Vocational Education (Slupe, 2014). Snedden and Prosser held the position that the role of vocational education was career preparation, and as such, should focus on those competencies "intimately identified with the occupation for which it trains" (Snedden & Dewey, 1977, p. 51). It was this philosophy that helped frame the Smith-Hughes

National Vocational Education Act of 1917—the first time the United States government appropriated funds to facilitate state growth of vocational programs (Howze, 2015; Slupe, 2014). It was also around this same time that Dewey published *Democracy and Education* (Dewey, 1919) in which he discussed the danger of vocational education becoming misinterpreted as "trade education". Echoing Bray's concerns, Dewey contended that a separation of curriculum would degrade the effectiveness of both vocational and liberal education and impair the students' ability to function fully within a democracy as evidenced in their ability/inability to effectively transform it by enhancing the lives of others. He recommended including appropriate sciences, economics, history relative to the current state of the industry, civics/politics, and adaptability (ability to transfer) as a method of empowerment — "an education which acknowledges the full intellectual and social meaning of a vocation" (p. 372). His voice would go unheeded for forty years. In the interim, little progress was made legislatively; but, behind the scenes, the pot was quietly simmering throughout WWI and the Great Depression.

Whether a response to the increasing number of lawsuits by apprentices against their employers, and/or the desire of the National Recovery Administration (NRA) to help re-enliven American industry after the financial collapse, employers and trade unions were invited to help formulate the National Industrial Recovery Act of 1934. Almost overnight, the Federal government's voice dominated the conversation on apprenticeships as a subset of the overall issue of fair labor practices. Even when the National Recovery Administration was deemed unlawful and subsequently dissolved a year later, Frances Perkins, U.S. Secretary of Labor helped enact the National Apprenticeship Act (1937), creating a national advisory committee comprised of equal representation from three groups (industry, labor and government), tasked with establishing the standards for all U.S. apprenticeship programs. William F. Patterson, Secretary of the Federal Committee on Apprenticeships spearheaded the project and commissioned a book, *How to Train Workers for War Industries*, that would soon define the American apprenticeship for years to come (Dodd & Rice, 1942).

2.4.4 Transition of a System within a Changing Context

The U.S. reliance on foreign tradesmen had created a scarcity of workers who could advance as foremen and managers retired, and it was determined that the time had come to turn the focus within: "No longer is it possible to draw upon European countries for our supply of

skilled workmen…The only satisfactory way of maintaining a supply of workers is to train young workers…Every plant…to assure the continuance of our industrial civilization as a whole" (Dodd & Rice, 1942, p. 135). In this seminal work, apprenticeship training was broken into two phases: 1) A scheduled, step-by-step work experience leading to increasing levels of competency in a skilled trade; and, 2) Instruction in closely related technical knowledge, theory, and practice (p. 4). This meant that experienced employees and instructors became responsible for the training of new hires, and novices deemed worthy by "desire and capacity" were to be noted and properly equipped through apprenticeship in a reasonable time for advancement (p. 5). A skilled trade was defined as one which requires at least two years for proficiency and encompasses a comprehensive education enabling flexibility and higher-level problem solving within the system; not one in which a worker operates only one or two machines, however skilled they might be. Dodd & Rice outlined five principles governing apprenticeships, calling for: 1) a mutually conceived, written agreement between the employer and apprentice; 2) that is reviewed and registered by a third party; 3) detailing an orderly and systematic planned progression of the apprentice through an on-the-job training procedure; 4) under "constant supervision"; and 5) for a specified period of time (pp. 135–148). The power over formal apprenticeships now rested firmly in the hands of the Federal government, with the unions and industry serving more as consultants and facilitators of the rapidly evolving system, and educators playing a third-party, supportive role.

Rogoff (1990), in discussing the importance of Gibson's (1979) work on ecological theory, emphasized the inseparability from, and influence of, the organism by and on its environment. This mutuality defines and structures the immediate and overall system(s) within which the novice learns, grows, and develops. The immediate environment of the novice has morphed over time from h/her home with a holistic focus on family identity through craftsmanship to the home of a master craftsman (who may or may not have held the same value system) focused on a set of goal-specific competencies toward an economic end, to the broader industrial setting with a focus on a particular organization's labor requirements, strongly influenced in the beginning by the rapidly evolving technologies and markets, and then formalized in the mid-twentieth century as workforce development in response to the government's production needs during wartime. While the contextual changes were gradual and seemingly benign, the state of America's youth proved Dewey correct—large gaps in literacy, critical thinking skills, and other fundamental competencies demanded a more holistic approach.

2.5 The Current Face of Apprenticeship in Five Countries

A 2013 study by three international organizations found the U.S. apprenticeship program had a low priority focus in our education and training policy, and is disproportionately small in size, relative to our labor force (0.3%), while predominately serving adults (over 18). Our system is seen as large and complex with limited resourcing, few opportunities in the public sector, and a bias toward higher education (Smith & Kemmis, 2013). Some of this is attributable to the relative size of the geographic U.S. as well as the size of our labor market; but, some is due to a difference in philosophy. Responsibility falls on the company sponsors in the U.S., both to fund and recruit apprentices; and, although companies are offered tax credits for having apprenticeship programs, that is the extent of federal incentives (Champion & Marrs, 2017). In addition, apprenticeship in the U.S. generally follows secondary education; whereas in the U.K. it is an alternative to an academic path, and in Germany and Australia, apprenticeships are on the path to higher education. The U.S. system maintains a high quality standard as well as high retention rates, while Germany boasts a well-developed competency-based curriculum, excellent integration with labor, and high stakeholder engagement, but, faces attrition challenges in some sectors. The Australian system is far more extensive and diverse than the U.S., but quality and consistency are lacking and attrition rates are high (Smith & Kemmis, 2013). It may be helpful to take a closer look at these systems to aid in understanding the impact of the differences in structure and approach.

2.5.1 European Union

Nearly 100 years after Bray first called attention to the plight of youth, a Harvard report entitled *Pathways to Prosperity* (Symonds et al., 2011) looked at entry into the labor market as a mediating factor in the transition to adulthood, and found that numerous European countries have highly functioning Vocational Education (VET) and/or apprenticeship programs facilitating the process. Consistent with the premise that finding stable and satisfying employment aids in the transition to adulthood, when compared to the United States these countries exhibit positive signs that their system is in many cases more effective. Germany, with the oldest, and some contend most developed system (Fuller & Unwin, 2011), joined by Austria, Switzerland, Denmark, Finland, Norway and the Netherlands, all offer a work and learn certification system comprised of both classroom and workplace experiences—40 to 70% of students enter the program in 9th or 10th

grade, and most participate for three years, emerging with a valuable credential that qualifies them for both the workforce and further education. Worthy of note, Ireland is not among the countries listed. Corcoran (2014) reports that while Ireland implemented a Vocational Education Act of 1930 and subsequently the Apprenticeship Act of 1931, the latter was an anemic attempt to append imported laws onto an ineffectual educational system without regard for the overall environment, rendering it virtually ineffective.

2.5.2 Germany

The German system, propagated throughout all Germanic speaking countries in Europe (Bynner, 2010), is a work of art, providing entrance into 340 occupations through a partnership between industry, unions, and government (policy makers). Administered by the Federal Institute for Vocational Training, Germany's apprenticeship program is committed to providing each student leaving formal schooling with a comprehensive experience culminating in the attainment of what Fuller & Unwin (2011) deem an "occupational identity" (p. 22) but, which Bynner (2010) contends is more accurately the student's identity as a German citizen. A dual-system, Germany combines on-the-job training (overseen by employers) and vocational education provided by educators in state run schools, based on curriculum and standards set by Federal, State, and Local Chambers of Commerce (Bynner, 2010). The system is undergirded by the requirement for a license to practice in many of the skilled trades/services (Fuller & Unwin, 2011), similar to the method employed by the guilds in the twelfth century. German apprentices function as students/trainees who look forward to receiving their full credentials and becoming adults; they do not view themselves as adults prior to full employment. This is understandable, given only 50% of German apprentices secure employment with their industry partner, and only 40% in the occupational area of their apprenticeship. Their British counterparts, on the other hand, who may in some cases enter the system (through traineeships) as young as 14 years of age, already view themselves as adults, and express more confidence in their soft skills and employability. With little variance in economic benefit or reward to labor between the two systems, the heart of the difference in approach lies in each country's respective goals: Germany's interest lies in developing youth to adulthood who manifest a rich quality of life, evidenced by community engagement, political interest, and an overall sense of life satisfaction (Bynner, 2010); while the

British system focuses more on making up the skills deficit and ensuring employability (Dolphin & Lanning, 2011).

The following table highlights some basic differences between the U.S. and German views of labor.

Table 2. U.S. vs German Employer Mindset toward Labor

MINDSET	**US Employers**	**German Employers**
ROI	Important	Important
View of Labor Cost	Expense	Asset / Investment
Approach to Training	Skill Building	Holistic
Responsibility	Education System	Dual System: Education/Employer
Focus	Immediate / At Will	Future Long-term View

It is not that ROI is less important to German employers; rather that they take a long-term holistic view of apprenticeship, linking permanent employment to adulthood. This proactive employment strategy comes from a firm belief 1) in their role as a partner in the development of their citizens; and, 2) in employment as integral to the development of the individual and to the nation's stability and sustainability. Remarkably, German employers are willing to financially invest not only in their own employees, but, in those who will work for their competitors as well (Bertolini Stakeholder Interview, 2019). Rather than viewing labor as merely an expense against profits, the German approach in essence, treats labor as an asset, and the financial investment an investment in the country's future. As we consider the U.S. apprenticeship system, it is important to ask what the status quo says about our mindset and overall goal(s).

2.5.3 England

With the establishment of the National Council for Vocational Qualifications in 1986, a competency-based certification system (the National Vocational Qualification, NVQ) was developed in the U.K. by which to qualify employees based on work-related skillsets; but,

essentially devoid at first of basic literacy skills. The flexible and loosely structured British system of apprenticeship incorporates what it calls NVQ Levels, with apprenticeship credentials at each of the first four levels accepted by employers in lieu of academic diplomas/degrees. It was hoped the system would become the standard and umbrella for all apprenticeship programs. When this did not happen, the *Modern Apprenticeship* was introduced in 1994 (Hasluck & Hogarth, 2010)—still using the NVQ levels, but evolving as it added more skillsets and delineations (now 8 levels) until it became both relevant and mainstream. Currently, basic literacy skills are covered under a traineeship which prepares individuals to enter the apprenticeship program; intermediate skills under NVQ2, and advanced skillsets under NVQ3. A non-degree, undergraduate level credential is available at NVQ4 and an academic track at NVQ5 leading to an undergraduate degree (Bynner, 2010). Levels 6 (graduate), 7 (post-graduate), and 8 (doctoral) are also available. In the last decade, the Apprenticeships, Skills, Children and Learning Act was introduced in part to "make provision about apprenticeships, education, training and children's services", clarifying who could apprentice (including those over 19 years of age who were lawfully detained (incarcerated), and providing oversight and funding entities (The United Kingdom, 2009). International Vocational Qualifications (IVQs) certifications are also now offered through Cities and Guilds, promising either a certificate, diploma, or advanced diploma with worldwide acceptance (British Government, 2017; Cities and Guilds Group, 2017).

The U.K. has few trades that require apprenticeship as a qualifier for entry; and, therefore must market the value of apprenticing to both industry and potential workers. Unlike the U.S., then, the U.K. subsidizes their apprenticeship (Champion & Marrs, 2017; Hasluck & Hogarth, 2010) and has created a demand-led apprenticeship system in which the training content is determined by the industry partner as well as the *2006 Leitch Review of Skills* (Hasluck & Hogarth, 2010). Making a case for apprenticeship has not been difficult among the youth, because the economic benefits of acquiring a marketable skill have been easy to document. It is demonstrating the value to industry that has proven more difficult (Hasluck & Hogarth, 2010; Mager & Pipe, 1997); but, a 2007-08 study by the University of Warwick Institute for Employment Research (IER) found that by taking the net present value of the apprentice during the first five years of employment following the apprenticeship, employers could realize a return on investment within one to two years (Hasluck et al., 2008).

The British focus has been on specific industries for the most part—engineering, construction, business and retailing—with training expenditures ranging from a little over $1000 for a foundational business administration apprenticeship to $67,044 for one in engineering. This means that business and retailing can break even after only a year, construction in the third year, and engineering not until year four (4). The ease with which an employee can move between employers (flexibility) also influences an employer's willingness to invest in apprenticeship/training. Britain's system is relatively flexible compared to Germany. This flexibility is reflected in lower investment expenditures for similar training experiences (Hasluck & Hogarth, 2010).

2.5.4 Australia

Historically, Australia had chosen to import its skilled labor and continues this practice today, using apprentices for a source of cheap labor. Knight's 2012 study of the Australian model of apprenticeship shows it changed little from its British roots until 1985, when a greatly expanded form of apprenticeship, called traineeship, was introduced. Traineeships (also found in Britain) expanded the reach of the model (both in age and caliber of participant) and reduced the entry requirements—thus, increasing the number of occupations and enabling less qualified workers to participate. But, in the process, it diluted the system, such that lower-paid trainees do not receive trade qualifications. In addition, the comparatively inflexible apprenticeships, with longer time-frames and greater educational requirements, failed to attract participants. In the mid 1990's, a government incentive program was introduced to enable more businesses to participate; but, Knight reports most of the growth from this financial investment went to the traineeships. The 1998 *New Apprenticeships* program added to the complexity of the problem, allowing students, current employees, and part-time employees to begin to participate, resulted in a gender and age diverse mixture of individuals (the oldest at 77) entering equally diverse occupations.

At first glance, the increased participation might seem to indicate the programs worked as employment went up. But, the results are less than ideal: a significant injection of cash ($2.9 billion in 2008-09) produced little economic benefit, and the traineeship system is failing to meet industry's changing needs or to ensure Australia's students receive a solid "general education" (Knight, 2012, p. 3). When Australia's Technical Colleges were shut down a few years ago due to lack of funding, the responsibility for training and apprenticeships fell to an inconsistent secondary

system. Of 292,900 total commencements in 2010, only 15,900 were diploma/advanced diploma recipients across all trades; or 5.1% compared to 64.9% for the AQF trainee certificate III. The challenge facing the trainee/apprenticeship system now is that while employment has increased across age groups, critical gaps in intermediate skillsets have manifest that threaten current and future industry demands (Knight, 2012).

2.5.5 Canada

Apprenticeship in Canada was tumultuous until just the past decade. While enrollments were increasing annually (150% between 1991 and 2007), completion rates were abysmal at just 23% (Statistics Canada, 2009). A number of researchers conducted surveys in an attempt to understand the phenomena, finding that the Canadian government had tried tax credits and grants in hopes of increasing the number of skilled tradespeople—to no avail. In 2013, an Action Plan was drawn up, and a study conducted to determine what changes to the program would be most effective. Coe (2013) found a number of possible issues undermining the system—lack of standardization of the apprenticeships and requirements being the most apparent. Completion rates varied by province and even within the same trade. Accreditation requirements as well as pre-requisite knowledge varied considerably by trade and province. Some Trades saw numerous periods of unemployment, forcing apprentices to seek other means of supporting themselves and their families. Canada's Trades Qualifications and Apprenticeship Act of 1990 was repealed in 2013, leaving the provinces and territories to self-regulate apprenticeship programs (Canadian Government, 1990). The change opened the door temporarily to the potential for even less consistency in standards and rules among the ten provinces and three territories. Concerned that credentials awarded in one province/territory might not be accepted by another; the Premiers of the Canadian provinces responded by creating *The Provincial Territorial Mobility Protocol* which directed the ministers to collaborate on a process to facilitate mobility of apprentices between provinces and territories (Premiers of the Council of the Federation, 2015). To further counter the potential problems associated with dissimilar apprenticeship programs, a credentialing system was developed by the Canadian Council of Directors of Apprenticeship (CCDA)—the Red Seal Endorsement (RSE), which is obtained through examination. This endorsement includes 56 "Red Seal" trades and is an enhancement granted to qualified journey-workers that is highly valued throughout Canada and world-wide (Canadian Council of Directors of Apprenticeship *CCDA*,

2016). 2016 saw a decline in Canada's apprentices to just 417,300. Of these, 72,000 were new apprenticeships. The improved economy bolstered enrollment 11.6% between 2017-18, with 79,863 new registrations for a total of 392,863 registered apprenticeships by the end of 2018 (Statistics Canada, 2019).

2.5.6 United States

On the heels of the National Industry Recovery Act of 1934, $14 million per year in funding through the George-Deen Act of 1936 expanded the vocational programs of the Smith-Hughes Act of 1917 from agriculture, home-making, trade, and industrial areas of focus to include teacher education and marketing. The 1946 George-Barden Act and 1956 George-Barden Amendments funded area vocational (career) centers, created Future Farmers of America and the New Farmers of America, and added nursing and fishery to the list of programs (Imperatore, 2017). In 1963, the Vocational Education Act finally completed the transition from the task-based labor-centered paradigm to something closer to Dewey's holistic view of the individual (Slupe, 2014), expanding to "persons of all ages in all communities" with funding specifically appropriated for disadvantaged students (Imperatore, 2017). Between 1963 and 1976, legislation included efforts to improve equity for women and to expand the reach through a postsecondary initiative. After a quiet period between 1976 and 1984, the Carl D. Perkins Vocational Education Act set off a flurry of activity and federal investment as well as a new focus on alignment, accountability, academic integration, and partnerships with business/industry; and, in 1998, the American Vocational Association became the Association for Career and Technical Education, reflecting the shift to a rigorous, competency-based focus (Imperatore, 2017). Since 2006, more than $1 billion has been appropriated each year with only minor changes in process or focus.

While vocational education and apprenticeships are administered by different governmental entities, there is cooperation in both jurisdiction and implementation—with educators providing much of the related technical instruction (RTI), and industry and unions providing the hands-on, occupation-related skills experience and mentoring. The U.S. system is continually evolving and improving; and, efforts and appropriations by both President Obama through the American Apprenticeship Initiative (2015) and President Trump through an Executive Order on June 15, 2017, demonstrate a heightened commitment to further refine as well as expand the reach and program offerings of industry apprenticeships. The *Presidential Executive Order*

Expanding Apprenticeships in America (Trump, 2017) tasks the Secretaries of Labor, Education, and Commerce to target and terminate the registration of ineffective programs and promote the development of third-party apprenticeship programs by industry/trade groups, unions, for profit/not-for-profit corporations, and joint labor-management organizations. This expanded access to previously underserved populations, promoted apprenticeship programs at colleges and universities, and establish a short-term *Taskforce on Apprenticeship Expansion* to identify underserved areas and populations and recommend strategies to promote both industry and private-sector initiative. It also opened the door to consideration of industry recognized credentialing. While there were 300,000 manufacturing vacancies and over 500,000 apprenticeships (585,000 in 2018), 80% were in building or metal trades (Department of Labor Employment and Training Administration, 2017). In 2018, the U.S. had 71,789 apprentices complete the Federal Registered Apprenticeship programs, with 23,441 active programs, 3,229 new programs and 238,549 new apprentices added. In addition, there were over 100,000 military apprenticeships as well (Department of Labor Employment and Training Adminstration, 2018). With the approval of IRAPs, barring unforeseen circumstances, we should see even higher numbers.

The Federal Guidelines constitute the core standard of a U.S. apprenticeship (United States Department of Labor, 2017). The Federal Guidelines constitute a living document and are published online with amendments and rules. The establishment of apprenticeship is found in the U.S. Labor law 29 CFR 29 that governs Apprenticeship and 29 CFR 30 which covers Equal Opportunity to Access. The five (5) requirements of a Federally Registered Apprenticeship providing the core standard are summarized as follows:

1) Direct involvement of the employer;
2) On-the-job learning/training/instruction (OJT/OJL/OJI) that is clearly structured and overseen by a workplace mentor;
3) Related technical instruction (RTI) that provides foundational technical and academic knowledge critical to the attainment of the necessary job-related competencies;
4) A published wage/rewards plan that shows progressive compensation commensurate with increased levels of knowledge and skills (competencies); and
5) The conferring of a nationally-recognized National Occupational Credential upon successful completion of the program (US Department of Labor Employment and Training Administration, 2015).

Recently, the 2016 *Strengthening Career and Technical Education for the 21st Century Act* was passed overwhelmingly (405-5), giving states and localities more flexibility to align their programs to the needs of the local community and encourage innovation (Imperatore, 2017); and, President Trump called for a further loosening of governmental control, allowing industry to determine the best way to train their prospective employees while still being able to register their apprenticeship programs with the Federal government. Once registered, industry and training companies can apply at the state level. State funds do not trickle down to industry; rather are used for infrastructure and marketing (Champion & Marrs, 2017). Federal regulations form the framework within which the states develop their program guidelines; and, employers and unions work within the state's framework to design their individual programs. For this reason, some states have more restrictive standards than others and individual apprenticeship programs may vary greatly between industry and employer. While the Federal credentials do cross state lines, the *National Occupational Frameworks* (NOF) system was developed (with employer consensus) by the Urban Institute to aid in the development of consistent, competency-based apprenticeship programs—intending thereby to ensure the quality and portability of the curriculum. Similar to the British system, employers or sponsors using the NOFs to develop their programs are granted an expedited review (American Institute for Innovative Apprenticeship, 2017). The private sector pays for apprenticeship training, recouping their investment through the work produced by the apprentice which is compensated at a reduced rate during the apprenticeship period as well as through tax credits on the federal level (Champion & Marrs, 2017). Three types of structures currently qualify for registered apprenticeship programs through the U.S. Office of Apprenticeship:

1) Time-based programs require between one and six years (2,000 hours/year) of on-the-job learning (OJL) based on the complexity of the position and type of program (the average program lasting around four years), and are paired with at least 144 hours of related technical instruction (RTI) per year. RTI focuses on theory and technical knowledge, general concepts and principles necessary to the work from related subject areas such as math and science, as well as real-world examples and opportunities to practice (Monroe County Community College, 2017). Some states may require RTI be offered only through public schools or postsecondary institutions, while others may allow unions, accredited online programs, and/or journeymen within the plants to

conduct the related instruction. Sponsoring organizations usually dictate the RTI curriculum, although often adhering to national/international standards or those of the trade/craft associations/unions (Monroe County Community College, 2017; United States Department of Labor, 2017).

2) Competency-based (performance) programs train to a standard that must be observable, measurable, and demonstrated; they are defined/described in terms of process schedules and related curriculum plans that detail expected hours for completion. These programs are more flexible in that they are self-paced, and have open entry and exit points so that apprentices can accelerate their progression through the process (United States Department of Labor, 2017)

3) Finally, a hybrid program utilizes a fixed time to completion per work process, setting the minimum/maximum number of hours required per task/job: e.g., 200 to 400 hours rather than 2,000+ (United States Department of Labor, 2017). According to Dodd & Rice (1942), the latter program type would constitute training; but, it is considered a form of apprenticeship under the current U.S. regulations.

Students are eligible to enter apprenticeship programs at 16 years of age unless the work is conducted in a hazardous environment, in which case the apprentice must be at least 18. They must also meet other qualifying criteria, such as literacy and position appropriate skill potential as well. The U.S. offers apprenticeships in over 1,000 occupations with more than 250,000 employers. Both the program and the individual must register with the Office of Apprenticeship and the apprentice must be employed full-time (or near full-time) with the company with which they are apprenticing. Wages typically are 40-50% of those for a journeyperson, and should increase as the apprentice gains additional skills/competencies. Programs vary widely in design and duration; and, in many cases, apprentices also earn college credit because of the partnerships among government, industry, and education (Monroe County Community College, 2017; United States Department of Labor, 2017).

2.6 Industry Recognized Apprenticeship Program

Effective May 11, 2020, the Executive Order signed by President Trump on June 15, 2017, will see its fulfillment in the form of a third-party Industry Recognized Apprenticeship Program (IRAP). Similar to Canada's Red Seal Program, this complement to the current U.S. Registered Apprenticeship Program was accomplished by amending the Final Rule, 29 CFR part 29 (labor standards for the registration of apprenticeship programs). These high-quality apprenticeships will be governed by Department of Labor standards. The may be developed and/or operated by any of a number of possible entities: state and local governments; business, industry, and non-profits; joint labor management organizations, trade associations and unions; certification and accreditation bodies for particular professions or industries; higher education, and the like. Only the construction industry is excluded at this time. The credentials will be valuable in that they will be recognized within the particular industries—and therefore more portable; at the same time making apprenticeship more lucrative to markets not previously participating in the learning model. Companies can apply to become Standards Recognition Entities (SREs), and once accepted can establish, evaluate, monitor, and recognize high quality programs with industry credentials (United States Department of Labor, 2020).

2.7 Summary

Notwithstanding the considerable financial investment and extensive effort put forth by multiple and diverse groups, it could be argued that the modern apprenticeship is less effective than it was at the time of its humble beginnings. While the number of apprenticeable occupations has risen exponentially, many countries have seen the percentage of successful apprenticeships decrease significantly. Access to opportunities is still an issue for some groups, and setting up the systems is costly and time-consuming. Standards are being developed which will help increase job stability and portability; however, corporate economics often preclude taking a holistic view of the apprentice as more than just labor. Some of the issues may be attributed to scaling, some to the number of critical stakeholders and/or complexity of the work; but, situated within this volatile, ill-structured, complex system, apprenticeship potentially remains a highly effective practice of developing competency and of passing on knowledge and skill to future generations. There remains, then, a need to evaluate the effectiveness and efficiency of our current models and

processes as they relate to measurable outcomes, taking into consideration the systems that produced consistent results in skilled workers and a solid citizenry. In looking backward, we may find the means to move forward.

CHAPTER 3. METHODS

This study explored the perceptions of critical stakeholders as to the viability of a fully remote apprenticeship delivery system and critical factors associated with its success, by asking the questions:

1. What is necessary to ensure the viability of a Fully Remote Apprenticeship Delivery System (FRADS)?
2. What concerns must be addressed if a FRADS is to be functionally equivalent to the current face-to-face system apprenticeship delivery system (F2FADS)?
3. What are the critical factors associated with deploying a Fully Remote Apprenticeship Delivery System (FRADS) as a path of inclusion for access-limited populations.

3.1 Research Methods

> "One must not begin with the facts nor with Descartes' deductive reasoning nor with a hypothesis…because at the beginning of inquiry that (a problem) is all one has"
>
> (Northrop, 1959, p. 17).

The need for exploratory research was addressed during the social sciences movement of the '50's by Jahoda, Deutsch, & Cook (1957): "In many social science circles, there is a tendency to underestimate the importance of exploratory research and to apply the value-laden term *scientific* only to experimental work" (p. 33). In their seminal work, they point out the difficulties that arise when topics of social import lack prior investigation and/or theory upon which to base hypotheses and empirical study. Further, they stress the place exploration has in the "continuous research process", serving as the initial step which lays the foundation for a well-crafted, deeper examination of the problem space. When this critical stage of research is viewed as inconsequential, studies may move forward without a well-defined purpose, using improper methodologies ending in findings of no consequence (Jahoda et al., 1957; Reiter, 2017). Because the purpose of an exploratory study is discovery, flexibility in this early stage is critical as the "indeterminate problematic situation is transformed", and perhaps even the course redirected as new insights are revealed (Jahoda et al., 1957, p. 34).

Flexibility, however, does not negate the need for purposeful planning. When beliefs, long fixed in tradition come into question, "problematic situations" arise in which the tension—resulting from particular conflicting elements—is foregrounded through examination in such a way that it "loses vagueness" and takes on a "more definite form". This "immediately apprehended quality is an irreducible datum…*fact* even if all else be doubtful" (Dewey, 1980, p. 67). In his rules of logic governing the stages of scientific inquiry, Northrop (1949) considers these "*relevant facts*", that become available for "effective discussion" and the inductive analysis of relevance, as well as the construction of "empirically answerable" questions (pp. 31–32). The presence of a problem, then, signals the potential for scientific inquiry. An exploration of the tension between conflicting elements in a problematic situation constitutes the essential first stage, providing a firm basis for methodically operationalizing the remaining stages.

Not all problems are the same, however. There will be "as many scientific methods as there are fundamentally different kinds of problems" (Northrop, 1949, p. 19). Further, problems of *value*, which answer a question of what *ought* to be, of necessity require a different method than problems of fact which are concerned with what *is* currently the case (p. 20). Problems of fact lend themselves to hypotheses and theories that can be examined to determine whether the facts align with the expected consequences. Normative social theories are "introduced to change the de facto situation at least in part" (pp. 20–21). This study focuses on both perceptions of the current and future desirable state of apprenticeship (what ought to be) in the United States, and the numerous facets (facts currently the case) important to consideration in the creation of a new model—both for design and implementation, as well as measurement and evaluation.

Despite the appeals of Northrop (1949) and Jahoda et al. (1957) to begin with exploration, exploratory research in the social sciences became subjugated for many years to the more highly regarded forms of empirical research. While a few attempts can be found at publishing exploratory studies, only recently did (Swedberg, 2018) argue the virtues of exploratory studies to the field of social sciences by pointing out the value of looking closely at a topic to determine whether to invest fully into it. Exploratory studies provide an opportunity to test a "radically new idea that looks promising" in a less risky environment, Swedberg contends; and, "deserve to be part of the general toolkit of the social scientist" (p. 3).

3.1.1 An Exploratory Study

This exploratory study took advantage of the spirit of the methods proposed by Swedberg (2018) and Jahoda et al. (1957) to discover the perceptions of key expert informants (stakeholders)—what Northrop (1949) would call *relevant factual information*—concerning the potential viability of a fully remote apprenticeship delivery system (FRADS). This step involved much less risk than moving immediately to the development of a broad survey or a pilot. Noted tensions exist between the current practice requiring a face-to-face OJI/OJT component of apprenticeship, and the possibility afforded by technologies of a fully remote apprenticeship delivery system. These tensions were transformed during examination into the *measurable datum* that will constitute the basis of further stages of inquiry. Stakeholder responses represent the perceptions of experts in the fields related to the various components of apprenticeship, and as such constitute the basis for the identification of the *relevant factual information*, which in this case are *concepts by intuition* (Northrop, 1949). Concepts by intuition rely on inferences made, based on scientific laws, which the expert uses to define and describe a phenomenon in order to differentiate and distinguish aspects of the aesthetic continuum—that which is immediately perceived (pp. 50–53). This helps determine an empirical basis for further study by carving out relevant hypotheses and foregrounding critical components and considerations of the construct—In this case a fully remote apprenticeship delivery system (Jahoda et al., 1957). While apprenticeship as a construct can be broken down into its component parts, the concepts of intuition, of importance to the delivery system, must be identified if the third stage of scientific inquiry—*deductively formulated theory*—is to become possible (Northrop, 1949, p. 53).

3.1.2 Theoretical Framework of Viability

This study asked stakeholders to consider factors critical to the viability of the current U.S. apprenticeship system, given a change of the OJT/OJI delivery system from face to face to that of a fully remote delivery system (RQ1). A validated *rubric* of service delivery system viability—IEG's Service Delivery Evaluation Framework—ensured stakeholders considered critical aspects of viability, and also facilitated analysis (Caceres et al., 2016). In addition, because this constitutes a large systems change, I asked the key informants for their perceptions of the readiness of stakeholder groups integral to the U.S. apprenticeship system (Weiner, 2009). Because of their

relationships within and between the groups, their expert knowledge of the culture is considered credible and reliable (Lincoln & Guba, 1985; Polit & Beck, 2010).

Tools related to viability. To guide stakeholder selection, question design, and analysis, I used two theory-based tools: IEG's *rubric* of viability and indicators of readiness.

Rubric of Viability. Appropriate to the examination of a topic of "pioneering character" (Jahoda et al., 1957), this exploratory study used a pre-defined, validated framework as a *rubric* of viability—IEG's Service Delivery Evaluation Framework—in both the planning and analysis stages (Caceres et al., 2016) to ensure essential, measurable aspects of viability were addressed. In planning, the framework helped guide participant selection and facilitated development of the interview protocol. In keeping with the nature of exploratory research, however, the interview protocol was designed with open-ended questions so that emergent themes could be captured and analyzed (Lincoln & Guba, 1985). Participants were asked to speak to the perceived viability of a fully remote apprenticeship delivery system as an alternative to the face-to-face, on the job instructional (OJI) component of a U.S. Registered Apprenticeship, that addresses both individual and societal considerations. The framework also served as a rubric by which to capture, identify, organize, and describe participant responses, flesh out gaps, adjust interview protocols, and identify areas for further study (Caceres et al., 2016; Gilbert, et al., 2014).

Indicators of readiness. Stakeholder assessments of readiness were included as an Enabling Condition under IEG's framework of viability, accounting for the systemic nature of this large systems change. They were then analyzed based upon their level of alignment with Weiner (2009) indicators of organizational readiness for change: valance (value) and efficacy (ability). Valance (the value placed on the outcomes of a proposed change) and efficacy (the perception of ability to institute a proposed change) are integral to organizational readiness. Readiness for change is a critical enabling condition of any large-systems change—half of unsuccessful large-scale efforts being attributed to "failure to establish sufficient readiness". Organizational readiness for change is a complex construct that describes a group's shared resolve to implement change as well as a shared belief in the ability to do so (i.e., efficacy) (Weiner, 2009, pp. 1–2). Shared resolve is directly related to the value (valance) that organizational members place on the expected outcomes of the change. The interview protocol included questions that elicited stakeholder perceptions of these indicators of readiness, and transcripts were coded for participants' statements addressing valance and efficacy.

3.1.3 Study Design

This qualitative exploratory study design was based on Jahoda et al. (1957) and Northrop's (1949) work detailing this important first phase of research that is often overlooked, resulting in poor or useless findings.

Preliminary Consultations. Prior to the beginning of the study, to be certain that at the most basic level the construct of a fully remote apprenticeship system is simply *feasible* within the parameters set forth by the U.S. Government, I reached out to Daniel Villao, former Deputy Administrator at the U.S. Department of Labor, who confirmed that "Nothing precludes these ideas [of fully remote apprenticeships] in our current structure…" (Villao, D., personal correspondence, October 23, 2017). Upon receipt of this assurance, I began to design the study. Once a construct is feasible, it is important to look at viability. Viability, however, is usually examined after implementation. I consulted with Dr. Susan Caceres and Tony Tyrell of IEG (Independent Evaluation Group, providing evaluation services to the World Bank Group), in a phone interview (February 2, 2019) as to the appropriateness of using the IEG Service Delivery Framework in the pre-design phase of a service delivery project to ensure the crafting of a viable design. They agreed that this should be possible and gave me to permission to use the IEG framework as a basis of this study.

Bounding criteria. Because of the exploratory nature of this topic, and given the literature recommending the bounding of exploratory studies (Jahoda et al., 1957), I chose three bounding criteria:

1) The object of comparison: A holistic U.S. Registered Apprenticeship with integration into the CoP;
2) Functional Equivalence; and,
3) Viability.

The object of comparison: a holistic, U.S. Registered Apprenticeship, with integration into the CoP. The interview protocol positioned functional equivalence for consideration within the parameters of a holistic (Dewey, 1919) U.S. Registered Apprenticeship system, with full integration into the broader Community of Practice (CoP) (Lave & Wenger, 1991). Thus, for purposes of this study, to be considered functionally equivalent, a fully remote apprenticeship alternative must adhere to the guidelines for a U.S. Registered Apprenticeship; be more than strictly a skills-based experience (Guile, 2013), and must include the integration of apprentices

into the CoP—all of which are critical to the long-term career path and mobility/portability of a U.S. apprentice.

Functional equivalence. I selected functional equivalency as the standard by which stakeholders were asked to consider and compare aspects of the current U.S. Registered Apprenticeship and proposed fully remote apprenticeship delivery systems (RQ2). Functional equivalence means that specific criteria ensure that one form of a thing is considered functionally equal to another (Cornell ILJ, 2018).

The U.S. Federal Guidelines for Registered Apprenticeships. The Federal Guidelines that constitute the core standard of a U.S. apprenticeship include five (5) requirements used as the core standard by which participants were asked to frame their discussion of a fully remote apprenticeship delivery system and to judge functional equivalency of a conceptual system:

1) Direct involvement of the employer;
2) On-the-job learning/training/instruction (OJT/OJL/OJI) that is clearly structured and overseen by a workplace mentor;
3) Related technical instruction (RTI) that provides foundational technical and academic knowledge critical to the attainment of the necessary job-related competencies;
4) A published wage/rewards plan that shows progressive compensation commensurate with increased levels of knowledge and skills (competencies); and
5) The conferring of a nationally-recognized National Occupational Credential upon successful completion of the program (US Department of Labor (DOLETA), 2015).

While individual fields, disciplines, and occupations may have additional governing requirements, this study was concerned only with the core structure of a Registered Apprenticeship, rather than the particularities that comprise the needs of individual industries and occupations. The code and five requirements selected as a basis of comparison are the critical, overarching guidelines, with Requirement #2 of most interest because the suggested change is in the delivery system used for the on-the-job training portion of the apprenticeship.

Viability. Beyond feasibility, viability must be sustainable. IEG's Service Delivery Evaluation Framework (Caceres et al., 2016) provides key indicators of service delivery program viability. I added Weiner (2009) two indicators of readiness (valance and efficacy) under Enabling

Conditions as this represents a large systems change, and as such readiness could be a critical consideration.

3.1.4 Access-limited Populations

At the heart of this study, based on my work with first generation college students, was the realization that many populations which I call *access-limited,* will never be able to participate in an apprenticeship under the current delivery system. While the current U.S. labor shortage has sparked increased interest in apprenticeship as a means of securing and training workers, I wondered if it might be possible that a fully remote apprenticeship delivery system might enable employers to recruit from the pool of labor currently unable to participate in traditional face-to-face apprenticeship opportunities. Stakeholders were, therefore, also asked their perceptions of the ability of such a fully remote apprenticeship delivery system to expand access to apprenticeship (RQ3).

3.1.5 Multiple Experts

In case study research, replication and contrast are important ingredients of rigor—two or more cases providing opportunity for replication and/or contrast (Yin, 2017). In a similar way, in exploratory qualitative research, replication and contrast are made possible by comparing the perceptions of purposefully selected participants (key informants) from integral, but disparate, stakeholder groups (Jahoda et al., 1957; Lincoln & Guba, 1985; Polit & Beck, 2012; Strauss & Corbin, 1997). In this study, the literature identified three main stakeholder groups pertinent to service delivery systems—policy makers, service managers, and front-line service providers (Caceres et al., 2016). Citizen beneficiaries are also integral to service delivery systems. As this is an exploratory study of a non-existent system, however, citizen beneficiaries are only touched on in a cursory manner as no actual system exists to help frame their responses.

3.1.6 Sample Size

Due to the nature of an exploratory study, relevant information is not necessarily predictable (Jahoda et al., 1957; Yin, 2017) and as a result, the gathering of appropriate data may change as new insights emerge. In this study, I began by identifying eleven (11) participants within

the three main stakeholder groups who fit the criteria, being careful to include those voices deemed most relevant (with high levels of knowledge and expertise) to the conversation (Polit & Beck, 2012; Ponelis, 2015). As knowledge gaps were revealed, I recruited additional participants based on stakeholder recommendations. Thus a total of fourteen expert stakeholders were interviewed (see Appendix A for a full list of participants).

(Caceres et al., 2016) gives a strong warning that establishing any program without gaining insight from those who will be served (citizen beneficiaries) means the interventions may: 1) Not meet the actual needs of the target population; 2) Meet them in a way that is less than desirable for the recipients; or, 3) Fail completely to achieve desired outcomes. While a citizen beneficiary is not included as an identified stakeholder in this initial study (because a validated model does not exist to present as a standard of comparison), I chose to apprentice a young man remotely for eight months so that I could better understand the fully remote apprenticeship process and the concerns and considerations from the viewpoint of a citizen beneficiary. This first-hand experience provided valuable insights that I have briefly addressed in APPENDIX L. This apprenticeship also served as an example used in several stakeholder interviews to explain how I was defining a fully remote apprenticeship delivery system.

3.1.7 Sampling Procedures

Two purposeful sampling techniques were employed (Palinkas, et al., 2015): criterion sampling and link-tracing. I first used criterion sampling to identify potential candidates for participation. A critical consideration in participant selection is access, as well as choosing appropriate individuals who can offer the most insight into the research questions (Yin, 2017).

Criterion sampling. Using LinkedIn.com over a two-year period, I formed relationships with key stakeholders from the groups identified, based on the following inclusion criteria: 1) Involvement in the U.S. apprenticeship system; and/or 2) Expertise that can contribute to the broad-view discussion of the potential viability of a fully remote apprenticeship delivery system (Lincoln & Guba, 1985; Polit & Beck, 2012). This included potential employers, educators, and technology professionals.

According to the literature, these “collaborators” are purposively selected, with the researcher making judgment calls as to who to include based on their own understanding of the topic. Key informants may be selected because of their role or because they have intimate

knowledge of a phenomenon, and can help reveal and interpret the culture and lend insight into a subject area. A fairly large group of potential informants are first identified (25-50), making up the pool. Then, a few critical "highly knowledgeable" participants are selected based on both their ability to provide a deep understanding of the culture as well as a willingness to participate in a collaboration of sorts, developing a "special, ongoing" relationship with the researcher (Polit & Beck, 2012). The fourteen key informants chosen for this study have become partners in this collaborative effort to parse out the elements of the proposed phenomenon. These ongoing relationships have evolved over the past three years, prompting bi-directional sharing, with the key informants providing an insider's up-to-date view of the ever changing environment and culture.

In this study, participants represent three main sectors identified by (Caceres et al., 2016): government/policy expertise, direct and indirect supporting service provision, and front-line service provision. They serve as policy makers, 3rd party intermediaries, business and industry employers, consultants/SMEs (some to governments others to business and industry), apprenticeship sponsors, technology providers, and members of higher education. Stakeholders work (or have worked) in government and/or policy on the federal and state level, as training providers to industry and the military, as 3rd party intermediaries facilitating the expansion of apprenticeship in the U.S., as employers in manufacturing and technology, as technology providers, and as members of higher education providing educational and apprenticeship sponsorship services. All are highly credentialed, and most have served in an educational or training capacity at some time in their careers. Familiarity with the current system(s) provides these stakeholders with intimate systems knowledge. Chosen for their position and expertise, all participants are public figures and decision makers with notable experience, expertise, and substantiated ability to speak to the topic. All agreed to be identified, with their names, position, and bio.

Link-tracing. Once IRB approval was received, eleven (11) stakeholders of the more than twenty who had expressed interest in the study were sent formal invitations to participate. The eleven were selected based on the stakeholder groups identified by IEG, the literature review, and my personal knowledge of the technology requirements. The remaining nine (9) initially invited either did not respond to the email announcing the start of the study (responses were used to generate the formal invitations because the initial contact was months removed from the beginning of the study); were redundant in the area of expertise; or were excluded based on the

recommendation of my Dissertation Committee for falling outside the scope of the study. Of eleven invitations initially sent via LinkedIn.com, six agreed to participate.

Gaps in knowledge and expertise were identified during initial interviews, and additional participants were then sought out using link-tracing, to fill the knowledge gaps and provide insight into newly identified sub-groups and related areas of expertise. In this method, respondents referred others "like them" from their personal networks (Spreen, 1992, p. 35). Inclusion criteria were also used to vet the referrals. Six new participants were added using this method.

In addition, a member of the Purdue University faculty, was invited because interviews revealed a gap in expertise in the evolving world of digital manufacturing; and, a second Purdue faculty member was invited because of a timely announcement of Purdue Polytechnic Institute's partnership with Purdue University Global for a $12 million, four-year, grant-funded cybersecurity apprenticeship initiative in the State of Indiana. His perceptions add understanding of the unique role Higher Ed might play in a FRADS. The six participants from LinkedIn.com, six referrals, and two from additional gaps in knowledge made up the final list of participants.

3.1.8 Data Sources

As the stakeholders were selected, I began to conduct semi-structured interviews using online collaboration platforms selected for the convenience of each participant (Yin, 2017). One interview was conducted face to face at the stakeholder's place of business at his request. Invitations to participate were extended via email; and an information sheet, consent form, and personalized set of interview questions (based on areas of expertise) were sent to all participants who responded with available interview times. The audio of all interviews was captured (with informed participant consent) using electronic recording tools. Transcripts were created and checked for accuracy.

3.1.9 An Iterative Process

In an exploratory study, fluidity and flexibility is especially important (Becker, 1998; Jahoda et al., 1957). In two cases, I reached out to participants post-interview with follow-up questions; and, two participants sent follow-up emails unsolicited. With the current COVID-19 crisis, I also sent a follow-up query to garner their thoughts on the impact of the pandemic on the

topic of FRADS given the worldwide move to remote work. Those responses are presented in the original form. Participant responses and any documents they provided are included in the data set. The interview protocol included a single set of questions asked of all participants as well as a unique set of questions relevant to each individual's area(s) of expertise and/or related experience (See Appendix F, Interview Protocol). After each interview, if questions were raised that were not a part of the original interview protocol, the questions were included in all appropriate remaining interviews (Becker, 1998).

3.2 Key Data Sources and Outcomes Explained

Data collection—Participant perceptions. Semi-structured interviews served as the primary source of evidence. Interviews are a common data source in qualitative research and are used to provide insight into "how" and "why" questions, as well as participants' perceptions and perspectives. Exploring multiple perspectives while maintaining consistency and structure ensured the stakeholder perceptions could be compared/contrasted. A well-developed interview protocol (See Appendix F, Interview Protocol) served as a guide for data collection and added to the reliability of the study (Yin, 2017). Because my purpose was to gain deep insights as well as to assess perceptions of viability based on the core markers delineated by IEG and Weiner (Caceres et al., 2016; Weiner, 2009), I chose to use a mixture of closed and open-ended questions with follow-up prompts (Smith, Flowers, & Larkin, 2009). These relatively "fluid", "guided conversations" explored participants' views on apprenticeship in general, including the current U.S. infrastructure and its ability to house a FRADS; the readiness of critical sectors and stakeholder groups for a large systems change; possible challenges and barriers; and, the potential to increase access to apprenticeship opportunities for access-limited populations. More specifically participants were asked to explore the viability of a fully remote apprenticeship delivery system as a construct (Rubin & Rubin, 2012). Multiple perspectives provided "replication logic", allowing areas of consensus to emerge (Yin, 2017). When an interview revealed new constructs of importance to the overall discussion, I modified the interview protocol to include those constructs prior to the next interview. Interview protocols were also customized to capture knowledge and perceptions relating to a stakeholder's unique area of expertise: e.g., apprenticeship, training, technology, policy, and/or large systems change. In some cases, due to the hypothetical nature of the construct of a FRADS, stakeholders asked me questions in order to clarify the questions so that

they were able to respond. For example, one stakeholder asked what I meant by "team" in an online environment. I used the example of my web team as we are all in different locations around the country. Another, an instructor, struggled to understand how the sense of presence could be established virtually. We briefly discussed the literature (Lowenthal, 2005; Richardson, et al., 2017; Swan et al., 2008).

3.2.1 Collection Method

Each interview lasted between 55 and 120 minutes. Only one participant requested (and received) an additional session. After each interview, the protocol was examined and adjusted as necessary to reflect insights that emerged (Becker, 1998). I personally conducted all interviews to lessen the chance of discrepancies in explanation of concepts and phrasing of questions, as well as to provide consistency in the interpretation of responses. Approximately half of the interviews were transcribed by a transcription service. The other half I personally transcribed. All were reviewed against the recording to ensure accuracy. I reached out via email to two participants asking follow-up questions. Quotes selected after analysis were sent to each participant for approval, along with the original question(s) and their transcribed response(s).

3.2.2 Instruments

Ponelis (2015) discussed the importance of detailing the relationship between the research questions and the data sources. In the phone interview with Dr. Susan Caceres and Tony Tyrell (February 2, 2019), I confirmed that the IEG Service Delivery Evaluation Framework (SDEF) (Appendix C) could be used during program design as a rubric of viability. The SDEF components and Analytical Protocol (AP) (Appendix B, IEG Analytical Protocol) provide measurable benchmarks necessary for a successful and viable service delivery system, as well as an excellent standard against which to discuss and assess a conceptual fully remote apprenticeship delivery system as defined/described by the stakeholder participants. As recommended in exploratory research studies (Jahoda et al., 1957), the IEG SDEF and AP then were used with the Federal Guidelines to create a comprehensive rubric of viability that facilitated question construction, helped bound the responses to functional equivalence, and served as an aid during final analysis

to reveal any gaps deemed critical to the successful delivery of apprenticeship services. The gaps were noted and the ramifications addressed in the Chapter 5, Discussion.

To make certain my research questions aligned with the interview questions, and that functional equivalence was foregrounded as the standard of comparison, I related each research question to the Federal Guidelines and the appropriate section of the IEG Analytical Protocol (AP); and, then created the interview questions to ensure the data gathered in stakeholder responses could/would answer the research questions during analysis. See Table 1 below.

Table 3. Alignment of RQ's to Federal Guidelines, IEG's SDEF, Analytical Protocol (AP) and Interview Protocol

Research Questions	Notes	Federal Guidelines	IEG SDEF	IEG Analytical Protocol	Interview Questions
What are the perceptions of critical stakeholders as to the viability of fully remote apprenticeships:	The interview gathered stakeholder perceptions which were then analyzed in relationship to the extant knowledge presented in the literature, the Federal Guidelines, and the IEG Service Delivery Framework and Analytical Protocol, with Weiner's (2009) Indicators of Organizational Readiness included under Enabling Conditions. **KEY** EC=Enabling Condition IN=Inputs SDI=Implementation SOP=Service Outputs SOC=Service Outcomes SDM=Service Delivery Measurement	Functional Equivalence is determined first by meeting core requirements for registered apprenticeships set forth by the US Department of Labor Code of Federal Regulations Labor Standards for the Registration of Apprenticeship Programs 29 CFR — Part 29. All Registered Apprenticeship programs consist of the following five core components – direct business involvement, OJT, related instruction, rewards for skill gains, and a national occupational credential: 29.3 Sponsor Eligibility 29.4 Criteria for Eligible Occupations 29.5 Standards of Eligibility 29.6.a Program Performance Requirements 29.6.b Evaluation Requirements 29.7 Apprenticeship Agreement Requirements		II: Enabling Condition (EC) A. Political Economy B. Leadership Dev C. Policy Dev D. Capacity Dev E. Budgeting F. Regulatory/Legal G. Data Systems H. Supply Chain I. Public Fin Mgt J. Country Procurement System Chain K. Other L. Contextual Interference of SD M. Valance (Weiner, 2009) N. Efficacy (Weiner, 2009)	d1, d2, d3, d4 Q6, Q7, Q8, Q9, Q12, Q13, Q16, Q17, Q18, Q19, Q20, Q21
			EC-F-R&L EC-G-DS EC-H-SC EC-M-VAL EC-N-EFF		
				III. Inputs (IN)	
			IN-A-F	A. Funding	
			IN-B-HC	B. Human Capital Service Providers & Managers	
			IN-C-Tech	C. Technology	
			IN-D-SDD-CB	D. Supports Service Delivery Design 1. Identify Citizen Beneficiaries 2. Needs Analysis	
			SD-D-EE-IP	3. End to End Implementation Planning	
			IN-D-SS	4. Service Standards	
			IN-D-OM	5. Operation/Maintenance	
			IN-D-DMII	6. Development of Monitoring and Improvement System 7. Design of Feedback Loop	
				IV. Implementation (SDI)	
			SDI-A-SDM	A. Service Delivery Model	
			SDI-B-C-GM	B-C. Governmental Model	
			SDI-D-PSP	D. Private Sector Provision	
			SDI-E-PPP	E. Public-Private Partnership	
			SDI-F-CDP	F. Citizen-Directed Provision	
			SDI-G-OP	G. Other Provision	
			SDI-H-CRSM	H. Cost Recovery/Subsidy Mechanism	
			SDI-I-FBL	I. Feedback Loop	

Table 3 continued

Research Questions	Notes	Federal Guidelines	IEG SDEF	IEG Analytical Protocol	Interview Questions
As a delivery system	This study only looks at the delivery of apprenticeship and not at the curriculum or instruction.	Delivery requirements are specified in 29.4.a: Structured, systematic, OJI/OJT, and supervised	SOP-A-SPT SOP-B-SM SOP-C-SQC SOP-D-OMFA	V. Service Outputs A. Service Performance Tracking B. Accountability Mechanism / Monitoring C. Quality Control Mechanism D. Other Mechanism Accounting	d1, d2, d3, d4 Q2, Q3, Q4, Q5, Q8, Q16
As a functionally equivalent alternative to the current face-to-face delivery system	To address an alternative, one must be familiar with the status quo to use it as a basis of comparison. Inputs, monitoring/evaluation and outcomes must be compared.	29 CFR — Part 29 29.3 Eligibility 29.4 Criteria for Eligible Occupations 29.5 Standards of Eligibility 29.6.a Program Performance Requirements 29.6.b Evaluation Requirements 29.7 Apprenticeship Agreement Requirements	SOC-A-CoS SOC-A-QoS SOC-A-AoS SOC-A-RoS SOC-C-SoCB SOC-C-SSCBO SOC-D-SUS	VI. Outcome (SOC) A. Outcomes Tracked 1. Coverage of Service (CoS) 2. Quality of Service (Qos) 3. Affordability of Service (AoS) 4. Reliability of Service (RoS) B. Disaggregated Data Collection C. CB Outcomes Tracked 1. Satisfaction of CBs (SoCB) 2. Sector-Specific CB Outcomes D. Trend data tracked 1. Sustainability (SUS) VII. Lesson Learned — SDM A. Achieving Expected Results B. Meet Expectations C. Enabling Conditions or Inputs (May) Impact Implementation	d1, d2, d3, d4 Q1, Q2, Q7, Q8, Q9, Q10, Q11, Q12
As a path of inclusion for access-limited populations?	Access-limited is broadly defined to include anything that impedes an individual's opportunity to participate.	Only groups covered under EEO are currently required for registration: 29.6.b.1.ii and 29 CFR—Part 30.	SDI-CBS SDI-NA	III.D.1 Identification of CB's III.D.2 Needs Analysis	d1, d2, d3, d4 Q14, Q15

3.2.3 Questions

The research questions served as a guide to the interview protocol, ensuring that the data collected provided answers relevant to the intent of the study. Using a semi-structured protocol, after the first stakeholder interview, some questions were modified and/or added/skipped in subsequent interviews, based on the stakeholder group, area(s) of expertise, the flow of the discussion, time constraints of participants, and constructs that emerged during prior interviews. Questions focused on indicators of readiness and viability, applicability to access-limited populations, as well as the stakeholders' perceptions of critical components and important partnerships required for a successful fully remote apprenticeship delivery system. See Appendix F for an example of the basic interview protocol.

A first round of questions was written with alignment to the Research Questions, SDEF, and Federal Guidelines noted. Questions relating to the indicators of valance and efficacy were included as a sub-set of the IEG SDEF *enabling conditions* which are critical to large systems change (Weiner, 2009). Other semi-structured questions were included to gain insight into the stakeholder backgrounds and positionality, such as their relationship to apprenticeship; their critical partnerships; their understanding of apprenticeship in general and a fully remote apprenticeship delivery system in particular; their thoughts on access-limited populations; their understanding and expertise in large systems change; and their perception of why the current system has remained relatively unchanged over the years. Gaps in understanding that emerged during early interviews triggered the addition of stakeholders and modifications to the protocol in later interviews.

3.3 Data Management and Analysis

Figure 2 below shows the flow of data from stakeholder group through analysis to deliverables. Table 4 (below) outlines the steps I followed to manage the data and perform analysis.

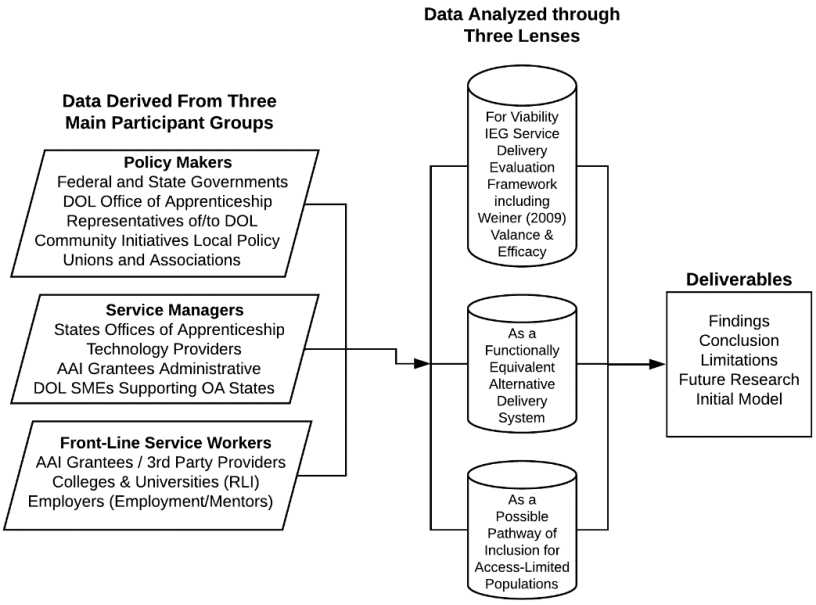

Figure 2 SEQ Figure \ Flow of Data from Participants through Analysis to Results

Table 4. Qualitative Exploratory Research Study Design. This table outlines the steps in the research methodology.

Step	Description	Purpose
1	Relationship building and Email Solicitation	Secured participants and informed of scope and rights
2	Data Collection	Evidentiary basis of study
	Personal Interviews	Garnered perspectives of critical stakeholders
	U.S. Federal Apprenticeship Guidelines	Federal Guidelines for Registered Apprenticeships served as a basis of functional equivalency
	IEG Service Delivery Evaluation Framework	Served as *Rubric* of Viability
	Indicators of Valance and Efficacy	Assessment of Readiness (enabling condition)
3	Transcription of interview audio recordings	For ease of analysis immediately after interview
4	Summarized Interviews	Upon completion of transcription, gained familiarity with the data and summarize individual perspectives
5	Reviewed transcripts against recordings	Updated for accuracy
6	Initial coding at Question Level	As each interview was transcribed, it was auto-coded (using nVivo's auto-coding functionality) at the Question level, to allow comparison of responses across questions

Table 4 continued

Step	Description	Purpose
7	Second coding: Identification of emergent themes with description	Interviews were coded a second time to identify overarching themes and/or gaps that could aid understanding of the complex environment, requirements, barriers, functional equivalence, appropriateness for access-limited populations, sentiment, etc. relevant to the potential viability of a FRADS.
8	Final coding: Identification and description based on IEG framework	Each interview was then coded a final time looking for concepts relevant to the IEG SDEF (see Appendix B) as well as indicators of readiness (valance and efficacy).
9	Codes were collapsed and organized with similar codes and/or concept groupings. Emergent over-arching themes identified.	Organized and classified the data; reduced/synthesized common concepts; identified over-arching themes; prepped for analysis.
10	Conducted initial thematic analysis	Noted unique perceptions of individual stakeholders; Compared perceptions by Stakeholder Group
11	Wrote initial report based on memory of overarching themes, sentiments, concerns, caveats	To gain an initial sense of the contents of the data
12	Conducted synthesized thematic analysis	Compared/contrasted responses related to viability, readiness (i.e., valance, efficacy) and functional equivalence. Also looked at perceptions of suitability for access-limited populations.
13	Conducted text searches to ensure all thematic content was included	Text searches for specific themes helped identify related participant responses that were included in discussions of other topics (See Codebook, Appendix M).
14	Findings written	Organized responses by RQ's and IEG framework
15	Member checking	Sent selected quotes I planned to use with the original question(s) and the full transcribed response(s) to participants along with their Bios for approval.
16	Synthesized and summarized data and prepared report	Drew conclusions and reported findings, limitations, and recommendations for further study.
17	Prepared and provided Executive Summary to stakeholder participants	Delivered promised report for member checking.

3.4 Trustworthiness

The standards used to judge qualitative research differ from a positivist approach as they are intended to better reflect the unique nature of the investigation and purpose of the approach. In the case of an exploratory qualitative study, my purpose is to ensure the research design is such that it accurately reflects the perspectives of my participants, fully examines the problematic situation, and reveals the relevant *factual situation* so that it can provide an empirical basis for

further study (Northrop, 1949). To establish the trustworthiness of this study, four standards are considered (Bloomberg & Volpe, 2008; Ponelis, 2015).

3.4.1 Credibility

The issue of credibility in qualitative research is of utmost importance as it indicates adequate measures have been taken to ensure accurate representation of the examined phenomenon—the study accurately performs its stated purpose (Bloomberg & Volpe, 2008; Shenton, 2004). For this reason, employing a structured process, multiple interviews, existing documents for comparison, and a theory-based framework as a basis of analysis was important. Engaging in peer debriefing also enhanced credibility, as does the provision of thick, rich descriptions, direct quotations, and member checking (Creswell & Miller, 2000).

Because this is an exploratory study, and it is the perspectives of select stakeholders that are being presented, the participant's agreement concerning the accuracy of the presentation of their individual contributions (established through member checking of quotations and the provision of an Executive Summary of the findings) is an important determinant of credibility. Because the purpose of this study is to look at the perception of viability specific to a fully remote apprenticeship delivery system, great care has been taken to use established definitions of apprenticeship and its components; to compare/contrast with known indicators of viability; and, to elicit perspectives from members of all critical stakeholder groups identified in the literature (Caceres et al., 2016). Each participant has been selected because of their close relationship to, and intimate knowledge of U.S. apprenticeships, education, technology, policy, large systems change, infrastructure, and/or service delivery systems. Each stakeholder group is represented by at least two voices. Each participant has earned recognition for expertise in their respective community of practice (CoP). All quotes used in this report were emailed to participants, along with the original question(s) and response(s) to ensure stakeholders agreed with the accuracy of the presentation of their perceptions.

An example follows:

> **Governmental Readiness**
>
> In terms of somebody from the outside as a third-party evaluator, assessing readiness…if the role is fairly minimal as to what government needs to be involved in to make this happen, then maybe the readiness is a 7 on a scale of 10. But if the

things they were intending to be…responsible for, especially if we maintain the portability and standardization…that might be a four or five.

Questions / Full Response

T. Let's go back to government readiness. What do you think about the government's Readiness to allow us to offer a fully remote apprenticeship system?

LE-A. you know I would have to say actions speak louder than words. I think words oh, somebody like John Ladd, would say oh my gosh that's exactly what needs to go on. They would just flat-out just say. They're on board. **(QUOTED)** *Now in terms of somebody from the outside as a third-party evaluator, assessing readiness. Then all of a sudden you say, what's going to be expected of them. So now if the role is fairly minimal as to what government needs to be involved in to make this happen then maybe the Readiness is a 7 on a scale of 10. But if the things they were intending to be in charge of, or responsible for, especially if we maintain the portability and standardization and so forth, now you've got a question what else is on the assessment in terms of evaluation to say how ready they are...and maybe now that score isn't a seven out of ten, that might be a four or five.* **(END QUOTED)** I think it's dependent on what you're going to ask them and have their role to be, as to their readiness. Now that may sound like kind of a wishy-washy answer. But my point is if it's everything to do with fully remote and connecting the dots like an organization that would be responsible for oversight and somebody else responsible for quality, somebody else for the evaluation, and they're not the one, but they're engage somehow. Maybe it's with some type of financial incentive. Or, ensuring the services being done for the labor pool. Because they really in most states have that responsibility. That to me would have to determine their readiness. And generally I would say, it's somewhere between a 5 and a 7. Not one or two. It's not one or two. And it certainly not 8, 9, or 10. Either way.

Stakeholder comments were accepted for inclusion in the analysis throughout the initial coding process, although I received only two emails from stakeholders that were initiated by stakeholders after the interview process was completed to offer additional insights and/or materials. After seeing the exodus of a large number of employees to remote work, I sent an email to all key informants asking for their perceptions of the impact of the crisis on remote work and FRADS in particular. Their responses are included separately within the discussion. Stakeholders agreed to have their names and bios included in the final report and their direct quotes attributed. Stakeholders will receive an Executive Report of the findings upon completion of the final paper. Professional bios are included in Appendix A, Participant Table.

3.4.2 Transferability

The context of this study is constrained to U.S. Registered Apprenticeship. Access-limited populations have been considered only as a comprehensive group of individuals rather than as individual sub-groups for purposes of this initial discussion. I first asked participants what they thought the word means; and, then followed their response(s) with how I am defining it for purposes of this study. I explained that I am using a broader definition that not only includes the ADA definition, but, also marginalized groups that fall outside of the conventional definition and/or Federal programs, some (but not all) of which are included in the Bureau of Labor (BLS) definition of *marginally attached* (See Section 1.1.3 Labor Potential). It is possible the findings of this study may apply to sub-groups within the U.S. access-limited populations; but, determining this was outside the scope of this study.

3.4.3 Dependability

Dependability refers to the ability of other researchers to replicate a study. In this case, replication is possible, as the criteria for participant selection has been explained, the interview protocol included, the documents for analysis made available, and detailed explanations of the methodology provided. Documented changes to the protocol and progress throughout the study also provides additional rationale for modifications to the study (Morrow & Smith, 2000).

3.4.4 Confirmability

It is the purpose of the study, as well as the steps I am taking to ensure credibility, that undergirds the study's confirmability. Prior to the beginning of the study, I conducted three pilot interviews to elicit feedback which I used to improve the formal interview protocol. I also looked to my committee to review my protocol and to offer guidance during analysis.

Apprenticeship expansion is a timely topic and there are many interested parties examining the path(s) to increase participation in apprenticeship. In involving the expert key informants in the review of their quotes prior to publication of the findings, I show my reliance on their perspectives as the critical foundation of the study. It is the participant's expert perspectives that readers will look to in order to form their own opinions. Those perspectives (both summarized and

as direct quotes), coupled with the literature, standards and indicators, formed the basis of my analysis, discussion and conclusions.

3.4.5 Potential Threats to Credibility

This study depends on experts who may be personally vested in U.S. policy, Higher Education, business and industry, and/or the U.S. Apprenticeship program. As such, they may have biases that may impact the findings of the study (DiCicco-Bloom & Crabtree, 2006). Questions were carefully worded to elicit expert assessment; and, as the researcher/interviewer, I listened carefully, asking follow-up, probing questions as appropriate. Because I was asking individuals for their personal perspectives on a topic that requires personal expertise and a level of involvement and commitment, personal bias is regarded as appropriate (Fields & Kafai, 2009).

The analytical protocol and service delivery evaluation framework (Appendices B and C, respectively)—chosen as a guide for interview protocol development, participant selection, and as a basis for the third level of analysis—have been thoroughly tested by IEG prior to this study, being used on a global level since 2016. Only a few small modifications were made for purposes of this study: 1) Textual simplification; 2) Adaptation of required components based on the nature of a virtual delivery system; 3) Adaptation of the framework to fit a conceptual delivery system; 3) Situation of the service and delivery system within the United States rather than on a global level; and, 4) The inclusion of Weiner's (2009) indicators of organizational readiness under Enabling Conditions to account for perceptions of readiness for the large systems change. An accounting of the development of the instruments is available within the IEG 2016/No 3 report (Caceres et al., 2016).

3.5 Researcher Background

Because many of the decisions involved in designing and carrying out a research study are impacted by the researcher's skills, experience and values (Yin, 2017), I am including some of my personal background information to offer rationale for my design choices. I hold a Master of Science in Education, Learning Design & Technology, and am completing my doctorate in the field as well. I am particularly interested in adult populations, access-limited populations, and online learning environments. I secured my MSEd through Purdue University's online program,

giving me a unique understanding of the needs of online students. As a PhD student, I also served as a TA in the online program, providing additional insight into the instructor side of the online learning experience.

In addition, I have owned a small technology company for 20+ years, working remotely with clients around the country, dealing in internet solutions, front-end and back-end applications, e-commerce, social media marketing, custom programming, and web hosting/design/development. I am intimately familiar with many of the technologies used for collaboration and am very aware of the sector-dependent diversity of company needs and solutions.

My research experience includes serving as a research assistant during my undergraduate years for a marketing/logistics professor at a well-known private mid-western university, focusing on survey implementation and quantitative analysis of large survey data sets using SPSS. I am CITI certified and for the past three years, I have served as a qualitative graduate research assistant and research team member at a large research institution, conducting field observations, interviews, and focus group interviews; as well as helping with research study design, survey design, interview and focus group protocol design, data analysis using NVivo; and the reporting of findings for presentation and publication.

3.6 Assumptions

In designing this study, I made certain assumptions to help direct the research process and provide rationale for my actions (Yin, 2017). I first assumed, based on my experience in technology and online education, that fully remote apprenticeships are at least feasible in concept, and (after an extensive literature review) I concluded that a discussion as to the viability of using them in certain instances is warranted. Further, I assumed that stakeholders already involved in the apprenticeship pipeline would be interested in exploring the construct as an alternative to the current apprenticeship delivery system, and that interviewing critical stakeholders within the U.S. apprenticeship system would provide a rich preliminary picture of the overall perceptions of viability and receptivity to the construct. Based on the literature, this study also presupposed that the current system is inadequate, as it fails to fully provide a path of inclusion for access-limited populations. Finally, it was assumed that access-limited populations may be interested in participating in apprenticeship opportunities if such opportunities are made more accessible, and

that these individuals would benefit from a pathway to full-time employment and membership in the Community of Practice.

3.7 Researcher Bias

As a human being, I perceive the world in a way unique to myself and my socio-cultural history. My perceptions and interpretations of what I observe are influenced by the many experiences of my life as well as the make-up of my personality and physiology, and my thought processing mechanisms. Because all of who I am determined how I parsed the data I collected, there is little chance my personal bias is not reflected in some way. The goal, however, was to minimize the impact of my personal bias so that as true a picture of the phenomenon as possible could be imparted. This was the mindset that guided my attempts to reduce bias during data gathering, analysis, and interpretation.

I also took steps to directly address my bias(es). The perceptions I had during the data collection process [documented in memo'ing] lent insight into the coding process and helped me make decisions that facilitated a meaningful and truthful interpretation of the data. I attempted to sort through the ways I was thinking about my study—addressing my reasons for conducting it and the decisions I made. By intentionally setting forth what I know might bias my analysis and interpretation I helped minimize the influences in two ways: a) The simple process of analyzing my position(s) relative to my topic helped foreground those influences in my mind, and helped me be more aware of them as I moved through the coding process and analysis; b) In stating my background and known biases for my audience, I enabled readers to contextualize my findings and conclusions, so they can more accurately assess my work.

Finally, in using a known framework for design and analysis (IEG), I subjugate my bias to the proven empirical work of others.

3.8 Limitations

As an exploratory study, the data is comprised of perceptions from only fourteen (14) individuals and therefore can provide only a basis for further inquiry and discussion. Some potential participants, better suited to offer input into the viability of a fully remote apprenticeship and what it might/should look like may be unknown and therefore excluded, resulting in an

incomplete picture of the potential viability of a fully remote apprenticeship delivery system as a vehicle of inclusion for access-limited populations. In addition, access-limited sub-groups may have varying types of concerns that are not addressed in this study.

As an exploratory study, I asked stakeholders to evaluate a hypothetical system that imagines the critical components of apprenticeship—as currently conducted using a face-to-face delivery system—situated within a fully remote delivery system. If another framework (rather than the IEG SDEF) were used as a lens to understand viability, it may be that different and even contradicting results might be returned. For example, the IEG SDEF looks at all parts of the service delivery supply chain. Other instruments may only look at the bottom line (ROI) and not include the ethical components, evaluations, checks/balances, and so on. The IEG service delivery framework is used for both domestic and international programs. In addition, because this was an exploratory study of a hypothetical system, a more conversational tone proved necessary early in the interviews to facilitate understanding of the questions. It is unknown whether all stakeholder groups would respond as this group did. In particular, the methodology may not perform as expected with certain sub-groups of stakeholders. It is unknown whether applying the findings to another country, or to a particular population, or even to a similar pedagogical model (such as internships)—with purposeful caution—would be justifiable; however, IEG does use the framework to evaluate service delivery programs globally.

CHAPTER 4. FINDINGS

4.1 Introduction

This chapter contains the results of the qualitative exploratory study methodology designed to answer the following research questions:

1. What is necessary to ensure the viability of a Fully Remote Apprenticeship Delivery System (FRADS)?

2. What concerns must be addressed if a FRADS is to be functionally equivalent to the current face-to-face system apprenticeship delivery system (F2FADS)?

3. What are the critical factors associated with deploying a Fully Remote Apprenticeship Delivery System (FRADS) as a path of inclusion for access-limited populations?

It is within the boundaries of these research questions that this chapter reports findings related to stakeholder perceptions of viability as identified in the IEG Service Delivery Framework and Weiner's theory of Organizational Readiness for Change (2009). Further, results are reported for stakeholder perceptions of specific factors requiring functional equivalence to ensure a viable alternative to the traditional apprenticeship face-to-face model, and offer some examples of what equivalence might look like as well. Finally, the stakeholder's thoughts on the use of a FRADS as a vehicle to reach access-limited populations is presented, and whether it might provide an alternate path of opportunity.

Responses are broken out by category, and then by sub-category. A short summary of the findings are reported for each overall category. Then for each sub-category, after a brief overview, stakeholder quotes are used to offer further understanding.

4.2 The Question of Viability

What is necessary to ensure the viability of a Fully Remote Apprenticeship Delivery System (FRADS)?

4.2.1 Enabling Conditions

Most stakeholders believed important enabling conditions are favorable to apprenticeship in general and will lend support to a fully remote apprenticeship delivery system (FRADS)—if it is properly designed and implemented. Presented first are basic conditions necessary to the development, implementation, and sustenance of a FRADS. Specifically, stakeholders discussed the current political environment, the existence of public policies and regulations, the technology infrastructure and requirements, the availability of necessary expertise, the requisite economic environment, and necessary partnerships within the supply chain. In addition, perceptions of the prevailing mindset, levels of acceptance, barriers and challenges, and current trends that may support the viability of a FRADS were explored.

Political environment. Stakeholder views supported the historical evidence that the U.S. political climate as it relates to apprenticeship, reflects the economic climate. Pre-pandemic, the economy was strong and employers were competing for labor (See explanation of the COVID-19 pandemic in Chapter 5. Discussion). The Federal Government was promoting apprenticeship and expanding funding efforts to increase the supply, skillset, and quality of the labor market. Stakeholders explained the current relationship and disposition of the U.S. Federal Government as follows:

> …if people don't need workers, they don't care about any kind of…apprenticeship program. So…right now [Pre-COVID-19], in the US, unemployment is at 3% and so most of the people who want to work are working. So, companies are having to look at different solutions to try to get people skilled up to get them on the job…In the last five years…there's been a significant amount of Federal…money that's been made available to…states to try different things.
>
> —Dr. Pamela Howze, Partner
>
> *American Apprenticeship Center, LLC*
> *Former New Program Director*
> *National Fund for Workforce Solutions*

> I think it's [the U.S. Federal Government] very receptive to any type of work-based training or apprenticeship models. There's been quite a few millions of dollars put out under the Obama administration and now under Trump. He's practically doubled that…Not just for Registered Apprenticeships, but, Industry Recognized Apprenticeships and other work-based learning models. So, it's a good time for training and apprenticeship.
>
> —Lucinda Curry
>
> *Director of Apprenticeship Works*
> *Robert C. Byrd Institute*

Public Policies and Regulations. Besides funding, numerous changes to the Federal rules and policies governing apprenticeship were also enacted in the past three years to further propel the apprenticeship movement. Policy changes, such as allowing third-party providers to help facilitate apprenticeship expansion and servicing efforts, as well as the approval of Industry Recognized Apprenticeships (IRAP) may impact the implementation of a FRADS. Stakeholders representing both the government and provider addressed the impact of the changes and the capacity of the environment to facilitate a FRADS.

> Under the Trump Administration, he [Trump] has mandated that apprenticeships become less bureaucratic, that 3rd party intermediaries are allowed. One of the rules that the DOL always followed very closely was that you could not hire apprentices through a 3rd party contract agency. They've had to change their language on that to accommodate companies who use staffing agencies…I've seen a lot of changes in the last couple of years that have really forced the USDOL to be more open to different models and methods of apprenticeship.
>
> —Dr. Pamela Howze, Partner
> *American Apprenticeship Center, LLC*
> *Former New Program Director*
> *National Fund for Workforce Solutions*

> We’re considered an [third-party] intermediary. Our organization identified…a gap in availability of cyber security talent. We created a solution from finding curriculum and providing structure of the apprenticeship for candidates; and connect[ed] those opportunities and candidates to employers. So we provide the three aspects of apprenticeship from employment, mentoring, and education and have aggregated that together to deliver those services.
>
> —Tony Bryan
>
> *Executive Director, CyberUp*

> There's nothing impeding you from deploying the types of models [FRADS] that you're focused on and have been describing during our conversation. The question is, can we line up all of those pieces in a way that make it the most powerful for the participant and the employer jointly?
>
> —Daniel *Villao*, CEO
>
> *Intelligent Partnerships*
> *Former Deputy Administrator*
> *Office of Apprenticeship, U.S. Department of Labor*

Technology Infrastructure and Requirements. When looking at the capabilities of U.S. technology, stakeholders were confident the U.S. has the expertise and technologies required to implement a FRADS. But, some mentioned the limitations of broadband in remote areas as a possible sticking point on the apprentice side of the delivery system.

> I think we have the capacity for it, we may not necessarily have it all today but with expansion of 4G and 5G capacity in our infrastructure, there's companies currently deploying hardline communication and wireless communication that can manage those types of pipelines. I think that it's available to us, the question is, are businesses ready to deploy that way?
>
> —Daniel Villao, CEO
>
> *Intelligent Partnerships*
> *Former Deputy Administrator*
> *Office of Apprenticeship, U.S. Department of Labor*

> Expertise, yes; infrastructure, maybe…in Indiana…There's still a lot of population that lives in rural areas…where a stable, let alone high speed, internet connection is difficult …Do we have the infrastructure? No, I'm not completely certain.
>
> —Dr. Nathan Hartman
>
> *Dauch Family Professor of Advanced Manufacturing*
> *Department Head, Computer Graphics Technology at Purdue University*

> So, you know I live in North Carolina and we're a pretty progressive state, but, we still have areas in North Carolina in the rural parts that do not have reliable broadband. So, I think depending on the location and whether it was an urban or rural area, that that could definitely impact the ability to do that.
>
> —Dr. Pamela Howze, Partner
>
> *American Apprenticeship Center, LLC*
> *Former New Program Director*
> *National Fund for Workforce Solutions*

Representatives of the tech industry believe there are low-cost solutions available to address the broadband issues. For example, existing technologies may be able to be leveraged to implement a FRADS; while wireless shows promise for broadband access in rural and remote locations.

> I think, you could probably leverage a lot of the [technology] infrastructure that's in place to accommodate a lot of this…Especially for companies who've embraced the digital transformation side of things. You're just sort of leveraging for a different purpose…It may not work for every single job or industry vertical, but, yeah I think the technology is certainly there.
>
> —Kerry Vickers
>
> *Chief Information Security Officer*
> *Aunalytics, Inc.*

> The trend right now…is…a wireless solution in the rural communities…you put in a wireless antennae, and it can go five miles…you can get connectivity just like [cable company] if not better. So I'll give you an example: [client name] is sitting in Elkhart…They've got a 200Mb wireless connection that hits the data center here and it's faster than fiber… going out to these rural communities and just blanketing them with all of these wireless, low cost options…
>
> —Terry Gour
>
> *Cloud & Managed Services, President & COO*
> *Aunalytics, Inc.*

Availability of Expertise. While most stakeholders believe the U.S. possesses the expertise to implement a fully remote apprenticeship, several questioned our resolve.

> And so do we have the expertise? Yes, I think we do…Do we have the financial or social motivation to make that happen? I don't know, there are days when I wonder whether or not we do.
>
> —Dr. Nathan Hartman
>
> *Dauch Family Professor of Advanced Manufacturing*
> *Department Head, Computer Graphics Technology at Purdue University*

> I think the question is, "Do we have the will?" You know, I don't know if you've looked at what Europe does, but…one of the Scandinavian countries, I believe… if you're displaced…you're automatically put into an apprenticeship program and they prepare you for your next job. We don't seem to have the will to do that…everyone complains about the high cost of our social services. It would be a lot cheaper in the long run, by factors of ten, to just give them good training for a year, and let them become self-sustaining and taxpayers instead of burdens on society…there's successful models in other places and we just don't seem to have the will.
>
> —Dr. Gary Bertoline
>
> *Dean & Distinguished Professor*
> *Polytechnic Institute at Purdue University*

> I think that big companies in particular are still having a hard time doing what I call "crossing the great divide", where they have to give up their traditional, top-down, "I think you do" way of approaching things; and, change how they do things…It's an uphill battle in a lot of…legacy institutions…I think they're beginning to feel it…not finding the talent…having to pay a lot more…There's more energy around it. But, I don't think it's reached a critical mass yet.
>
> —Pat McLagan, CEO
>
> *McLagan International, Inc.*

Economic Environment. The U.S. economy was performing well prior to the COVID-19 pandemic. While this seemed positive, the abundance of jobs led to a depleted labor pool. Stakeholders say this is turn sparked interest in alternative methods of gaining and training employees.

> …every time we meet with people, they're saying we cannot find people to fill the positions we have. I had a plant manager tell me one day that if he could get enough people he could double his production—that the business was there but he could not get the people.
>
> —Jackie Allen
>
> *Former Program Manager*
> *Robert C. Byrd Institute for Advanced Manufacturing*

> So, I think with the lowest unemployment rate that we've had in 20 years, we have to look at a lot of different ways to build a workforce and to build talent pipelines…and we need a lot of ways.
>
> —Dr. Pamela Howze, Partner
>
> *American Apprenticeship Center, LLC*
> *Former New Program Director*
> *National Fund for Workforce Solutions*

> Companies are being driven to look at their head count in a very serious way, they're looking at a globally competitive marketplace and…what they perceive to be a diminished talent pool in the U.S. So the economy is certainly driving companies to re-think their HR policies or HR practices, their hiring…
>
> —Daniel Villao, CEO
>
> *Intelligent Partnerships*
> *Former Deputy Administrator*
> *Office of Apprenticeship, U.S. Department of Labor*

Supply Chain Partnerships. When the U.S. government began to address the labor issues, new partnerships began to form. As money was appropriated and released, and regulations and policy restrictions relaxed, the apprenticeship supply chain began to fill in. Stakeholder responses indicate the breadth and complexity of the supply chain required to provide apprenticeships. Some partnerships formed between business/industry (employers), training providers, and governmental bodies on multiple levels.

> The primary relationship that's important is the employer. Apprenticeship is fully reliant on the ability to put people to work. If there's no employer there is no apprenticeship…beyond that…you want to have genuine partnerships with training providers…you want apprentices to understand their commitment to this process and the investment that's being made for them… you want to have good relationships with those pipelines that are introducing people into these apprenticeships…The last stakeholder group is the funding source. If there's an opportunity to offset some of the cost…you want to make sure that those partners are also included.
>
> —Daniel Villao, CEO
>
> Intelligent Partnerships
> Former Deputy Administrator
> Office of Apprenticeship, U.S. Department of Labor

Partnerships have also formed between technology providers, K12 and higher education.

> State agencies that are related to workforce initiatives. Federal—as you saw the grant we just received…we're doing some work now with CRANE, the naval research center in Southern Indiana, for example. As well as, other organizations—I don't know if you've heard of Conexus (Indiana), I serve on their board, for example. A lot of that is workforce related for advanced manufacturing, so those kinds of organizations that support business and industry in general.
>
> —Dr. Gary Bertoline
>
> *Dean & Distinguished Professor*
> *Polytechnic Institute at Purdue University*

Also of interest is a movement toward partners assuming non-traditional roles.

> Well, one of the big pushes is to get the Community Colleges to be the program sponsor. And, so it's very different, it's not a company owning the sponsorship, it's the college…I think you'll see this growing, the number of apprentices and types of programs and things like that, growing as more and more registered apprenticeships are sponsored by the colleges.
>
> —Dr. Rebecca Lake
>
> *Dean, Workforce and Economic Development*
> *Harper College*

Some partnerships are between state government and non-profit organizations and/or trade associations.

> For us, strong non-profit partnerships has been a big part of that, so community oriented, mission focused organizations that serve demographics that are important to us…our local WIOA (Workforce Innovation and Opportunity Act) Boards, and to…the state of Missouri through the use of the OA (Office of Apprenticeship) dollars has helped us as well.
>
> —Tony Bryan
>
> *Executive Director, CyberUp*

> We are the only AAI grantee that has a national footprint to expand apprenticeship in manufacturing…It's important to partner with state agencies throughout the nation. For example, Alabama has an Apprenticeship Alabama team focused on expanding registered apprenticeship, so that's a great partnership. And, then, just working with different manufacturing associations.
>
> —Jackie Allen
>
> *Former Program Manager*
> *Robert C. Byrd Institute for Advanced Manufacturing*

> Our partnerships with the Regional Department of Labor Offices in each state is very important. They provide a lot of technical assistance…and help us get our standards approved…Veteran's groups…disadvantaged youth groups…JobCorps …Challenge Academy…With our women's pre-apprenticeship program, we partner with…West Virginia Women Work…It takes a lot of partners to really do apprenticeship well.
>
> —Lucinda Curry
>
> *Director of Apprenticeship Works*
> *Robert C. Byrd Institute*

Another newer phenomenon are the regional collaboratives that have formed—enabling employers to offer more high quality apprenticeships.

> We [National Fund for Workforce Solutions] have 32 [now 33] regional collaboratives, and 20 [now 26] states that we work for, with a combination of workforce partners who include the Workforce boards, the United Way, the Chambers of Commerce, employers associations.
>
> —Dr. Pamela Howze, Partner
>
> *American Apprenticeship Center, LLC*
> *Former New Program Director*
> *National Fund for Workforce Solutions*

> There's a set of employers that are actually using the apprentices and we are the ones that have voting rights in our consortium. But, then, we couldn't do it without having a strong relationship with our school system because that's where we go to recruit our apprentices…and also our formal education provider…The other…partnership role that I do really value and I think very important to…the explosion of GAP compared to some other consortiums is our community partners…the community Foundation and our chambers, both in Greensboro and High Point…
>
> —Tammy Simmons
>
> *Partner at American Apprenticeship Center, LLC*
> *VP Marketing & Culture Machine*
> *Specialties, Inc.*

Finally, and often overlooked are those partnerships that must be created within the institution if an apprenticeship program is to be successful.

> The other partnerships…are…inside your institution…places where they're starting to run large grants…focusing on apprenticeships…don't do that very well…they don't sell the "Here's why we're doing apprenticeships, and here's how we could use your help"…Be careful that you don't think of partnerships as only what you can do outside…you have to have those partners who are really willing to work with you and streamline some stuff, and not do everything "we've always done for 40 years".
>
> —Dr. Rebecca Lake
>
> *Dean, Workforce and Economic Development*
> *Harper College*

Mindset. In looking at enabling conditions, stakeholders saw mindset as a key factor in the failure of the apprenticeship system to evolve at the same rate as technology; and, felt the long-standing U.S. mindset—with a focus on company ROI—may explain: 1) Why our apprenticeship system lags behind countries such as Britain and Germany; and, 2) Why, despite technological advances and capabilities, we still use a face-to-face apprenticeship delivery system.

> I was in Germany about five years ago…one of our Purdue grads was the president of the North American operation of a Germany company. A very high tech company that provided conveyors and timing sensors and things in the manufacturing industry…And, as soon as we started on the plant tour…I noticed that there was an area that was probably 50'X70' that wasn't part of the manufacturing enterprise...They didn't have conveyor belts going through it, but, they had all kinds of technologies in there. And, there were probably 20 young people in that particular area and there were three older people in that area.
>
> And, I asked him, "What is that?" And, he said, "That is our apprenticeship program that we partner with the city that our company is located in." And, I said, "Wow that's pretty nice. So, how much government funding does it take to do that." And, he said, "No, we do that as a service. We invest €2 million a year into their apprenticeship program." And, I said, "Wow, and so you have a steady supply of workforce.' And, he said, "Yeah we do; but not everyone ends up working for us, and that's okay." It's a totally different mindset.
>
> —Dr. Gary Bertoline
>
> *Dean & Distinguished Professor*
> *Polytechnic Institute at Purdue University*

> So I worked for a German company. I spent a lot of time in Germany with apprenticeship programs and they have a completely different viewpoint of apprenticeship. They see apprenticeship as a social responsibility. When I was at Siemens, they would take about 400 more apprentices in the Berlin region than Siemens could accommodate just to train them for other companies. So, it's a completely different point of view about society and preparing young people for jobs and so it's just very very different and very unique.
>
> —Dr. Pamela Howze, Partner
>
> *American Apprenticeship Center, LLC*
> *Former New Program Director*
> *National Fund for Workforce Solutions*

Stakeholders also expressed concern that the current [PRE-COVID-19] U.S. mindset—being somewhat fixed—could inhibit the implementation and broad use of a FRADS.

> Many of them [companies] are beginning to adopt things like robotics and human robotics integration and AI solutions, etc. But they still require people to show up to the office. They build these massive campuses where they expect people to work day and night when it can all be done remotely. So it's really just force of habit, it's just this control mindset that requires a supervisor, a manager, a director, a vice president to see people in the seats in the building in order to understand or believe that they're producing quality outputs on behalf of the business and it's just not necessary any more. We have friends at [company name] for example who are reimagining their electronic footprint providing for their clients data services. And so they're building major hubs in several markets around the country to provide technology services to their clients now…Why?…A company like that has a hard time getting people to relocate… Why do you need to have people physically in a building if they're all working on digital platforms.
>
> —Daniel Villao, CEO
>
> *Intelligent Partnerships*
> *Former Deputy Administrator*
> *Office of Apprenticeship, U.S. Department of Labor*

> I think we're still stuck as a country in that very traditional millennium's old apprenticeship system. We're slowly starting to move to some more dynamic opportunities within the apprenticeship space, so I think the technology is there, I think the capability is there, I think it's about changing mindset and getting employers bought in...
>
> —Chris Motz, EJD
>
> *Regional Vice President, Partnerships & Strategy*
> *Purdue University Global*

One stakeholder discussed four existing mindsets he believes would need to be addressed if apprenticeship is to be delivered remotely.

> Recruitment mindset. There's a bigger mindset than just adopting technology. Some of it really starts with the people in the companies who have too much tradition and…old mindsets…there's a whole lot more candidates out there that probably meet your qualifications than you were ever aware of just because you were so limited in where you thought you could find them…
>
> A culture mindset. If they're an agile…kind of organization…they get a lot out of their scrum meetings and they don't use technology to do it, they're still in that mode of…it's important for us to all meet, and we've created this really cool space…and we really enjoy each other's company…If that's the case…if you're trying to do remote apprenticeship and that's kind of this additional step that they're not generally doing, then I think it's more of a negative than a positive.
>
> Assessment and evaluation mindsets based on proximity. There's a mindset on performance evaluation and…competency assessment…you don't want there to be bias in the review…assessing soft skills…the way people observe them in a meeting—as they leave, as they interact…the alignment of other HR systems…have to be fair when somebody is…fully remote.
>
> Growth mindset. At Blue Cross Blue shield...for somebody…who transitioned… from one kind of role to another…a step up…I had to change the whole mindset, because a lot of times people said… "We can't even train people for the job that they're in and you want to train them for the next one?" And my answer was "Absolutely, because if you don't, how are you going to grow?"
>
> —Lonnie Emard
>
> *Apprenticeship Director*
> *Arkansas Data Science Center*

4.2.2 Current Trends

Concerns Foregrounded. With any systems change, factors that formerly precluded the change often become foregrounded. With only half of the states overseen by the Department of Labor Office of Apprenticeships, and the approval of Industry Recognized Apprenticeships, questions of credentialing and portability—ensured under trade associations and Federally Registered Apprenticeships—must now be addressed and resolved.

> There's going to be more of a problem in certain occupations than others…when you think about licensing. Just because you're licensed to be a nurse in one state doesn't mean you're licensed…in another state…But, if you're a plumber or an electrician…the labor unions…say if you're certified…And, that's portable…these non-traditional areas, like IT…technical skills… advanced manufacturing, transportation logistics…we struggle…to come up with standards.
>
> —Lonnie Emard
>
> *Apprenticeship Director*
> *Arkansas Data Science Center*

> …you have a little bit of a disparate system right now…about half of the states are recognized and overseen by the federal government, by the federal system. They all have agreed to a joint set of standards and premises under which apprenticeship will be recognized. And, then you have about half the states, 25 states, that have said, yes we'll at least at minimum meet those federal standards, but we also have additional standards that employers are required to meet in our system…Now we have had efforts around the country to get those autonomous states, for lack of a better word, they're called state apprenticeship systems, SAS, to get those apprenticeship systems to uniformly kind of identify what the differences are between them and the federal system so employers can very rapidly address those differences. So there's efforts under way for that but you know it's a process.
>
> —Daniel Villao, CEO
> Intelligent Partnerships
> Former Deputy Administrator
> Office of Apprenticeship, U.S. Department of Labor

The disparity in models is of great concern, in that apprentices may not understand what makes one credential different from that offered by another program.

> A lot of the newer models have not been vetted yet and do not have accreditation standards. And, so I think that to make sure that when we call something apprenticeship, there is a verifiable credentialing system so that one person can't say, "Well, I went through a 4-year tool and die apprenticeship" where someone else went through a two-week customized training and they're both calling them apprenticeship. Just like in the college system, you have accreditation…there needs to be a level of consistency in apprenticeship as well. And, right now, there's not. Registered apprenticeship has that level of consistency and has for 50 years. But, right now, everybody's calling everything apprenticeship, just to get on the bandwagon and get some of these Federal dollars and they're not all quality programs. So, that concerns me.
>
> —Lucinda Curry
>
> *Director of Apprenticeship Works*
> *Robert C. Byrd Institute*

Positive Trends Stakeholders saw trends that may positively impact the acceptance of FRADS, such as the expansion of youth apprenticeships and policy changes on the Federal level.

> In North Carolina, we've had a huge boost toward youth apprenticeship…high school to apprenticeship programs. And [we're] seeing our numbers steadily rise. They are still the minorities in the state…but…it's definitely on the rise. …There are several bills going before Congress to support apprenticeship programs, so I think there's a lot of policy change that's happening.
>
> —Dr. Pamela Howze, Partner
>
> *American Apprenticeship Center, LLC*
> *Former New Program Director*
> *National Fund for Workforce Solutions*

Stakeholders also believe the development, use, expansion and maturation of technologies as well as the declining age of decision makers may create a more favorable environment for a fully remote apprenticeship delivery system.

> The interesting thing is every year that goes by, leaders become younger and younger. So again, if your stance is, "Is this something that's viable?" I don't think it's a matter of if, I think it's a matter of when. And I really believe that the when might be now. The when could be now for 20% of companies. It could be 40% in five years. I don't know what it is, but I can see that trend growing as leadership and management gets younger, tools continue to mature, and in the rural areas as internet connectivity and all of that becomes more readily available.
>
> —Terry Gour
>
> *Cloud & Managed Services, President & COO*
> *Aunalytics, Inc.*

> INMCC is…targeted at helping Indiana manufacturers become more competitive especially in light of this wave of digitalization that is transforming manufacturing...It's not such an engineering or manufacturing centric process anymore. This idea of digital data and product life cycle management…it's much more of an enterprise level view now, when you talk about product sustainment you talk about supply chain and those sorts of things .
>
> —Dr. Nathan Hartman
>
> *Dauch Family Professor of Advanced Manufacturing*
> *Department Head, Computer Graphics Technology at Purdue University*

Finally, a shift in the positioning of apprenticeship is taking place in which apprenticeship is being redefined as a transformational business tool vital to the future of work, a viable alternative to a college education, and as a contributor to the well-being of society.

> When you think about it [apprenticeship] in terms of the business opportunity… as the transformative model for business, it really allows a business to compete in a much broader space…
>
> Apprenticeship is a market capture strategy…a business tool…a family transforming career on-ramp…a policy structure that allows organizations to transform market spaces.…the ability to take somebody without any competency or knowledge in a particular occupation and really fully saturate them through experiential learning, on the job exposure, as well as in-classroom exposure…that knowledge is really what begins to transform and empower families.
>
> —Daniel Villao, CEO
>
> *Intelligent Partnerships*
> *Former Deputy Administrator*
> *Office of Apprenticeship, U.S. Department of Labor*

4.2.2 Factors Impacting Readiness

Borrowing from Weiner's theory of Organizational Readiness for Change (2009), I asked stakeholders to consider the value (valance) of a FRADS, as well as the ability of the critical stakeholders to create and sustain a viable system (efficacy). They then offered their perceptions of the readiness of various stakeholder groups involved in the apprenticeship system.

While many stakeholders saw a FRADS as potentially valuable [Weiner's valance], because it represents a large systems change, several believed it would require educational initiatives aimed at specific stakeholder groups: business and industry, parents, and potential apprentices if it were to become widely used. Value, in many cases, was defined in terms of return on investment.

Return on Investment. Several stakeholders focused on the value of a fully remote apprenticeship delivery system based on the impact on ROI, such as the costs of housing an employee onsite, time saved on travel, and impact on overhead. But, they also acknowledged trade-offs.

> It doesn't cost really any more to have internet fees…but if you have somebody in person, now you've got to have…desk spaces…cubicles…I look at our office… we spend $12 thousand a month for this office. We have fifty (50) people but the [labor] burden cost of every individual in a cubicle is fairly high. There's a big ROI if we don't have to do that [house an employee].
>
> —Terry Gour
>
> *Cloud & Managed Services, President & COO*
> *Aunalytics, Inc.*

> If I don't have to fly you in or drive you in and you don't have to take that hour to commute and I don't have to set up a space for you and provide you a desk and pay rent and light bills and the related such things for you to execute your training at my location, I've saved a significant amount of overhead and so in my mind it's a reduced cost.
>
> Now are there trade-offs? Absolutely. You have to have a trusting environment where you actually can see and control the delivery of the work…So is it easier to show somebody how to manipulate a particular thing in person? Absolutely. So there may be some additional time that's required for certain skills, but all in all, if it's all being managed virtually, it should come in at a much cheaper cost.
>
> —Daniel Villao, CEO
>
> *Intelligent Partnerships*
> *Former Deputy Administrator*
> *Office of Apprenticeship, U.S. Department of Labor*

Other Benefits Lending to Viability. Stakeholders attributed value to other aspects of a FRADS. These included expanded reach and the ability to employ access-limited populations.

> I think there's value in delivering either way but I definitely see the value in doing remote apprenticeships…I'll look at it from our lens. It would be really cool if I have people that are on my staff…that can offer services to small businesses in rural communities that don't have the infrastructure support that they would need from a security perspective. So we would be able to help strengthen and better the country's networks for small or large companies by delivering remotely. So I definitely see a lot of value in this as a delivery mechanism for apprenticeships.
>
> —Tony Bryan
>
> *Executive Director, CyberUp*

> I think the advantages are it could be made available to a larger number of people—like people who have some sort of disability and they can't leave home…I think there is a huge issue in America with transportation for people who live in poverty and they don't have a reliable way to get to work…
>
> —Dr. Pamela Howze, Partner
>
> *American Apprenticeship Center, LLC*
> *Former New Program Director*
> *National Fund for Workforce Solutions*

Other benefits include tax considerations and as well as the ability to train seasonal workers and those positions with environmental requirements for training.

> I guess you could place it in…districts where you can get better tax incentives. You…can place it where the workers are already living. So, you capture different audiences than…ones that you would normally have access to…Seasonally, if there was some type of training that needed certain kinds of weather conditions, you could see if the weather was good or conducive to whatever that training needs. Maybe they need bad weather for training.
>
> —Tammy Simmons
>
> *Partner at American Apprenticeship Center, LLC*
> *VP Marketing & Culture Machine*
> *Specialties, Inc.*

Stakeholders also saw the advantages to recruitment, as a fully remote option removes some of the hiring considerations based on location.

> I think what this also affords is some flexibility…you're taking some of the things out of play that might be an issue…right now if I want somebody to work here, they pretty much need to live within 25 minutes…if they're remote…you can really focus on…strengths. I don't care about where they live…I care about those strengths and what we need in our environment.
>
> —Terry Gour
>
> *Cloud & Managed Services, President & COO*
> *Aunalytics, Inc.*

Value [valance] beyond the immediate company needs. Stakeholders also saw the potential value of a FRADS to contribute to the education of the workforce as a whole by tying employment to competencies rather than only to traditional credentials earned in institutions of higher education

> Yeah, I absolutely do. I think it's [FRADS] necessary. I think it will transform the way apprenticeships are done and I think it will proliferate more apprenticeships. I mean I think as I look around the space more and more jobs are tied more to the competencies of an individual than they are to the educational credential that an individual has and I think as jobs continue to change at a very rapid pace…more and more we can leverage apprenticeships to prepare people for the workforce, even in a way that traditional educational credentials don't do.
>
> So you start out with what are the competencies for a job, deliver those through an apprenticeship, perhaps at the end. Or…as a part of that apprenticeship you're getting certification that's required in that particular job field. And then again, because that's been articulated for academic credit [referring to conversations Purdue Global is currently involved in[rather than having to start from ground zero on your journey towards a degree, by the time you finish your apprenticeship, say you're halfway there. So I think it's really critical that we develop an alternative delivery system to be able to accomplish that and leverage technology.
>
> —Chris Motz, EJD
>
> *Regional Vice President, Partnerships & Strategy*
> *Purdue University Global*

Efficacy. In thinking about efficacy—the perception critical stakeholders hold as to the collective ability to develop a viable FRADS—many stakeholders believed that we as a country have the ability.

> Absolutely, we're America, right. We're the world of opportunity, I'm confident if anybody could figure it out, it would be us.
>
> —Tony Bryan
>
> *Executive Director, CyberUp*

> Do we have the expertise? Yes, I think we do.
>
> —Dr. Nathan Hartman
>
> *Dauch Family Professor of Advanced Manufacturing*
> *Department Head, Computer Graphics Technology at Purdue University*

> I think it's very possible and we should have started in what, '91. No, I actually believe that's very, very doable. And, part of the challenge in trying to innovate learning in general is a challenge. Because people just keep on wanting to do the same things and expecting different results.
>
> —Dr. Gary Bertoline
>
> *Dean & Distinguished Professor*
> *Polytechnic Institute at Purdue University*

Efficacy as a function of Technology. A representative of the IT sector positioned the efficacy of FRADS within the rapidly changing world of technology. He stresses the need for the system to be simple to use and replicable.

> What you're proposing [FRADS] is never ever going to get worse, it's always going to get better. As technology improves, as things are more readily available and internet gets faster and this RED (remote ethernet device) device that used to be $500 is now $60, I mean these things are becoming more readily available…what you're doing…is…thought leadership. You're thinking of something that is an idea that can be utilized now by some, but as we go forward, by more.
>
> If you look at Amazon— super successful, huge company. They didn't invent the catalog, Sears did. Sears just didn't put it online. They invested in legacy technology: you have to come to the store; it's brick and mortar and all of that. And Amazon is killing them. This is more of an Amazon idea. This is something that can be valuable and you've proven it. There's some challenges but these challenges are only going to get smaller as time goes on. Twenty (20) years ago this couldn't happen. Twenty (20) years from now this may be the norm…I think the only way to [get people] open to it is to make it… easy and repeatable.
>
> —Terry Gour
>
> *Cloud & Managed Services, President & COO*
> *Aunalytics, Inc.*

FRADS in Manufacturing. Another stakeholder has firsthand knowledge of early attempts to deploy a hybrid type of remote apprenticeship for a manufacturing application that demonstrates proof of concept.

> This pilot that one of our partners is doing…trained 20 Veterans and Staff members in VA hospitals in two states, mainly on using 3D printing for therapy…It's not a full apprenticeship program. It's more of a customized training program. But, it's completely remote.
>
> —Lucinda Curry
>
> *Director of Apprenticeship Works*
> *Robert C. Byrd Institute*

Perceptions of Readiness by Sector. In judging readiness directly, rather than as a function of efficacy and valance, stakeholders assessed specific groups within the delivery system: government, corporate, parents, potential apprentices, and, the military. They also offered their perceptions of the overall readiness of the United States to accept and implement a FRADS. Perceptions ranged from being fully ready to readiness conditioned on mediating factors.

Governmental readiness. Stakeholders believe governmental readiness depends on the level of involvement and responsibility the Federal and State departments are expected to assume. One concern is that the U.S. may lack the governmental structure to operationalize a FRADS.

> In terms of somebody from the outside as a third-party evaluator, assessing readiness…if the role is fairly minimal as to what government needs to be involved in to make this happen, then maybe the readiness is a 7 on a scale of 10. But if the things they were intending to be…responsible for, especially if we maintain the portability and standardization…that might be a four or five.
>
> —Lonnie Emard
>
> *Apprenticeship Director*
> *Arkansas Data Science Center*

> I've had several conversations with the folks at the Department of Labor…apprenticeship office…where we discussed some of these…very concepts and they were very, very open to it, very excited about it. I think the struggle is always, okay what do we do with this because it's so new and out of the box and we don't have a structure set up to operationalize it, so yeah, I have seen first-hand that that particular agency is very open to it.
>
> —Chris Motz, EJD
>
> *Regional Vice President, Partnerships & Strategy*
> *Purdue University Global*

Employer readiness. Stakeholders were less certain about the readiness of business and industry to deploy a fully remote apprenticeship delivery system—manufacturing in particular. A few stakeholders felt FRADS might be a "hard-sell" because apprenticeship as a construct is not well understood.

> I think companies are still struggling with the word apprenticeship in general…so you just have to be lot more clear and transparent with your language and deliberate with the words you use…what the definition of an apprentice is...there's still some need for education broadly around what apprenticeship is to corporations.
>
> —Tony Bryan
>
> *Executive Director, CyberUp*

> I think it would be a hard sell…the model would have to be there. There would have to be some really solid examples. I think that you would need a testbed, a company buying into it, and have some real examples to show, as you utilize that for outreach…You would have to definitely have some people telling the story, how it's working and that it is working.
>
> —Jackie Allen
>
> *Former Program Manager*
> *Robert C. Byrd Institute for Advanced Manufacturing*

To facilitate acceptance, participants suggested stakeholder education as well as a successful deployment with testimonials by satisfied companies serving as product champions.

> It's the stakeholder education. You have to have a real cadre of materials and people that are knowledgeable to share that information, to talk to business owners in a way that they understand…re-educate American employers and HR leaders and educators on the value that apprenticeship represents and how it can reduce costs, transform lives, become a community engagement tool that's really much more meaningful than its current utilization, and create a globally competitive market provider in America.
>
> We have to get these examples and put them in front of people…these corporations are all looking at what their competitors are doing. If their competitors have discovered some valuable tool that allows them to move faster, smarter, create more value for their stockholder, move into capture a little bit faster, expand their footprint, whatever, they're going to take it seriously, but you gotta make the case….as soon as one client demonstrates that it's a valuable approach, I have three more…
>
> —Daniel Villao, CEO
>
> *Intelligent Partnerships*
> *Former Deputy Administrator*
> *Office of Apprenticeship, U.S. Department of Labor*

> I think that any time you do change, there's going to be a little bit of communication you have to do, validation. So, if you could get a couple of companies to kind of endorse what you're doing…And, they will now become your spokesperson, so you don't have to defend yourself all the time, and they become a champion for you…strategies like that.
>
> —Dr. Gary Bertoline
>
> *Dean & Distinguished Professor*
> *Polytechnic Institute at Purdue University*

Age as a Mediating Factor. Age was mentioned by nearly every stakeholder; albeit in different contexts. Some focused on the age of employers (owners and C-Suite) while others referenced the age of potential apprentices.

Several stakeholders mentioned possible age-related constraints due to the use of technology as a mediator in a FRADS.

> Not to say that all older people are not literate in technology but in general that's the way it is. And so I really believe that as the decision makers become younger and younger and especially coming from all these different varied backgrounds…this becomes more popular. I think the stumbling block is going to be the decision makers that are older that just say: "You know what, this is not for us."
>
> —Terry Gour
>
> *Cloud & Managed Services, President & COO*
> *Aunalytics, Inc.*

> …the concern that I would have would be—we still have a generational gap from the managers and the decision makers of large companies that think that [conducting life and work online] is weird and wouldn't be as inclined to do that.
>
> —Tony Bryan
>
> *Executive Director, CyberUp*

> If we're targeting young people to get into these programs, you know they're very technologically savvy and not afraid of technology. I think for older workers, it would be pretty overwhelming.
>
> —Dr. Pamela Howze, Partner
>
> *American Apprenticeship Center, LLC*
> *Former New Program Director*
> *National Fund for Workforce Solutions*

Also of concern was the traditional nature of legacy institutions as it pertains to large systems change efforts.

> You get into some of these bureaucracies and whatever entrepreneurial and change oriented stuff either gets beaten out of them, or they've let it happen. So you have...in some cases the institutions have been so intractable that people have given up. In some cases, it's generationalized. I think the younger people coming in at least initially—they're used to things changing around them. They're used to and they want to have more control over their life.
>
> —Pat McLagan, CEO
>
> *McLagan International, Inc.*

Information Technology (IT). Industries in the IT space as well as financial institutions were thought likely to be ready and accepting of the construct; although some might want/need a reliable reference architecture or framework.

> I would think that the IT industry would be the most willing to participate just because of the way we embrace technology in general. So, high tech companies in the IT space. I would say possibly companies in the financial space. I mean as far as like back office workers that do processing for accounting, payroll, those kinds of functions, I think would be good candidates for that.
>
> —Kerry Vickers
>
> *Chief Information Security Officer*
> *Aunalytics, Inc.*

> If your [purpose] is to define "Is the time to do this now, and are the companies interested in doing that", I'm going to predict the answer is going to be "Yes" and "Yes". Maybe not all companies, but a certain percentage of them. And, I bet there's going to be a percentage that would say "Yes, but," and that "but" is—"I need a framework of how this can be successful and if I follow this then I have a high likelihood of success."…In some respects, I think the tech companies have already produced the tools that make this possible. And the fact that the majority of the training right now is no longer a classroom for tech type products, the industry has already embraced it…I think that for this to be successful you have to empower and integrate this remote person into the company's environment with their [the employer's] tools and their processes … it's almost like you're creating a reference architecture—Use one of these four platforms…Store it in one of these four areas. Integrate it with IT in this way, and we see a recipe for success.
>
> —Terry Gour
>
> *Cloud & Managed Services, President & COO*
> *Aunalytics, Inc.*

Manufacturing. Most stakeholders believed it might be best that manufacturing not be addressed in the first round of implementation; and, some especially familiar with the manufacturing sector questioned whether it was applicable to manufacturing at all.

> I don't know that they [manufacturing] are very ready at all. I don't think their readiness is very high. On a scale of 1-10 with one being not ready at all and ten being ready to where they could start tomorrow, my experience tells me that they're about a three. And I say that because I think there are a number of issues still that they would want to try to have fully vetted and to find answers for even though that may not be entirely possible, things like security that we talked about earlier, things like the proper infrastructure by which to do this.
>
> —Dr. Nathan Hartman
>
> *Dauch Family Professor of Advanced Manufacturing*
> *Department Head, Computer Graphics Technology at Purdue University*

A stakeholder working in Advanced Flexible Manufacturing, however, provided insight into the capabilities of deploying remote training within additive manufacturing.

> We do have a new program for Additive Manufacturing Technology that could be done remotely because most of it is the programming of the parts. It could actually be set up to send an STL file to a machine at one of our sites to run the parts and be verified by an instructor.
>
> —Lucinda Curry
>
> *Director of Apprenticeship Works*
> *Robert C. Byrd Institute*

Parental readiness. Several stakeholders mentioned that parental education may also be necessary—that parents may not be aware of the opportunities and paths available.

> A lot of people don't think much of manufacturing or the construction industry. They have certain ideas of what that industry sector is, and whether there's actually anything appealing there for them. When we think of a factory as dirty, dark, and dangerous…it's not that way anymore because it's so sophisticated. So, re-educating both parents as well as the younger workforce as far as what the real opportunities are there. That to me is a big challenge, because it's great to come up with all these apprenticeships but if people think that working in manufacturing is an awful job, you won't get them to even apply. How do you break down that barrier? And that's real, as you know in many industry sectors.
>
> —Dr. Gary Bertoline
>
> *Dean & Distinguished Professor*
> *Polytechnic Institute at Purdue University*

Any remote education or work requires the support of the family and it is important that the family is involved in creating an environment conducive to work and learning.

> If you can inform parents and counselors and teachers and the students themselves as to where these opportunities are going to be and the fact that if you're a college bound candidate, then by all means make sure you're going to college with an idea in mind of what you're going to do, don't just go pay $80,000, end up in debt, and then decide, oh my gosh, I can't get a job.
>
> —Lonnie Emard
>
> *Apprenticeship Director*
> *Arkansas Data Science Center*

> And I would even contend that you might even want to build a community of practice around that, much the same way you see communities spring up for people; especially parents who might have children with certain medical or social or behavioral conditions…to help parents…cope with the different scenarios that they face.
>
> —Dr. Nathan Hartman
>
> *Dauch Family Professor of Advanced Manufacturing*
> *Department Head, Computer Graphics Technology at Purdue University*

Apprentices [Citizen Beneficiaries (CBs)]. Nearly all stakeholders believed potential apprentices would see the value of a FRADS and believe that such a system could be successfully implemented. Most stakeholders viewed apprentices as young and/or millennials. One concern was raised that potential apprentices might worry about their position within the organization and the team because of their lack of physical presence.

> [As an apprentice]…maybe I would have concerns I wouldn't be supported. I wouldn't be part of the team. I would be disposable because my employer doesn't see me from day to day. So it would be easier to get rid of me…[be]cause there's not that face-to-face personal relationship… I can't do happy hours after work and hang out...I don't think you ever reduce office politics and popularity contests in an organization….if I'm remote, I lose some of that opportunity.
>
> —Tony Bryan
>
> *Executive Director, CyberUp*

Military readiness. Four of the stakeholders served in the military in various branches and capacities. Several stakeholders currently work directly with the military, facilitating training and apprenticeship efforts. Stakeholder consensus is that the military is probably the sector that is most ready, and that would be most open to testing a FRADS.

> Yes, I think they're the most-ready, because they do understand training. And, they do understand training at a distance. They have training everywhere in the world. And, they are using more and more online capabilities. So, yes, I think that they're probably the most open to remote training opportunities.
>
> —Lucinda Curry
>
> *Director of Apprenticeship Works*
> *Robert C. Byrd Institute*

> I think there would be some receptivity to it [with the military]…Skill Bridge is designed for transitioning veterans at the six month mark prior to your transition out. You can go work for a company as a service member and you're paid through the company, through the military still, and you work for free at that employer. So I think combining that remote apprenticeship to Skill Bridge is a great transition…I work with a lot of cyber security guys that they're getting out of the military walking into $125 thousand jobs and have no issues. But if you look at Infantry Combat Arms types roles like infantry, field artillery, mechanics—this would be a great way for them to get experience in other spaces that they probably haven't had an opportunity to do through their military service, that they could get upskilled in a different way.
>
> —Tony Bryan
>
> *Executive Director, CyberUp*

Overall readiness. Overall readiness was judged by stakeholders to be between a three/four and an eight on a scale of 1 to 10—zero (0) being not ready at all; and, ten being completely ready. [Note: Some stakeholders proposed ordinal ranking to quantify their responses to the question of "How ready do you believe…?".] The perceptions of readiness were based on the general availability of connectivity and the beginning movement in some industries toward online/remote work.

> I think we would be good. I'd say if I gave it a scale of ten (10), I'd give it an eight (8). I mean most places have WiFi connectivity; and I think working remotely is more acceptable, and individuals are getting more accustomed to online work. I think we would be there with a little bit of structure and support to make it executable.
>
> —Tony Bryan
>
> *Executive Director, CyberUp*

> I think that the readiness on the part of the U.S. to really expand apprenticeship in general is about a five or six…maybe it is a seven. For a fully remote…"maybe a four, a three or a four"…There will always be a little lag. But I do think in some occupations…some industries…some companies, it may go faster than that. And that…may be a byproduct of what it takes in a certain industry…because the acceptance of remote work has already been done…something else has paved the way. The foundation has already been laid because that call center or that cyber security specialist or that whatever, is already kind of viewed as a remote job."
>
> —Lonnie Emard
>
> *Apprenticeship Director*
> *Arkansas Data Science Center*

The ease with which some positions could become remote was also a factor considered in judging overall readiness.

> Certainly some industries are more ready than others. Honestly, I think we [Aunalytics] could do something like that easily…certain positions keep in mind. Not for every position, obviously…But, for help desk technician. You know, that could easily be worked out. Even a network engineer that largely doesn't have a lot of need to have any sort of physical connectivity, or physical hands-on gear. We could easily accommodate that. But, again that's more to our business model. I think companies like us in this tech space would be much more apt and much more prepared to pivot a little bit and add this as another option.
>
> —Kerry Vickers
>
> *Chief Information Security Officer*
> *Aunalytics, Inc.*

4.2.3 Other Components of Viability

Stakeholders were also asked to consider and comment on other components included in the IEG framework: 1) Inputs, which in the case of apprenticeship include employers, human capital, communicative and collaborative technologies; and, 2) Funding. Because of the current conceptual status of FRADS, stakeholder perceptions that touched on the remaining IEG

components of Implementation, Service Outputs and the Feedback Loop are addressed only as they relate to functional equivalence (see Section 4.3).

Inputs. Stakeholders believe many of the necessary inputs of a FRADS are already in place and/or available in the United States: e.g., human capital—both employers and marginally attached and access-limited individuals; and communicative and collaborative technology(ies). Human capital in the form of employers with assigned mentors within business and industry is considered the most critical input. The pool of potential apprentices also falls under human capital. Finally, communication and collaboration technologies are seen as available inputs; but, not ubiquitous throughout the rural areas of the U.S. **Human Capital: Employers.** The existence of human capital does not guarantee participation in U.S. apprenticeship. Stakeholders positioned the employer as the driver of the apprenticeship process—offering apprenticeship as an alternate path to traditional education and employment.

> Apprenticeship is designed to really take a person from day one and employ them in the environment…and that requires the full participation of employers…You have…to talk to business owners in a way that they understand that this is a valuable approach and that it's workable and it's not going to disrupt either their current market space or their practices in a way that will upend their business model...
>
> —Daniel Villao, CEO
>
> *Intelligent Partnerships*
> *Former Deputy Administrator*
> *Office of Apprenticeship, U.S. Department of Labor*

Large public U.S. companies are accountable to stockholders, and therefore focused primarily on profits. This presents unique challenges to recruitment of employers for apprenticeships.

> I think of publicly traded companies, they have to see the value in their bottom line and how it's going to make their shareholders more money. And I hate to make it about money but it's the truth. If I'm on the board of directors at [company name]. I don't give a crap about who they hire or how they hire, all I care about is what my stock price is..Can you make both happy? Sure, it requires some more time and sometimes money to be able to do that.
>
> —Tony Bryan
>
> *Executive Director, CyberUp*

> [In] a registered apprenticeship program, the companies fully invest in the apprentice… you get a job before you're even come to school….if everything goes well, and 90% of the time everything goes well…you just have a job till you want

> to move on…Nobody would ever pay that much money for you just to get an education and then let you move on.
>
> —Dr. Rebecca Lake
>
> *Dean, Workforce and Economic Development*
> *Harper College*

> So this idea that I'm an employer and I need to squeeze every penny out of my workforce and therefore I'm going to move my entire company to a state where the minimum wage law is 30-40% lower than the state that I'm currently in, and I don't have to pay overtime and I don't have the fear of unionization... Those players are always going to interfere…with the process of equipping a workforce that's globally competitive [be]cause they're only focused on their own bottom line…on the small sphere of influence that they may have rather than the opportunity to capture global impact…
>
> —Daniel Villao, CEO
>
> *Intelligent Partnerships*
> *Former Deputy Administrator*
> *Office of Apprenticeship, U.S. Department of Labor*

Because of the focus on ROI, ingenuity helps counter the financial and human capital constraints of small businesses as evidenced in the following stakeholder descriptions of solutions they have created to take advantage of the apprenticeship opportunities.

> I heard about it through another program in our state (Apprenticeship 2000), and then I convened some other employers together to listen to what I had heard and to provide me some starting partners to get this thing kicked off. Our company was one of the leaders…There's a set of employers that are actually using the apprentices and we are the ones that have voting rights in our consortium.
>
> —Tammy Simmons
>
> *Partner at American Apprenticeship Center, LLC*
> *VP Marketing & Culture Machine*
> *Specialties, Inc.*

> Capacity equals cost, so if I have a major corporation with a training budget, I can deploy faster, I can create the partnerships faster, I can adopt a curriculum faster, I can analyze my occupational needs sooner because I have staff capacity or a consulting capacity that allows me to do that and then I can deploy these workers much faster and there's cost connected to that.
>
> If I'm a small employer, say 10-20 people, I may only be able to run 1-2 apprentices because I can't manage the payroll and I have to justify it through business capture and I may not have the capacity—the tools available to me. So that's why we aggregate employers often when they have similar occupations so that we can get to scale faster and help them reduce the impacts to their business.
>
> —Daniel Villao, CEO
> *Intelligent Partnerships*
> *Former Deputy Administrator*
> *Office of Apprenticeship, U.S. Department of Labor*

Stakeholders held different views of the importance of company culture and whether it could be imparted remotely. Two stakeholders who both hold to the importance of a close-knit culture facilitated by time spent together offer additional insight into how the make-up and culture of a company may impact the broad adoption of a FRADS; and, conditions under which it may make sense.

> I think you hire for culture and you train for the skill. And so if they've got the right culture fit…the same core values that your organization does, then I would invest into them all day long.
>
> I think in certain industries…being a part of the community…may not be required…[gives an example of a member of his current team]. So, we have a completely different culture, we don't hang out and all that, but he's a great resource. So I think there's times where it's not a requirement for everybody to feel like they have to do the same things in the community…sometimes having something that's completely different almost supplements the team that you have. I'll give you an example. We…have these huddle meetings…getting the entire company together. Well I really can't get the entire company together [be]cause somebody has to stay here and do things. If I had some remote team that's still on and going—that takes some pressure off of what we're doing here for sure.
>
> —Terry Gour
>
> *Cloud & Managed Services, President & COO*
> *Aunalytics, Inc.*

> I don't think there's a way to supplement happy hours and I mean some people have value in that and some don't…For me personally if I look at a place that I want to go, culture is important to me. Even if I'm going to go be a cyber security analyst, I want to have some sort of (it's probably my military that comes out in me) mission. I love values. I mean I love that stuff! I kind of eat it up and I love corporate culture. I don't know how you'd replace that piece remotely. I know they've got virtual job fairs and all these others things and stuff like that, maybe you could have like that, like virtual lounge, just for people to go and hang out. Now maybe we have a real life Sims game, or you could have Avatars. From the cyber security perspective, I have just found that those teams are generally pretty tight, they get along really well, there's kind of this family culture where they're problem solving together…
>
> My wife…works remote, and manages a team of 12 or so…I don't think she's met half of them, and she has relationships…and they do a good job. But that's the culture of that company… that's a very different corporate culture than say Edward Jones in St. Louis where they wear suits and white shirts four days a week and on Friday they get to go casual by wearing a suit and a blue shirt… So there's a very big difference between those two corporate structures, so how would you make that universal for every employer?
>
> I think it [a FRADS] would produce a person who was good at completing tasks that my organization needed but not necessarily somebody who would be a team player who drinks the kool-aid of my corporate culture, who's all in.
>
> —Tony Bryan
>
> *Executive Director, CyberUp*

Human Capital—Mentors. Stakeholders believe that second only to the employer in importance to a successful apprenticeship, is the mentor.

> The mentor role is probably the make or break to a successful apprenticeship… you could have all the same components and have a poor mentor relationship or [do] a poor job of that, and it will fail, whereas you could have a process that's shy of certain components in the education or the training but you have a great mentor and it will make up for it and the next thing you know it's successful.
>
> —Lonnie Emard
>
> *Apprenticeship Director*
> *Arkansas Data Science Center*

> I think a lot of mentorship in organizations, whether it's big or small, is often learning the culture and the ways of working that go alongside of working with other people…So things as simple as learning to have a conversation, learning to articulate your point, learning to advocate for a particular position, learning to present a budget and defend your rationale. Those kind of things you learn from being in an organization where there are other people in close physical proximity to you. And so I think…learning the social dynamic of how to work is just as important as learning the specific bits of what the work is.
>
> —Dr. Nathan Hartman
>
> *Dauch Family Professor of Advanced Manufacturing*
> *Department Head, Computer Graphics Technology at Purdue University*

When asked if the level of hands-on oversight a mentor has to provide varies, stakeholders pointed out the differences based on the safety aspects of a particular position.

> …the federal regulation requires one-to-one [mentoring]; but it's also based on safety criteria. So clearly if you have somebody operating a chop saw, you need direct supervision over that individual that is operating a highly complex and dangerous piece of equipment.
>
> An environment where safety is not such a great issue, the department [Office of Apprenticeship] has typically granted waivers or has historically granted adjusted ratios for this type of training and so they review them depending on the occupation. They've already approved a variety of models where the ratio is greater than one, but historically it is one-to-one, but that's typically rooted in safety.
>
> —Daniel Villao, CEO
>
> *Intelligent Partnerships*
> *Former Deputy Administrator*
> *Office of Apprenticeship, U.S. Department of Labor*

> In manufacturing apprenticeships, you teach them safety on the front-end and that's a required component by the USDOL, and, they learn good work habits and they actually statistically end up being safer workers than your current work force.
>
> —Dr. Pamela Howze, Partner
>
> *American Apprenticeship Center, LLC*
> *Former New Program Director*
> *National Fund for Workforce Solutions*

Mentor involvement varies based on the structure of the work environment, and declines as the apprentice becomes more skilled in the position.

> Typically, they're [apprentices] working on projects. So, the mentor's not with them all the time. The mentor gets them started and helps them connect to resources. And, then basically the apprentice does the work unsupervised for the most part.
>
> —Dr. Pamela Howze, Partner
>
> *American Apprenticeship Center, LLC*
> *Former New Program Director*
> *National Fund for Workforce Solutions*

> …by the end of the first year your mentor time goes down. So, you never have to...buy a mentor to work with the apprentice. You essentially take the old guy, that's just about ready to retire, that's got a lot of information in his head. And, you have him work with the apprentice. And, as the apprentice gets better and better and better, the time goes down, and down and down for the mentor. And, then, he doesn't start at a whole salary, he starts lower, so you can recoup those costs… "You don't have to buy an extra mentor. Just use Joe, who you already have."
>
> —Dr. Rebecca Lake
>
> *Dean, Workforce and Economic Development*
> *Harper College*

Human Capital—Potential Apprentices. Several stakeholders gave insight into the make-up of the potential apprentice market, such as their age and backgrounds; the level of commitment and expectations; and some misconceptions about youth apprentices.

> There's a pretty wide range of apprentices in terms of age. Most people think, "Well this is just a different avenue for somebody who didn't go to college". So they think an apprentice is you know 16 or 18 to 24. In most states…the average age of an apprentice is about 32… you've got incumbent workers…displaced workers…previously incarcerated…veterans.
>
> —Lonnie Emard
>
> *Apprenticeship Director*
> *Arkansas Data Science Center*

> You have to be able to read and write and do math at a college level. You have to interview with the company and the company's got to decide…"I really like you. I'm going to take a shot on you." And, you get a mentor, and onboarding, and orientation and then you come to school and then you sign a contract with them that says: "If I flunk out, or if I say, I don't want to work with you anymore," that you must pay them back all the educational funds that they've paid for you.
>
> We have what we call an intrusive academic coach. We tell the companies everything and everybody understands that…because they're paying for this guy to go to school. Whether you're in insurance or advanced manufacturing or supply chain. Everybody knows your grade at your company.
>
> I said…"when do they get useful to you?" And, they [the employers] said, "They get useful at the end of the second semester." And, that's a three (3) year program…six (6) semesters…two (2) semesters a year.
>
> —Dr. Rebecca Lake
>
> *Dean, Workforce and Economic Development*
> *Harper College*

> …because the young people are so technologically savvy, they're not afraid of any learning technology, so they're able to come on board very quickly and be very productive early on in their apprenticeship program. Companies often view youth as a high risk scenario. And, the data actually says different. In manufacturing apprenticeships, you teach them safety on the front-end and that's a required component by the USDOL, and, they learn good work habits and they actually statistically end up being safer workers than your current work force.
>
> —Dr. Pamela Howze, Partner
> *American Apprenticeship Center, LLC*
> *Former New Program Director*
> *National Fund for Workforce Solutions*

Communicative/Collaborative Technology(ies). Stakeholders seemed clear on the need for communication/collaboration technologies. Manufacturing presents more challenges than IT or office positions due to environmental conditions and types of interactions required.

> I think…you would clearly need a channel that allows for clear and accurate communication…some sort of telecommunications or web/video conferencing capability would be important. Now how feasible it is…could be about noise…safety…vision…a number of conditions that from a human safety point of view may or may not be feasible in a modern factory. Let's assume…they're converting a factory to be robotic…hopefully those robots would have some level of intelligence to be able to interact with their human counterparts that would not put anyone in harm's way…I think it's a situation where I would see a mixture of technologies coming together.
>
> ——Dr. Nathan Hartman
>
> *Dauch Family Professor of Advanced Manufacturing*
> *Department Head, Computer Graphics Technology at Purdue University*

Communication in Manufacturing Environments. Stakeholders believe accessibility to the mentor from the floor is a priority, and logistical issues would require a creative solution. In addition, quality checks are usually conducted in person; and the mentor/apprentice relationship is mediated by a sight line between apprentices and mentors. Being able to physically observe what their mentors are doing provides cues as to when to reach out with questions.

> …if you're on the [manufacturing] floor, and you need to talk to your mentor, and you see that they've got twenty-eight (28) things going on with them. They're in a machine and they've got people standing in line waiting to talk to them, or they're rushing over to get something into the quality lab before the cut-off time. Then, you're going to know to hold your questions for a few moments of time...I guess you're not going to be there day-to-day to see what's going on in the midst of the workday, if you're just..."Hey I need ya". It might not be a good time.
>
> —Tammy Simmons
>
> *Partner at American Apprenticeship Center, LLC*
> *VP Marketing & Culture Machine*
> *Specialties, Inc.*

> I think that maybe there would need to be some training videos, and then also Skype meetings where the apprentices can contact that mentor even from the...definitely from the floor as well…There would have to be a lot of communication between the mentors and the apprentices…The accessibility of the mentor…and the mentor's limitation to not be able to actually check the parts that are being produced…could limit the success……not that it's just lip service, that "Oh, you'll have someone that you can contact." You definitely have to have someone that you can contact and that's overseeing the work...and teaching.
>
> They [the company and mentors] definitely still have to be very present with the apprentices so they can monitor what the apprentices are doing. So, if it's developed well and managed well, I think the learning process can still exist in that [FRADS] environment.
>
> —Jackie Allen
>
> *Former Program Manager*
> *Robert C. Byrd Institute for Advanced Manufacturing*

> One of the things I was thinking about when you brought this up and asked me to do this, I can't remember the company name. But, they have, it's like this motorized iPad with this video/audio…You can actually remote control this bot thing and it drives around the office. And, it looks kind of like a Segway but it's got an iPad with your face on it. So, you literally are driving around the office in virtual reality but you're controlling this thing and people can interact with you just like you're there…They call it a self-balancing, tele-presence robot…If you go to DoubleRobotics.com, they have them.
>
> —Kerry Vickers
>
> *Chief Information Security Officer*
> *Aunalytics, Inc.*

Funding. The U.S. apprenticeship efforts are funded both privately and publicly. While training and wages are in many cases assumed by the employer, public monies have been appropriated to expand apprenticeship. This includes recruitment of employers and apprentices, the development of competency requirements and curriculum, and even training for disadvantaged populations. To date, supply [potential apprentices] exceeds demand [available apprenticeships].

> [The second most important factor] is the demand for the program and being able to fund and meet the demand of candidates.
>
> —Tony Bryan
>
> *Executive Director, CyberUp*

> If there's an opportunity to offset some of the cost, either through credits or government funding or local city funding or county funding, state funding, etc., foundation grants, any other types of resources that may be available to facilitate those partnerships that are required to get to the completion of the training, you want to make sure that those partners are also included.
>
> —Daniel Villao, CEO
> *Intelligent Partnerships*
> *Former Deputy Administrator*
> *Office of Apprenticeship, U.S. Department of Labor*

> WIOAs are in every single state, every single district there is. And, they have the word apprenticeship in the new world regulations for WIOA's…they're the WorkNet centers…they have something called ITA's, the Individual Training Accounts…they're supposed to serve the clientele base who are disadvantaged, [who] don't really know English well, they can't get a job, the job changers…you lost a job and you're looking for a new job….across the country…You could get $6-7,000 to pay for somebody's training.
>
> —Dr. Rebecca Lake
>
> *Dean, Workforce and Economic Development*
> *Harper College*

In attempting to make apprenticeship more lucrative to employers, at least one state has waived the cost of apprentice' tuition.

> One of the things that we've done in North Carolina to offset the cost, is we now offer a state tuition waiver for any high school student that goes into a registered apprenticeship program. For the life of their apprenticeship, their college tuition is waived and paid by the state.
>
> There's also been private foundation money that's been made available to an organization in DC called New America: The Partnership to Advance Youth Apprenticeship. The National Fund is a national partner with that group…there's a lot of things on the radar to say "Look, it doesn't always have to look the way it looks in construction trades or manufacturing."
>
> —Dr. Pamela Howze, Partner
> *American Apprenticeship Center, LLC*
> *Former New Program Director*
> *National Fund for Workforce Solutions*

4.3 Functional Equivalence

What concerns must be addressed if a FRADS is to be functionally equivalent to the current face-to-face system apprenticeship delivery system (F2FADS)?

4.3.1 A Holistic Approach

Stakeholders believe in the importance of a holistic approach to apprenticeship, regardless of delivery system. This means viewing every person and skillset as important to the common good—positioning the apprenticeship within the ecosystem; not serving up isolated (proprietary) skillsets or exalting some types of work over others; providing instruction in soft skills and creating a full experience that will ensure the apprentice's employability going forward.

> I think a lot of mentorship in organizations…is often learning the culture and the ways of working…with other people. Most people…don't…work…in complete isolation. So things as simple as learning to have a conversation…to articulate your point…to advocate for a particular position…to present a budget and defend your rationale. Those kind of things you learn from being in an organization where there are other people....And so I think…learning the social dynamic of how to work is just as important as learning the specific bits of what the work is. …those cats over in Germany have [had] figured it out…for a long time. UK has a model, Finland…even Italy to some degree… some…more strongly than others, but one commonality that I've seen is: 1) The addressing of the whole person; and, 2) This recognition that everybody can be a contributor in sort of the larger societal good…And…the typical apprenticeship types of jobs, those skilled trades kinds of jobs are not necessarily looked down upon as something less than. And so this idea of an apprenticeship is highly enculturated within their society.
>
> —Dr. Nathan Hartman
>
> *Dauch Family Professor of Advanced Manufacturing*
> *Department Head, Computer Graphics Technology at Purdue University*

> The criteria wouldn't be, in my mind, a true apprenticeship if you're piecemealing out the work. In other words…there's a difference between an electrician who understands the full scope of the occupation from pulling the wire, laying the pipe, connecting the conduit, installing the fixtures, connecting them to the panel…and a technician who just comes in and swaps out the guts of a light and makes it an energy efficiency light. There's a big difference in their ability to…participate in an occupational space…
>
> In the IT space, it's not enough for them to be able to, in a single certification of a single type of program, to be able to call themselves a coder (for example), because they know a particular type of coding and have a certification in it in a particular

> segment. They have to have the full exposure of what that means, how it plays in that ecosystem of that space and they have to have the complement of skills that allows them to move from coding in that particular lane of work…into other bodies of work when that particular lane is not available. I don't feel that there's any barriers that you wouldn't be able to overcome. I do think that you have to be prudent and thoughtful about the way these workers are interacting with their employers and creating an experience that allows them to truly be fully employable in an occupation is really the end game…a full experience…not just limited to task specific work that doesn't give them the full employment experience that they would experience in a physical environment.
>
> —Daniel Villao, CEO
>
> *Intelligent Partnerships*
> *Former Deputy Administrator*
> *Office of Apprenticeship, U.S. Department of Labor*

One stakeholder shared their company's purposes in being very intentional in providing a holistic apprenticeship experience—they are preparing them both to be future leaders and mentors.

> We're not only developing our pipeline of the people in front of our machines in front of our parts, but, we're developing them to be our future mentors for the next people who are coming on the job and the training. And, if they don't have any of that hands-on, their own personal experience, you know, "This person was a good mentor because they did this with me, and this person was not a great mentor because they did this with me", then you know you'll have that learning curve…I think [this] is very important for them to go through.
>
> …the way that we do apprenticeship—you're grooming them to work in your business and your facility. So the whole process isn't only the skills part of the training, but, it's also inducting them into your culture and into your organization. So there's different things that they're getting while being in your facility that you can't get just in a remote training op location. Now, if a person's going into a job that they're location is ever-changing and their job is never the same and they don't have to work in an organization with the same people, then you know maybe some of that's not as valid.

> But, the day-to-day stuff…We're… not only hiring machinists and tool and die makers; but, I'm hiring future leaders for our company. And, the exposure to them learning the whole company and the culture from the ground up is invaluable.
>
> —Tammy Simmons
>
> *Partner at American Apprenticeship Center, LLC*
> *VP Marketing & Culture Machine*
> *Specialties, Inc.*

4.3.2 Importance of Presence

Nearly half of the stakeholders expressed a preference for fact-to-face interaction; but, some also mentioned instances where presence would not be an issue.

> You're sacrificing some of the personal nature of somebody actually being with you. Rather than just being there in a two-dimensional state…you're just not going to get fully embraced in the culture when you're not there, hanging out with people, interacting with them outside of, you know—meetings, and scheduled times and things like that.
>
> —Kerry Vickers
>
> *Chief Information Security Officer*
> *Aunalytics, Inc.*

> You have the service desk side and you then have what's called the project engineer or the architect side. The middle tier is kind of the tier that's more relationship based. They're the ones that are the IT face of a company, so…we assign them to certain accounts…[on] site a couple of times a week…[where] presence is important. But when it comes to the people doing the project work—they never go out on site because they connect to Cloud servers…And when it comes to the service desk—97% of the time they don't. So I think it's truly identifying…those roles that require an onsite presence and… those roles that don't.
>
> —Terry Gour
>
> *Cloud & Managed Services, President & COO*
> *Aunalytics, Inc.*

Some stakeholders personally believe physical presence is critical to a sense of inclusion and belonging.

> I'm a human social person…If I was fully remote, I would probably feel that something was missing…That's got to be something you evaluate…if somebody really needs that [presence], they're going to miss that, and it's going to show up somewhere in their behavior. And eventually, they may leave. Because they're saying, "Oh I tried that, and you know what I just didn't realize how disconnected I was"…

> Flexibility is valuable to me. But if I was never showing up in Arkansas, I never interfaced with those people face to face, or went out to lunch, went to a ball game one tonight, or whatever; I'd feel like I really didn't know them and they really didn't know me. And I think that's important to relationships…
>
> —Lonnie Emard
>
> *Apprenticeship Director*
> *Arkansas Data Science Center*

Especially when dealing with young apprentices [high school age], stakeholders believe additional effort to solidify the sense of presence is critical to developing rapport.

> I'm doing much more than giving a person a job and a skill in my company through this apprenticeship. You're teaching them and mentoring them on all aspects of life and community and leadership and organization...I want them in my presence. Just because I think there's tremendous value in that on-the-job learning piece of it, from the personal communication aspect side of it.
>
> When I'm recruiting young juniors and seniors in high school, we found that to be very successful, you actually need to touch them more often…more interaction than just the typical new employee on the job. We decided it was so important because they were so young and for many of them this was their first job and training, that we needed to meet with them weekly to do weekly check-ins as a group, as well as they have a mentor everyday that they can go to that's their on-the-job trainer. And then they have an overall mentor that comes and helps them. They actually need more increased communication to be successful.
>
> They [a member of the GAP consortium] took one of the star apprentices…and, we were all excited about this guy going to this company. It had great potential. But, they put his job in the new building where there were only a handful of people, under five…And, didn't check in with him regularly, and he started complaining that he wasn't as happy. He started missing more work. And, ultimately, was one of our few kiddos that left the program early and didn't finish. I'm sitting there kind of thinking that you know he had access to a phone. There were other people in the building that he could have called and could have asked for help if he needed to. But, he felt very isolated.
>
> Another thing, I'm specifically talking about youth apprentices and maybe it's a little bit different with adults. But, you know, you think we take youth out of a classroom setting. They're with their peers every single day, and what really keeps them jelled is the ability to work with others and with their peers. They love getting together with the other apprentices in our company or from the other companies that only have one or two in some group settings.

> You know, [the] Gallup Strengthfinders thing, one of the questions is "Do you have a best friend at work?" Sometimes that is a hidden motivation that drives people to do better, and get to work, and hey, it's not so bad." So, I kind of think about that when I think about these younger apprentices.
>
> —Tammy Simmons
>
> *Partner at American Apprenticeship Center, LLC*
> *VP Marketing & Culture Machine*
> *Specialties, Inc.*

4.3.3 The System

Not every component of the apprenticeship system will require a change if a FRADS is to be offered as an alternative. Stakeholders found some, however, to be critical to success. Stakeholders in Academia stressed the importance of learning science serving as the basis of the system. Apprentice recruitment and related learning were seen as areas requiring special attention; although related learning in many cases is already offered remotely, and the apprenticeship plans include support for RTI. In relating FRADS to the on-the- job (OJT/OJI) component of the apprenticeship, stakeholders believe that some individuals are by nature a better fit for a fully remote delivery system.

System Components: Learning Science as a Foundation. When asked about the current face-to-face apprenticeship system stakeholders identified basic components they believe may need to be addressed if functional equivalence is to be achieved. Some stakeholders believed any FRADS model must start with the learning science undergirding the structure.

> I think this is where that learning science and folks who understand how to align online content to what has traditionally taken place in a traditional classroom face to face or hands-on becomes critical. There are certain quality measures, certain controls that will need to be put into place when you’re talking about putting those, the apprenticeship training into a remote delivery application. But I think it can be done [be]cause there’s a science behind that.
>
> —Chris Motz, EJD
>
> *Regional Vice President, Partnerships & Strategy*
> *Purdue University Global*

System Components: The Structure. Others stakeholders considered the requirements of the system itself.

> I would want to know about how they facilitate it all. What are the measures of success? What systems would we be using to collaborate with? What would be the expectations for contact? That's where my head would be.
>
> —Kerry Vickers
>
> *Chief Information Security Officer*
> *Aunalytics, Inc.*

System Components: Technology and Tech Skills. It became apparent with each interview that certain facets of remote apprenticing were of greater concern and those functions that are dependent on or facilitated by technology were seen as most crucial, all else being equal.

> I think how you recruit the apprentice would be important, I also think some component to test them for their technology skills [prior to engagement] would be important.
>
> —Dr. Pamela Howze, Partner
>
> *American Apprenticeship Center, LLC*
> *Former New Program Director*
> *National Fund for Workforce Solutions*

> I'm of the belief that if you're hiring the right person who really cares about what they do, whatever the construct of the job is, they're going to get it done…I don't see that there's that big of a discrepancy [between hiring for a FRADS vs F2FDS apprenticeship]. I think there's potential flaws that are going to exist either way. And there's also the things that you ought to be looking for, that you're going to pick up regardless, in terms, of a successful hire…There are some people that can work that way [remotely] and do that really well. And the job, if it's conducive to that…You might look for those characteristics. Just like you want a smiling face if they're working for Southwest Airlines, you know.
>
> —Lonnie Emard
>
> *Apprenticeship Director*
> *Arkansas Data Science Center*

> I would say probably somebody that's going to do really well in a remote location, and that would stand out in-house would need to be a self-starter, a self-motivated person. Because it's just kind of you out there responsible for your education and getting the learning and the understanding. So, I think it could be done. But, individualistically, what this person's strengths are would play a role in some of it.
>
> —Tammy Simmons
>
> *Partner at American Apprenticeship Center, LLC*
> *VP Marketing & Culture Machine*
> *Specialties, Inc.*

Vetting the candidates for both technology skills and "fit" was thought to be especially important. One stakeholder talked about the profiling software he uses for new hires.

> Have you heard of one called the Profile XT? It's a tool, online. You…give this assessment to someone…45 minutes online. And it gives you ten pages of information about them…the people that we have hired that have done this, after a year, everything [it indicated]…is true. The strengths are there. The challenges are there…If you have a rock star individual…have them take it…look for his/[her] scores and then use [those] as the bench mark…It rates things like verbal reasoning, numeric reasoning, assertiveness, persuasiveness...and then…determines…the success areas that you need every role to have…if you're [looking for] a project manager you need somebody that's going to kind of stand up for the statement of working scope and not be afraid to challenge both team members or the clients. [One] guy that we hired is a fantastic guy, super sharp, but he is more of a people pleaser…so he tested out of that scope, and we ran into some issues, and it [the assessment] told us we might run into those.
>
> —Terry Gour
>
> *Cloud & Managed Services, President & COO*
> *Aunalytics, Inc.*

> I think people have focused on the quality aspect of traditional classroom delivery versus online and I think slowly but surely what has happened is that qualitative studies of student outcomes have shown that there's very little difference if any and in fact there are some studies that would show that the educational outcomes across the board as well as student engagement is higher with online delivered coursework than face to face. So I think over time as learning methodologies, as platforms have developed and evolved, as people have become more specialized in their training to be online instructors, I think the quality of the experience is really to the point where it's certainly on par and in many cases surpasses face-to-face experiences.
>
> —Chris Motz, EJD
>
> *Regional Vice President, Partnerships & Strategy*
> *Purdue University Global*

Stakeholders representing the tech sector believe a remote training experience can provide additional benefits including more one-on-one time with an instructor.

> I absolutely believe [that the quality of the training can be equivalent and the caliber of the employee can be comparable with remote training]. I think a couple of different things. When you take somebody out of their environment, it depends on the individual, but many individuals aren't as comfortable…you're in a room with different people that you may or may not want to express your opinion to…because you don't know these people…I think the experience is definitely more one-on-one and more collaborative with the instructor when they do it [remote training]. I have not had anybody come back and say, I wish I had appeared in the class.
>
> —Terry Gour
>
> *Cloud & Managed Services, President & COO*
> *Aunalytics, Inc.*

A member of the Higher Ed sector believes that with the proper use of technologies such as virtual reality (VR) and augmented reality (AR), the experience might even surpass that of a traditional face-to-face experience.

> …it could…be that if you overcome some challenges…if you start moving into some other augmented ways of learning, that actually enhance the learning, you might end up with a better experience than they would in the more traditional [apprenticeship]. There's a lot of talk about whether educational technologies improve or don't improve [learning]—that depending on the tool and the situation that it actually is better. So, if you take advantage of the technology in some way. If you actually enhance learning, then I actually think that there's a possibility that you're improving the experience and improving what would be a more traditional apprenticeship.
>
> —Dr. Gary Bertoline
>
> *Dean & Distinguished Professor*
> *Polytechnic Institute at Purdue University*

Stakeholders agreed that ensuring an apprentice learning experience that will be accepted as nationally equivalent (and therefore portable) by business and industry is critical. Credentialing, itself, is a matter of debate within the apprenticeship arena due to the dual system. A state may be under the Federal system (DOL Office of Apprenticeship) or under state governance (SAS). Federally Registered Apprenticeship, Industry Recognized Apprenticeship (IRAP), or apprenticeships governed by a trade association or union such as the International Brotherhood of Electrical Workers (IBEW) represent varying types of credentials.

Stakeholders believe the fully remote OJI/OJT experience will need to adhere to the same standards as the face-to-face experience, meet all credentialing requirements, and produce outcomes equal to a face-to-face OJI/OJT experience including the attainment of industry credentials specific to the position.

> Well I think the processes are the same [to ensure quality control]. What exists in the current space is twofold. One is managed by the employer and the education provider jointly, so they ensure that they're getting the kind of training, that the curriculum reflects the kind of outcomes, for the occupation that the employer requires; and that the participant is fully engaged in those processes so that's one review process. And the recognizing entity, the agency or the certifying body has periodic reviews of the programming to ensure that their outcomes, that they're producing the kinds of outcomes that they're promising the public. I think it's the same whether it's in a physical environment or a digital environment. If you're claiming to create jobs and training people for occupations that can be used beyond a single employer, then you should be able to demonstrate that and it should be pretty easy to track.
>
> So it just depends on the type of credential…some programs have national recognition, some programs in the states create their own apprenticeship criteria or add to the federal criteria. And then, certain occupations, a certification is not enough—they have to have a license. And, that means that that license is created at the state level or even at the county level. So it does depend on the occupation and it depends on how each region is interacting with that occupation.
>
> I think that the question that needs to be asked is whether or not the employers in that particular sector will recognize that type of work experience and training [fully remote apprenticeship], and hire people based on it. So the fact that you create an apprenticeship program and train people to do X on your systems, that's great, and that person is a great and a valuable employee to you. But will he or she be valuable to the employer down the street who competes against you?
>
> —Daniel Villao, CEO
>
> *Intelligent Partnerships*
> *Former Deputy Administrator*
> *Office of Apprenticeship, U.S. Department of Labor*

> …In terms of the supply side, the message of apprenticeship is tremendous and it's portable. The fact that when somebody gets an apprenticeship credential, it's almost like a degree in and of itself, if done properly. There is some value in the portability of an apprenticeship…whether it was exactly the same or not. If somebody was a Java developer and went through enough training and worked for a year effectively…you look at them. But if you could look and say…they were certified because somebody else looked at them besides that one employer, you'd think of it more highly, right? Because you'd have third-party credential

> verification. And I think that's what we don't want to lose…that we have with Registered Apprenticeships.
>
> The DOL Office of Apprenticeship [oversees apprenticeships to verify credentials]; but, that's only if it's a Registered Apprenticeship. Anyone can call something apprenticeship. It's not a copyrighted name…You can have an association...be a manufacturer's association...and you can give them a certificate. Whether that certificate is really worth anything...it's just a concern. I'm not saying there's a lot of bad apples out there. But, I think with this new industry recognized apprenticeship, which they don't have the regulations written for, yet; but, they've already put out a lot of Federal dollars. It's sort of the cart before the horse, you know…It's like what industry entity is going to be the certifying officials. And, what is their credentials themselves, that they have this authority.
>
> —Lonnie Emard
>
> *Apprenticeship Director*
> *Arkansas Data Science Center*

In addition a fully remote apprenticeship delivery system should meet: 1) the employer's quality standards; 2) merit national recognition to ensure portability; and 3) within manufacturing, be able to incorporate methods for the physical assessment of parts by mentors and industry partners at required checkpoints.

So I like the structure, the rigidity of the Department of Labor. I liked it more so when I felt the government was all in on apprenticeship and was making that certificate at the end of their apprenticeship that they earned valuable; and that it carried the same weight as a degree. It had some transferability across states but if you take out those standards...

…the difference between a recognized and industry recognized apprenticeship are the standards and the appendices that somebody is writing. Like we have *Appendix A* through whatever that we wrote and delivered that has all the inner workings of our program. If I'm industry recognized, I don't have that and that's really the only difference…The logic behind it recognizes that they want to make it easier for companies to adopt apprenticeships and companies have a fear that the government complicates things…So if they reduce barriers to companies to do that, then of course there's going to be a higher adoption rate. So I would say like even the UK, they haven't gotten away from their standards. They mass produce apprenticeships, but they still have some benchmark and assessment that comes along with each of those apprenticeships [so] that they carry weight and make sure that they're high quality.

…it's [credentials] a polarizing subject…some security professionals are like all in for certifications…Some…say they're not important and just because somebody could pass a test doesn't mean that they're going to be a good security professional. And then, dependent on the person…those…pro certification—they might really like SANS or ISECA…I think it's a little bit of personal bias or preference for the company…certifications…familiarity…If I'm a government contractor, I require…three, they've added a fourth. So Security Plus meets government standards to go into a contract for entry level and CISSP is the second one they look for, for management level. They've recently added the CompTIA…CASP+…

—Tony Bryan

Executive Director, CyberUp

Portabiity is best ensured when using a certifying agency such as the Department of Labor for registered apprenticeship; and having interim credentials built-in, such as NIMS where a company mentor or instructor is able to review their program and check their parts...which we do with our NIMS [National Institute for Metalworking Skills, https://www.nims-skills.org/credentialing] even with our onsite programs. And, with metal working skills credentialing you have to have your instructor check the parts and there's quite a few checkpoints, up to 30 checkpoints on a part, on these project-based learning [credentials].

—Lucinda Curry

Director of Apprenticeship Works
Robert C. Byrd Institute

Stakeholders suggested that forethought and preparation is key to producing an equivalent mentoring experience.

> As long as it's a high quality program and a lot of thought's been put into how that mentor's going to teach them and oversee their work [it can be a comparable experience and outcome].
>
> —Jackie Allen
>
> *Former Program Manager*
> *Robert C. Byrd Institute for Advanced Manufacturing*

Stakeholders also believe that the technology today is capable of supporting the mentors, who must be carefully chosen and trained, given the delivery system selected is a good fit.

> I think again if you have the right delivery system and you have the right master [mentor], if you will, teaching those skills and moderating the progression of the apprentice—even in a remote, an online space or platform—that the technology today I think is such that that master is going to be able to see what's happening and being done and say, "Okay here's how you need to modify the way you're doing that in order to master this particular skill."
>
> —Chris Motz, EJD
>
> *Regional Vice President, Partnerships & Strategy*
> *Purdue University Global*

Finally, they believe that it may be possible to remotely mentor more than one apprentice at a time, benefitting the ROI.

> There is such a thing as one to many. Kind of like when we hire somebody for the service desk. Steven typically likes to hire 2-3 at the same time. Then he's working with 2-3 at one time. And so he feels like he's giving up an hour or two of his time but there's a multiplicative factor by doing so. But if it's just 1:1 and all of a sudden this apprenticeship doesn't go well, now you've just worked nights trying to get caught up, plus you didn't get the return.
>
> …I would say I think that sweet spot could be three, like you have 1:3. Because is there a learning experience that the apprentices learn from one another?
>
> Or maybe the number is two. I don't know what it would be. But if there's something so that there's a little bit more of a return…so that whoever is doing this says, "I'm going to be getting this return and the company will get this return from my time". And you're not putting all of your effort on just one, maybe it's a couple.
>
> —Terry Gour
>
> *Cloud & Managed Services, President & COO*
> *Aunalytics, Inc.*

While technology may seem to be the driver of a FRADS, the apprenticeship model of learning remains at center stage. The technology(ies) chosen must simply facilitate the mentor/apprentice relationship and each parties various functions, while promoting sound instruction and learning.

While stakeholders mentioned a number of possible technologies that might be used to implement a FRADS, members of the IT sector believe the best approach is to let the tools used by the host company guide the process.

> I guess my preference would be that the tool has to integrate with whatever company is providing this apprenticeship. So, if we were providing it, we would probably use GoToMeeting…the reason we would use it is because we're a Citrix partner and we get it for free. So it may not be the best but it's what we have for free. If you're Google shop, you're probably going to do HangOuts and some of those other things. We're now looking at switching to WebX because we're also a Cisco partner. So all that to say, I don't know if there's one preferred tool of choice. I think the tool of choice has to be whatever is integrated and utilized with the rest of the teams here…whoever is doing the apprenticeship should conform to the tools that the company utilizes.
>
> —Terry Gour
>
> *Cloud & Managed Services, President & COO*
> *Aunalytics, Inc.*

The size of company might dictate the options for connectivity, access, and security; but, because there are only a handful of platforms, reference architectures could be constructed to expedite planning and implementation.

> "…what's the size of the company we're looking at doing this with? If you're [company name] and you've got 4000 employees, you're going to want to have these relationships connect into your environment and you're providing what you need to. If you're a manufacturing client…with 42 employees you might embrace the concept of [an external, centralized solution].
>
> I probably lean towards…not having something centralized because I think that for this to be successful you have to empower and integrate this remote person into the company's environment with their tools and their processes… [otherwise] the IT people…are frustrated because somebody else out here is telling them what to do.

> I…think it's a matter of defining, "If you use these four tools or five tools…it's almost like you're creating a reference architecture. Here's the reference architecture, use one of these four platforms…store it in one of these four areas, integrate it with IT of this way, and we see a recipe for success.
>
> —Terry Gour
>
> *Cloud & Managed Services, President & COO*
> *Aunalytics, Inc.*

The FRADS system requires a way for an apprentice to connect to the internet and to interact with/connect to and navigate a company's network.

> There are so many different solutions both free and paid that really work very, very well. We've got internet band-width now that we didn't before. There are devices that can be put onto a home or business network that have network access controls and permissions that you just put on…and now this person is a full member of your team…not only a member of [the team], with the ability…to collaborate; but…of the domain, the file server, the share rights, all of that just by using these devices.
>
> —Terry Gour
>
> *Cloud & Managed Services, President & COO*
> *Aunalytics, Inc.*

In addition to access, apprentices and mentors must have a way to communicate and collaborate. Our IT stakeholders discussed some of the available technologies and reasons for choosing them. Real-time communication is considered essential to providing a functionally equivalent apprenticeship experience.

> …It comes back to having good clear lines of communication. A good collaboration system that's utilized and leveraged…like Office 365 where you have Microsoft™ Teams…you can do video…screen shares…file sharing…online ways you can collaborate on files…OneDrive where you can share files…SharePoint where you have collaborative content with workflows that you can build…some video conferencing…so you can be personable.
>
> —Kerry Vickers
>
> *Chief Information Security Officer*
> *Aunalytics, Inc.*

> One of the biggest barriers [in the past] was…video conferencing…There's so many different solutions both free and paid that really work very, very well…how do you put that together in a package that makes it easy for an executive to even say, "We're going to invest in this"? …if we were providing it, we would probably use GoToMeeting at this point…because we're a Citrix partner and we get it for free…If you're a Google Shop, you're probably going to do Hangouts and some of those other things. We're now looking at switching to WebEx because we're also a Cisco partner…I think the tool of choice has to be whatever is integrated and utilized with the rest of the teams…should conform to the tools that the company utilizes.
>
> —Terry Gour
>
> *Cloud & Managed Services, President & COO*
> *Aunalytics, Inc.*

While several stakeholders indicated their concerns with never meeting face to face, nearly all realized they have tools already in use that facilitate team activities.

> Nothing can take the place of getting a couple of key people in the room and digesting and coming up with a solution right then and there. You can get all of the same people on a call. And, I know we do that and it's leaning that direction. But, it's not how I currently am comfortable doing it. I would rather look somebody in the eye, have somebody throw out an idea, somebody walk through it on the board, write some stuff down. You know...but, I guess you could do that by way of video streaming.
>
> —Tammy Simmons
>
> *Partner at American Apprenticeship Center, LLC*
> *VP Marketing & Culture Machine*
> *Specialties, Inc.*

Presence was a topic of concern to many stakeholders. This is another area that presented first as a rather adverse reaction, which changed over the course of conversation as tools and various situations were considered.

> I think you would need some kind of a mechanism that would allow you to have a sense of presence, whether that's real or perceived. To have the sort of mentor…and apprentice actors in that scenario, they would need to somehow be able to have the kind of interaction or at least be able to perceive the interaction that they would need in order to be able to communicate and pass on knowledge with each other...
>
> From this notion of presence, I could see the use of virtual reality or augmented reality type technologies that might promote that idea of presence somehow. But again, those technologies require a certain amount of networking architecture, a certain amount of connectivity, a certain amount of preparation of data in order for them to be useful and effective…

Can we make the communications infrastructure work as seamlessly as possible and…replicate the phenomenon of presence or physical proximity in that fully remote apprenticeship? I know it almost seems like an oxymoron to try to talk about fully remote yet replicating presence, but I do believe that's an important thing.

—Dr. Nathan Hartman

Dauch Family Professor of Advanced Manufacturing
Department Head, Computer Graphics Technology at Purdue University

You know, if I were going to build some sort of remote delivery system for apprenticeship, I think it would have to be a combination of some sort of great tele-presence, collaboration platform…something that is going to be really key is that collaboration platform…But let's not forget…technology for training like AR and VR. Maybe it's a combination of all those modalities of training and learning that will be the most effective. You've got a LM (learning management) platform, and you've got VR and access to AR and access to this collaboration platform and keeping people well connected to that. I think that would sort of round out the entire solution.

—Kerry Vickers

Chief Information Security Officer
Aunalytics, Inc.

…we have had such a large transition to life online that we have a large generation behind us that they're okay with that [online relationships]. I think of my own kids. I'll think of myself, I won't even say my kids. I'm 40, but I have guys I've been playing Xbox with for 17 years. I don't know who they are, I've never met them. I know their names. I know their life story, cause I've played Xbox with them for 17 years. I consider them friends but I've never met them. So it can be done. I think it just would have to be intentionality that would have to be in it for a company to be able to, a large company, jump into it.

My oldest son is 23 and he's like, I'm going to drink tonight with my friends, and his idea of drinking tonight with his friends is to play Xbox, playing on his PC and drinking. That's a foreign concept to me. When I say I'm going to go hang with my friends, I'm going to go out and drink a beer with somebody, not hop on a computer and do it. But I make fun of him; but I have a group text with five people that I play Xbox with. Now we talk, "Who's playing tonight, who's not playing tonight?" They know what's going on with work with me and I know what's going on with them…So I get it. You think of Tinder and people basing marriages on dating apps. I mean we're not too far removed from that level of automation.

—Tony Bryan

Executive Director, CyberUp

Some stakeholders were unable to visualize all of their mentor/apprentice activities being transferred to an online environment, and felt a community of practice (CoP) would be tough to replicate.

> One of the things I'm really proud of that we do with our apprentices is that we teach them not only on-the-job things, but, we're interacting with them—teaching them life skills…like money management, or buying a house. Or, they're going to buy their first car, should they lease or buy new. We introduce them to volunteering in the community…
>
> And, what I'm finding is they're now developing a passion for community service work and learning different things from different avenues and streams of people. So, you would lose that in some remote locations. Because now, they're not only a valuable member of that company, but, they're a valuable member of that community and very involved in different things. You've got that synergy there that you would lose if they were somewhere else.
>
> —Tammy Simmons
>
> *Partner at American Apprenticeship Center, LLC*
> *VP Marketing & Culture Machine*
> *Specialties, Inc.*

Some ideas were outside the box, such as the pro bono model of (CoP) integration used by Purdue Global's online law school and the use of a self-balancing, tele-presence robot to enhance the sense of presence and facilitate integration into the CoP.

> I think it's [integration into the CoP] critically important. Again, that's part of what learning is all about generally, but certainly an apprenticeship is sort of immersing them in the field. And it can be done. It can be done through online learning just as it can in a traditional classroom. I think of our law school, Purdue Global has the nation's first and oldest fully online law school. There aren't very many of them because the bar association doesn't really recognize fully online legal education.
>
> But one of the ways that we've integrated the facilitation of the online law student into the field of practice is through, I mean it's set up as a pro bono shop that students through a mentor at the law school will actually do pro bono work, it's actually physically based in Orange County, California, but they can be anywhere giving legal advice and doing legal work under that mentor's guidance and it fulfills that practical sort of internship need in that particular field. So it's possible, those things can be integrated into the online experience.
>
> —Chris Motz, EJD
>
> *Regional Vice President, Partnerships & Strategy*
> *Purdue University Global*

> I guess it depends on how you bring that person into that Community of Practice. It may be having that solution we were just talking about where you have that motorized iPad. It might make that a whole lot easier…it makes that mobile video-conferencing solution a lot more feasible. It makes it more mobile so you could be integrated more…
>
> —Kerry Vickers
>
> *Chief Information Security Officer*
> *Aunalytics, Inc.*

While some stakeholders believe it is more a function of the individual than the technology(ies), others suggested using social media groups and/or online community sites (even co-teaching), to help provide the benefits of a larger community.

> There are a lot of…technologies we have today. For example, like the teleconference that we're doing here or whether we might use WebX or Skype. It is possible obviously to get multiple people into a teleconference like that. For some people, that I think, fully fills their need for presence and therefore doesn't necessarily disrupt their conceptual model of what a Community of Practice is. Other people need much more human interaction and much more physical interaction than other people do and so that could very much disrupt their conception of a Community of Practice. So I think a lot of it won't necessarily be as much dependent on the technology as it might be dependent on the person.
>
> —Dr. Nathan Hartman
>
> *Dauch Family Professor of Advanced Manufacturing*
> *Department Head, Computer Graphics Technology at Purdue University*

> I think that [integration into the CoP] might be a little more challenging. I have developed a community of practice over the years in regard to apprenticeship, so I am connected to all the big players in the nation. So, I think it would be a little more difficult but I don't think it would be impossible…everybody's used to social media, why can't that be associated with a community, an online community and build that in as a kind of a requirement along the way? Because you have to learn to work with other people. That's kind of a side skill...the collaboration ability. There has to be some way to build in that social network as part of the learning process. And, then they can co-teach. I mean why can't co-teaching be part of learning.
>
> —Dr. Pamela Howze, Partner
>
> *American Apprenticeship Center, LLC*
> *Former New Program Director*
> *National Fund for Workforce Solutions*

The issues of assessment using technology vary from the RTL/RTI portion of the apprenticeship. Assessment must measure the skills and competencies acquired through the OJT

training and mentor interaction which in some cases are hands-on skills with physical products. Of utmost importance is that the same success measures are being used for remote apprentices as for face-to-face onsite apprentices, with the same reporting measures, and metrics so that neither environment has an unfair advantage. Pre-testing the assessment methodologies was suggested as a way to ensure equivalence.

> Comparing somebody who was not remote in a very similar type of role would be one way [to measure functional equivalence]? Certainly some sort of assessment for a measure of success. Making that consistent whether you're remote or in person. Make sure they're being measured by the same success measures, the same reporting measures, the same metrics.
>
> —Kerry Vickers
>
> *Chief Information Security Officer*
> *Aunalytics, Inc.*

> I think there would have to be certain controls, certain evaluation points and those evaluation points and processes are going to have to be standardized so that you can ensure that the competencies have been mastered. So I think there's going to have to be some developed assessment tools along the way to evaluate progress.
>
> —Chris Motz, EJD
>
> *Regional Vice President, Partnerships & Strategy*
> *Purdue University Global*

Security is of utmost importance, and whether hardware or software solutions are used, there is potential for compromise. Stakeholders familiar with security protocols offered insight into potential solutions, including multiple levels of security, VPN access, and hardware devices such as Sophos' RED product line (see https://www.sophos.com/en-us/products/unified-threat-management/add-ons.aspx).

> I think a lot of that will depend on the nature of the job or the nature of the organization. I could easily envision some cases where we would have to go through multiple levels of security protocols before we could collaborate in a mentor/apprenticeship manner; others, we're just going to dial somebody up on Skype and off we go, because the nature of the work or the nature of the dialogue or the information is not as sensitive as it might in some other places…There may always be a situation where some people simply don't know what they don't know and are able to exist in that environment without a care in the world so to speak. And then other organizations may need to—whether it's for regulatory compliance or other reasons—secure that system in a way that has multiple layers of security and it may not be the most user friendly thing in the world to use but that is what

> they had to create in order to make sure that they were compliant with whatever security measures that they had to abide by.
>
> —Dr. Nathan Hartman
>
> *Dauch Family Professor of Advanced Manufacturing*
> *Department Head, Computer Graphics Technology at Purdue University*

> …That [way to manage security] again comes down to…the security stance of the company itself. And so we have some companies that are extremely security focused. We have other companies that are not nearly as concerned about security and it could have to do with where their files are stored and who has access to those files…
>
> Most of the clients that we [have]…use a device called a RED, a remote ethernet device. And so…when we want to connect to an environment, typically you'll have a firewall sitting on one side…you put this $60 or $70 device…programmed to reach out to the home base and create that VPN tunnel… preprogrammed …cost effective and secure and then you don't have to worry about IPs because this device is going to have a Mac address…and…certain credentials…and any information that's transmitted…is encrypted. These devices are designed to give them to somebody with very low IT skills. Turn it on, plug it in, plug your computer in and you're done…
>
> In an environment where a company may not have certain cloud-based technologies…it [the RED]…[is] just as secure as if you're sitting right in the next cubicle. Actually probably more secure because everything is encrypted…
>
> —Terry Gour
>
> *Cloud & Managed Services, President & COO*
> *Aunalytics, Inc.*

Stakeholders believe that in an online environment, monitoring and evaluation can be the same or similar to a face-to-face environment, and may actually be easier and more effective. One stakeholder shared the USDOL process for overseeing the quality of Registered Apprenticeships.

> The USDOL does a number of things to ensure Quality. One of the things that I'm doing in my role at the National Fund is as a state coach for three states that received an apprenticeship expansion grant from the USDOL. So, I'm monthly coaching for Delaware, Pennsylvania, and Maryland. And, I'm doing it through a contract company that the USDOL hired…Maher & Maher…they have a very large DOL contract to do the monitoring for states that have received these expansion grants.
>
> —Dr. Pamela Howze, Partner
>
> *American Apprenticeship Center, LLC*
> *Former New Program Director*
> *National Fund for Workforce Solutions*

Another, involved in Advanced Manufacturing, believes diagnostic and predictive models can be created with feedback loops to aid the evaluation process.

> You could, I think, because one of the inherent premises of this digitalization movement is the idea of a feedback loop and the ability to have systems that are more self-correcting, self-diagnosing than they were in the past. Because with that ability to move digital information comes the ability to, I'll say, build better diagnostic as well as predictive models for decision-making.
>
> And so I think to your point, one of the things that we actually are doing some research work on here at Purdue is how you package up that information so that it survives that sort of inbound and outbound feedback loop. And that's something I think will continue to be a point of interest for industry in this current industrial revolution that we are now in.
>
> —Dr. Nathan Hartman
>
> *Dauch Family Professor of Advanced Manufacturing*
> *Department Head, Computer Graphics Technology at Purdue University*

Suggestions included standardizing evaluation points and processes and auto-generating user surveys to capture feedback.

> And there's a couple of different ways…Our system for Service Desk…anytime there's a ticket that is completed, it sends out a survey…if somebody answers this five question survey, we give a dollar to a charity…every month we pick a new charity. It could be Ronald McDonald House, Food Bank, whatever…I've got a dashboard where I can…look at every individual and on a scale of 1-5, where are they…more the lag measure [be]cause you find after the fact that…that individual is getting it or not—How are they able to support? …What is the quality of that support that they're giving?

> So if we have somebody that's remote versus here [on site], you could tell very quickly, "Are the individuals that are sitting at our office here more successful with our clients than somebody that's not?" I can tell you that it really comes down to the individual. We've had individuals that we've moved around, and some of them work in this part of the office and some work here or there. And it's not like their survey scores have changed dramatically. They're rock stars of the rock stars. They're going to rise to the top no matter where they are.
>
> —Terry Gour
>
> *Cloud & Managed Services, President & COO*
> *Aunalytics, Inc.*

Maintaining a broad view of skillsets to measure the apprentices' flexibility in knowledge application was considered critical; as well as tracking more than just time. Tracking and monitoring for evaluation purposes should be possible within the technologies selected.

> Well, I guess it kind of depends on what's the nature of the capabilities that people are developing? Do they have to show they can fix a machine? I mean that's a pretty obvious thing and you can throw lots of things at them. But…to what extent does the test totally match the training. Sometimes, the test will not totally match. And, then, sometimes you want to have more generic skills, so that you are flexible in a lot of situations. So, then you would have to have enough in your test to test across a range of problems that a person would face, to be able to say the person has the capability.
>
> So, you'd almost have to say how broad is the skill, if its a skill that has to be applied across a broad range of situations, you'd have to sample across the range in your evaluation. One example isn't going to tell you anything. One test.
>
> You could actually, maybe keep track better, too, of the things that they're doing and...there'd almost have to be something in the remote experience that's keeping track of what's being done. And, I don't think it should be time. Time is a bad measure of anything in my view.
>
> —Pat McLagan, CEO
>
> *McLagan International, Inc.*

4.4 A Path of Inclusion for Access-limited populations

What are the critical factors associated with deploying a Fully Remote Apprenticeship Delivery System (FRADS) as a path of inclusion for access-limited populations?

Reflecting on Access-limited Populations. In approaching the concept of access-limited populations, some respondents focused on the lack of opportunity based on economic status, geographic location, limited access to WiFi, and incarceration.

> The first thing I thought of were folks on like Indian reservations, people that are very remote, very distant, maybe don't have access to the level of WiFi connectivity that they need in order to take advantage of online delivery. But you know folks in prison could also be sort of in that category and I just think of anybody who maybe lacks easy access to the technical requirements.
>
> —Chris Motz, EJD
>
> *Regional Vice President, Partnerships & Strategy*
> *Purdue University Global*

> I think of availability of WiFi connectivity, opportunities for careers within particular industries, transportation challenges for folks to get to places they would need to be.
>
> —Tony Bryan
>
> *Executive Director, CyberUp*

Other stakeholders mentioned the disabled and home-bound, as well as those unsure of their ability to successfully participate.

> Maybe people who are disabled or don't have reliable transportation. It could be in school youth who are living in poverty...People who aren't maybe physically able to get to work. There are a lot of people who would like to work, but they physically aren't able to go to work.
>
> —Dr. Pamela Howze, Partner
>
> *American Apprenticeship Center, LLC*
> *Former New Program Director*
> *National Fund for Workforce Solutions*

I probably would start with people who have problems getting to where they needed to be…You think about the [Native American] reservation. And, you think about these pipeline workers or…linemen workers…I do see it definitely could work for those populations that have limited access to logistically do things. And, that is a concern that I have with our own apprentices—I go into the high schools and sometimes I wonder: Are there kids there that inside they are excited about this opportunity, but, they think there's no way I can even get there. I'm not even going to go down that path because I can't even get to the store. The bus will pick me up everyday and I couldn't even get to school.

—Tammy Simmons

Partner at American Apprenticeship Center, LLC
VP Marketing & Culture Machine
Specialties, Inc.

Another interesting perspective came from the experience of a higher ed stakeholder where the University is located only an hour from a major city—that of the mindset.

It's kind of like a food desert in a big city…There's jobs in Lafayette at the local Subaru plant, but, someone that's spent their whole life in Indianapolis, it doesn't register with them…They can't imagine living in a smaller city…away from everything they know and understand…that really don't have any ready access to these kinds of opportunities because of where they live. The same thing can be said of the rural areas.

—Dr. Gary Bertoline

Dean & Distinguished Professor
Polytechnic Institute at Purdue University

Another issue of access may be a field of work in which mentors are few and not local.

To me access-limited, I mean it could be access to…technology, it could be access to transportation, it could be access to mentors themselves, maybe they work in such an obscure field that there aren't that many…mentors for them to apprentice with…

—Dr. Nathan Hartman

Dauch Family Professor of Advanced Manufacturing
Department Head, Computer Graphics Technology at Purdue University

Special Populations. In discussing access-limited individuals, I shared with stakeholder a story about the ease with which one of my students with Asperger's interacts in an online environment versus face-to-face settings in which he stutters and struggles with tics. Their responses lend insight into this particular potential segment of the labor market.

> Microsoft™ was having problems getting people with STEM backgrounds, actually in advanced mathematics, into their programming teams and really needed to get higher caliber, higher functioning, math literate people into their system. And so they began to review their hiring process and applications that were getting rejected by the electronic system that was screening them, and they had noticed that there was handfuls of candidates that had multiple degrees that were not making it through the interview processes or even through the electronic screening process…because the interview process was not considerate of…the realities that autism represented to those candidates. So…they partnered with a non-profit in Seattle that specialized in autism…
>
> One of the things that they learned was that problem solving in groups with like-minded folks helped people with autism communicate and participate more openly. And so they designed an interview process that put people in groups, took these candidates, put them in a group to solve problems and they would then identify the types of skills that each individual had by their areas of focus in solving these problems.
>
> And as a result…to my knowledge…the initial classes had over 30 people that they were able to move through their hiring process and actually place in real employment roles…So that type of powerful transformation happens when you take steps on purpose…really creating powerful pathways for people to participate, capitalizing on the talent that they can contribute to an organization, based on the talent that the organization actually needs.
>
> —Daniel Villao, CEO
>
> Intelligent Partnerships
> Former Deputy Administrator
> Office of Apprenticeship, U.S. Department of Labor

> I think we make judgments too many times about peoples' ability to do work…and I think we unnecessarily marginalize a certain number of those people…There are all kinds of stories across the country where someone has had a particular level of benevolence, and…resources and…motivation where they have succeeded at reaching out and engaging and helping those kinds of populations be productive…To me it's a want to thing. It's not that it can't be done…

> We miss a lot of opportunities to help these people who may be access-limited find ways to be what someone might…call "productive" members of society, because we…write them off as if they have no ability to do anything, when in fact they have quite a bit of ability to do some things…very well…
>
> —Dr. Nathan Hartman
>
> *Dauch Family Professor of Advanced Manufacturing*
> *Department Head, Computer Graphics Technology at Purdue University*

When access-limited individuals require wrap-around services—services provided by agencies and community groups to support individuals falling within ADA guidelines—the system must incorporate local support personnel, even though the work is located elsewhere.

> …not all intermediaries are physically located in a community or side-by-side or whatever…unless you're talking about wrap-around services…Let's say that remote worker happens to be an autistic candidate or…there's some other characteristic about them that typically you have to now go out and find out: 1) Who's going to engage them; and, 2) Do they have the capability given this job assignment, given this set of circumstances—that they can provide that same set of services in exactly the same way they would if they were in your community and physically working on your site.
>
> So typically if you think about the partnering that goes on in the early stages of identification of who's all the role-players, and why, and are we dealing with an audience that has those characteristics; it may or may not come up. But a lot of times companies these days are saying I want to open my doors to more underserved populations and that has a whole set of potential circumstances.
>
> Like veterans, people with disabilities…autistic folks...typically that's identified upfront under some kind of sub-contract or sub-agreement or memorandum of understanding that says, "Hey we're an organization that is already set up to help these folks, but we have to help them as it relates to the job that you've asked them to do." And if there's uniqueness or things they need to be aware of…then typically they interact [with the wrap-around service provider], and they're there to do that. And so that is set-up up-front.

> And then they [the wrap-around service providers] meet those requirements—whether you say they're on call, or…just providing some kind of check-up every now and then: "Is everything going okay? Any circumstances we need to be aware of?" That kind of thing.…they [wrap-around service providers] probably exist in the community where the candidate exists. So even though that's not where the work is—they're [the apprentice is] doing it remotely, from wherever they are. As long as that [wrap-around] service is available to them [the apprentice] face to face personally…in that local place…
>
> —Lonnie Emard
>
> *Apprenticeship Director*
> *Arkansas Data Science Center*

Special populations—The impact of job Role on Success. One stakeholder discussed the way roles might influence the success of students with socio-emotional challenges.

> I think what could potentially happen is you would put those individuals into roles where they could succeed…if we're looking for someone here in the IT side and they're going to do firewall limitations… they [could] never [have to] come to our office because it's more of a methodical project-based work. Here's the statement of work; here's the 27 things we need to do on the working plate. As a matter of fact, we have some fully remote individuals that do certain projects that we've never met and they do it fantastically.
>
> So maybe in my mind it's based on the role. If you're in a…project role or you've got a defined statement of work of what you're supposed to do…I think that would be fully successful. I think if you're in a role where it's variable and you're trying to be reactionary…[to] either what the customer's needs are, or what the security codes are [that are] coming through, then it's a little bit harder.
>
> And…one other thing…that would be the differentiator…if somebody would be more of a contributor, like a top contributor…I think that this would apply. But, if they're in…the leader position, I think [a] leader [role] really requires somebody to be [physically] present.
>
> —Terry Gour
>
> *Cloud & Managed Services, President & COO*
> *Aunalytics, Inc.*

4.5 The Matthew Effect

In addressing the Matthew Effect with stakeholders, I was curious as to whether stakeholders thought it would be best to only offer the FRADS option to access-limited populations. Most felt a fully remote apprenticeship opportunity should be offered to everyone.

The rational varied widely. Because FRADS represents a large systems change, some participants thought that through more use, bugs could be more quickly worked out and some standard technical architecture configurations could be developed, making it easier to sell to other companies. Several others expressed their belief that affirmative action measures rarely work. In the end, the consensus remained: To be successful and eligible for funding, an initiative cannot over promise and may want to phase the roll-out.

> The difficulty is that if you say that only those who are different or have limited-access…are the ones who can use those funds. Sometimes, those funds never get used, and they sit there. Or, they only use a percentage and they sit there. And, they can't do that. Because Feds and States come back and say, "Okay, we gave you $200,000, so you needed to spend it on something." And, so, "Well, we waited and they never came." Well, you can do all the outreach and if the kids don't come, they don't come. So, one of the things you might want to do in that regard is say, we have $200,000 and we must have 10-15% given away to limited-access people who need it, people with Asperger's, whatever.
>
> And, the others can be given to...You know maybe do a step-up, people who live in poverty. And then, there's another percentage, those who are career changers. So, you can stage it like that. But, if you get money from the Feds, or even if you took it from the Joy Foundation, or wherever, they would want to see at the end of 6 months (if they're smart, and they are), at the end of 6 months and the end of the year, "Okay, we gave you $200,000. You were supposed to serve 10 people or at least 15%, so how did you do." "Well we really couldn't find it." Well then, you didn't need this money. So, you have to be very careful.
>
> —Dr. Rebecca Lake
>
> *Dean, Workforce and Economic Development*
> *Harper College*

Finally, intentionally balancing the offering can help ensure the pendulum does not swing so far as to create another disparate situation.

> …if you want to reach disadvantaged communities, you have to do it on purpose. And people get upset with it…because it’s not about creating another disparate environment. It’s about leveling the playing field. And so you can’t swing the pendulum entirely to the disparate community side, it has to be a balanced approach. But you do have to purposely focus on ensuring that those folks that are disadvantaged get a fair opportunity to participate.

The bottom line…reality is that all of this has bottom line business impact. If it don't make money, it don't make sense. And so if a company doesn't feel empowered through these design strategies that they will get the highest caliber output and be able to get a production that they need out of these workers and capture market share…If they don't feel that that's available through the utilization of the access strategies that are created, they will not participate.

So you have to have a balanced approach and perhaps that means that there's two or three people that have [a] tremendous amount of access; who get in before somebody that doesn't have the same kind of access. That may be part of the equation—that there are going to be people that get in simply as a natural course of action because they are willing and able to engage. And it takes a little bit more effort to engage participants from other environments who may not have the kind of confidence or access or information that they need to rapidly fill in those slots.

So I think it's a mix. I don't feel that you're cutting out disparate communities by opening the door to everyone. I think that it's incumbent on the group that designs and manages these processes to purposely prioritize the groups that the organization is interested in…

—Daniel Villao, CEO

Intelligent Partnerships
Former Deputy Administrator
Office of Apprenticeship, U.S. Department of Labor

CHAPTER 5. DISCUSSION

Beginning in 2015 with President Obama's American Apprenticeship Initiative and continuing with the Trump Presidential Executive Order Expanding Apprenticeships in America (2017), U.S. apprenticeship expansion has been heavily funded. Systems have been set in place and policies have been introduced, modified, and/or adapted to facilitate and accelerate growth. And yet, U.S. employers still complain of a skills gap (First Coast Living, 2020), and even mid-pandemic, many remain in dire need of qualified employees. While the apprenticeship movement was starting to gain momentum in the United States with over 500,000 new apprenticeships added as of January 2019—the US Bureau of Labor Statistics (2020b) reported that 7.4 million full-time jobs remained unfilled at the end of 2019. In addition, over 500,000 positions that year were filled by H-1B skilled visa holders, rather than U.S. citizens (Costa & Hira, 2020). This despite the fact that 6,001,000 non-institutional, civilian Americans over the age of 16 were unemployed, and 95,636,000 were listed as "Not in labor force" (Bureau of Labor Statistics, 2019).

This study is based on the premise that given the state of technology with the extensive communication and collaboration tools available, a fully remote apprenticeship delivery system (FRADS) is feasible and has the potential to increase access to apprenticeships, possibly even for members of access-limited populations. This alternative path to long-term, full-time employment rests on the potential viability of a functionally equivalent FRADS.

In this study I explored expert perceptions and judgments of key informants, members of various stakeholder groups within the service delivery supply chain—apprenticeship, education, government, and technology providers—in order to identify critical factors related to the viability of a FRADS; as well as to elicit any concerns, challenges and/or barriers, benefits, and recommendations they might have. True to the nature of a qualitative exploratory study, I isolated, identified, and examined critical variables that can be used as data points for further empirical study.

After a brief review of the findings by research question, this chapter looks at the issue of viability in light of the concerns of the stakeholders, both within the context of the pre/mid 2020 COVID-19 pandemic, and as a result of the stakeholder's own introspective process in the course of the interviews. To help frame the discussion I note a series of qualifiers as well as a brief review of the definition of apprenticeship as established over time. This is followed by a look at the various

lenses through which apprenticeship is viewed; as well as a brief review of the impact of societal upheaval, and specifically, the COVID-19 global pandemic, on apprenticeship in general and specifically on the immediate and future viability of a FRADS. I then address the issue of functional equivalence by proposing a three-part process map that can serve as the a basic structure upon which to build a model. This process map identifies the basic technical components necessary to the delivery of a fully remote apprenticeship, while addressing important stakeholder concerns. Next, my frustration at the lack of opportunity for apprenticeships suitable for access-limited populations (the motivation behind this study) is addressed in light of stakeholder recommendations. The chapter concludes with a discussion of the implications of this study for future research and practice.

5.1 Is the Apprenticeship Movement Ready for a FRADS?

The majority of stakeholders, pre-pandemic, believed a FRADS could be viable, but, expressed concerns and offered conditional approval in some cases. Some of their concerns have lessened mid-pandemic, especially those related to mindset.

5.1.1 Overview of the Results by Research Question

The findings of this study provided a rich picture of the pre-Covid-19 apprenticeship environment and suggest a FRADS may be viable [RQ 1] given the existing enabling conditions (such as political environment, funding sources, internet connectivity, technological capabilities), inputs (suitable industries, human resource availability), and indicators of readiness (valance and efficacy)—provided careful attention is paid to stakeholder (including parental/family) education, system design, implementation, packaging, recruitment, onboarding and integration, and monitoring of processes and outcomes within a holistic framework. Areas of concern regarding functional equivalency [RQ 2] include: 1) Lack of physical presence; 2) Difficulty integrating a fully remote apprentice into the corporate culture; 3) Difficulty integrating a fully remote apprentice into the broader Community of Practice (CoP); 4) The assessment of competencies in a fully remote environment, especially in the manufacturing sector; and, 5) Tracking and accountability of members within the system, and of the system itself. These areas of concern will be addressed in Section 5.3 Functional Equivalence. In addition, to create a path

of inclusion for access-limited individuals [RQ 3], it was suggested that the delivery system should be made open to all potential apprentice groups in order to establish and stabilize the methodology—integrating access-limited populations over time (see Section 5.4).

In Chapter 2, we saw that over the course of time the basic ingredients of an apprenticeship have remained the same. The power of the apprenticeship model of learning is based on the consistent interaction between the expert and the novice with the purpose of transferring knowledge (including tacit knowledge) and acquired (practical) skills from the expert to the apprentice until competency is achieved. This occurs via instruction, demonstration, observation, assessment, feedback, and correction until the novice acquires the competencies commensurate with expertise and is awarded a recognized credential, attaining a state of employability (Rogoff, 1990; Romiszowski, 1999; E. Smith & Kemmis, 2013). This form of situated cognition is that which Lave & Wenger (1991) identified as "legitimate peripheral participation". The novice enters a community of practice (CoP) and through the interaction with expert members, develops into a fully participating, competent member (Driscoll, 2005, p. 165). The U.S. Registered Apprenticeship Program served as the exemplar in this study because of its adherence to the historical model of apprenticeship, and provided a common frame of reference for purposes of discussion with stakeholders.

As we saw in Chapter 2, throughout history the vulnerability of apprenticeship to changes in the economic, political, religious, and environmental well-being of society have been well documented—with major crises tending to stop/start apprenticeship efforts as well as to change them in somewhat in nature. The movement to a more holistic view of the individual, and a shift in the balance of power in favor of workers after the Bubonic Plague, is an example of this [see Section 1.1]. The United States, however, has not experienced a major change to its apprenticeship system since the industrial revolution when problems associated with an over-dependence on foreign workers precipitated the decision to begin to systematically introduce apprenticeship to grow our own labor force at home. While changes of Administrations and economic cycles have given the U.S. the ebb and flow of interest and investment in apprenticeship, there had been no notable changes to the delivery system when I began this study in 2017. In fact, even seasoned professionals I interviewed, working under the funding provided by the U.S. Department of Labor, had given little thought to changing the delivery system itself.

5.1.2 The COVID-19 Pandemic of 2020

The timeliness of this paper and uniqueness of the impact of the global COVID-19 pandemic on remote work, and therefore on fully remote apprenticeships, makes it important to frame the findings and discussion within the Pre/Mid COVID-19 paradigms. The world was alerted to the COVID-19 pandemic on the 31st of December, 2019—the World Health Organization (WHO) calling it a pandemic (Ravelo & Jerving, 2020). On January 7th, the CDC issued its first U.S. travel notice for all travel from Wuhan, China. Additional travel restrictions were imposed over the next weeks, and states began to issue stay at home (SAH) orders in March, 2020. What was first expected to be a few weeks turned into months, with mandated closings of all but essential businesses in many states (Ferrise & Exner, 2020). In the upheaval that followed the lock-downs, companies that could, moved to work from home (WFH). And, while 16.3 million Americans remained unemployed at the end of August 2020, only 4.5% (300,000) of the 6.5 million openings were active apprenticeship opportunities (Jordan, 2020a)—currently in-process 1:1 contractual apprenticeships. The U.S. Government does not currently track available, but unfilled, apprenticeship opportunities (Jordan, 2020b).

In January, 2020, the environment that houses U.S. apprenticeship changed drastically. Apprenticeship was in full gear in the United States with hundreds of millions of dollars appropriated to the effort to expand apprenticeships in order to build a 21st Century labor force. By March 2020, many states were already closing schools, churches, and "non-essential" businesses, forcing even the most conventional companies to rethink their remote work policies (Bashshur et al., 2020; Davis & Green, 2020; Elliott, 2020; Mathew, 2020). Called "the World's largest work-from-home experiment", (Banjo et al., 2020), discussed the movement of Chinese workers to home offices just three days following the January 31st, 2020 closing of the U.S. border to travel from China. The suggestion that video chat would replace onsite co-working proved to be a haunting prediction. We have now seen WFH teams multiply into "armies" (Banjo et al., 2020, paras. 4–5). In the meantime, legacy companies that had previously never sanctioned remote work began scrambling to set-up systems. Inter-country travel slowed, then stopped. Interstate travel in the United States followed suit. All schools moved learning to the home with the primary responsibility placed on parents. As many as could attempted to move to e-Learning. Those that could not, sent home worksheets. Shelter in home and self-quarantine orders were given. And, as the shelter in home extended into July in many U.S. states, the world of work seems likely changed

forever. As of the finalization of this paper (November 3, 2020) there were 46,840,783 reported cases of COVID-19 with 1,204,028 COVID-19 related deaths worldwide—and 9,268,818 reported cases in the U.S. with 230,893 deaths. At the peak of the current crisis, more than 20 million people had lost their jobs (Davidson, 2020). While restrictions on business and travel have been lifted in many states, uncertainty looms, as manufacturing returns to work, and reported cases begin to rise each time states open up. Appendix K, Coronavirus Timeline US Response contains a detailed timeline of the COVID-19 federal policy actions through April 2020.

In monitoring the impact of the COVID-19 pandemic on apprenticeship, it might help to look at a previous health crisis—the Bubonic Plague of 1347-1348 [see Section 1.1]. The plague of 1347 claimed 30-45% of the population within only a few months. Everywhere it spread mostly adults, and therefore much of the skilled labor perished. With a great number of children orphaned, and any employers who had escaped the plague left without workers, the tide of power swung in the favor of the poor. Fatherless children were given apprenticeships, a home, and the ability to learn entirely new skillsets from expert craftsmen and artisans (Smail, 1996). In addition, the demand for labor meant employers had to raise wages to get and retain workers (Augustyn, 2020).

I reached out by email to my stakeholders in March 2020, asking about the impact of the pandemic on their respective apprenticeship programs. Many companies let apprentices go. Some moved apprentices into a pre-apprenticeship program so they could continue to participate in classes. In the tech sector, many apprentices were moved home along with the rest of the workforce. I was told most of these apprentices were not new to their programs, and it was thought they would transition with minimal difficulty. Whether any support systems were put in place is currently unknown. We have yet to see the entirety of the impact of the pandemic of 2020 on labor. But, we do already have some sense of a shift in mindset toward WFH.

5.1.3 The Ingredients of Change

The circumstances of the 2020 COVID-19 pandemic has forced many employers to reconsider their mindset toward remote work as WFH became an overnight requirement for all businesses deemed non-essential that wanted to continue to operate. While many stakeholders I interviewed believed it could require a “changing of the guard” to effect the paradigm shift required to accommodate a FRADS, it appears the current mid-pandemic environment may

actually precipitate the sea change necessary through supportive and co-creative efforts in partnership with the very employers who may have previously been resistant to WFH.

The pandemic raised two critical questions simultaneously: First, in economic downturns, governmental and employer interest and investment in apprenticeship usually fall initially. If COVID-19 follows the pattern, apprenticeship as a whole should decline in investment dollars, begging the question: Will employers, service providers, and front-line workers have the money to invest in a fully remote apprenticeship delivery system if it is made available? On the other hand, we have seen a mass exodus of onsite workers from offices, escaping to the safety of their homes. This WFH environment readies the stage for a FRADS. But, a critical question lingers: Even if resistance to a FRADS is lessened, and WFH becomes more ubiquitous, will employers still need labor once the effects of the pandemic fully manifest? And, if not, what will happen to the apprenticeship movement? These questions, while outside the scope of this study, strengthen my contention that a FRADS needs to be assessed for viability in the event WFH becomes the norm and apprenticeships are still being offered. It appears now is the opportune time.

5.2 The Question of Viability begins with Stakeholders

In discussing the viability of a FRADS, stakeholders believed the following were areas of concern:

1. Garnering employer buy-in:
    - Employers are not yet fully acclimated to apprenticeship in general;
    - (Pre-pandemic) Employers were not yet embracing remote WFH; and,
    - Employer education would be needed to help identify the benefits of a FRADS and how it could be implemented and managed.
2. Parental education:
    - Parents (in the case of younger apprentices) would require education as to the environment and support needed by the remote apprentice.
3. Internet connectivity:
    - Internet connectivity is not ubiquitous in the U.S.
4. Suitability of some industries:
    - Certain industries (such as healthcare and manufacturing) might not be suitable for a FRADS.

5. Apprenticeship as a holistic model of learning:
    - Providing a holistic apprenticeship experience was seen as essential, including opportunities for service to the community.
6. Sense of presence:
    - A sense of presence is essential for trust.
7. Integration into the company culture:
    - The need to integrate the apprentice into the company culture is important to the identity of many companies.
8. Integration into the Community of Practice (CoP):
    - The integration of the apprentice into the broader CoP is important to their experience and growth in the field.
9. Tracking and accountability:
    - There must be a method for tracking and holding remote apprentices accountable.
10. Lack of a proven model:
    - Without a proven model, garnering buy-in would be difficult is not impossible.

5.2.1 Great and Unrealistic Expectations

The construct of viability carries with it not only the capacity to exist (feasibility), but the ability to succeed, grow, and to thrive as well. It connotes sustainability and even effectiveness (Merriam Webster's Dictionary, 2018b). Because of my background in technology, designing curriculum to utilize technology, and adult and online learning theory, I believed a FRADS to be feasible, and potentially viable. Acceptance of technology, however, is mediated by multiple factors, including the way one views risk (Bourrie, Jones-Farmer, & Sankar, 2016; Rogers, 2003) as well as indicators of readiness for change—valance and efficacy (Weiner, 2009). As stakeholders articulated their thoughts during the interview process, their initial assessments in most cases became refined by the end of the interviews; with nearly all stakeholders indicating (and, in one case, reflexively conceding) that the construct could be implemented (efficacy), was potentially viable, and may even have merit (valance), especially in certain circumstances. Initially, however, many expressed confusion as to the method, purpose, and need for an alternative delivery system, which surprised me. Given these stakeholders are all involved in some

way with apprenticeship, technology, or learning, I realized the value of, and need for, a FRADS was not as easily discerned as I had expected.

Stakeholder concerns 1 through 4 (Section 5.2 above), were directly impacted by the widespread responses to the contagion: 1) Work from home (WFH); 2) Remote learning; 3) Increased broadband initiatives; and, 4) Virtual delivery of healthcare and counseling. It is indisputable that WFH allowed many businesses to continue to function. E-learning was proven possible on every level, although in the short-term as an emergency measure, its effectiveness for some students is questionable. Broadband initiatives that had been trudging along suddenly had the government and private sector's full support (Federal Communications Commission, 2020; O'Reilly et al., 2020; Rizzo, 2020). And, sectors that some stakeholders questioned being even possible in a remote setting—such as doctor's visits and mental health consultations—proved both feasible and viable, and in some cases—preferable. The value of remote work, especially in cases of emergency lockdowns, appears indisputable. Numerous companies are considering continuing WFH in some form even after all restrictions are lifted (Akala, 2020; Berliner, 2020; Mathew, 2020; McLean, 2020). It remains to be seen to what extent the pandemic may positively moderate valance (the value placed on the ability to conduct remote work) and efficacy (the ability to remotely manage projects and employees and effectively carry on productive work), especially as these pertain to the potential viability of a FRADS, all else being equal.

I also realized that having been embedded in the tech field for so many years, I held unrealistic expectations of the technological readiness of critical stakeholders. While early in my career, I was aware of the need to slowly bring on new technologies when working with upper level management and support personnel, my position within my company became further removed from the end-user over the years, and I had lost touch with the true state of technological acceptance and even aptitude. I expected stakeholders to be far more tech savvy than I found some to be. I realized through the course of the interviews, that stakeholders with more extensive online learning and/or remote collaboration experience embraced the construct more readily, which makes sense. And, stakeholders cautioned that the generation holding the proverbial purse strings—still comprised of at least 41% baby boomers (Rosenbaum, 2020)—demonstrates less aptitude and interest in technology, which must be taken into consideration when introducing a FRADS.

On the other hand, while nearly all stakeholders believe the younger generations are tech savvy (because they are digital natives), and expect potential apprentices will be able to easily acclimate to a FRADS; my experience working with young people is that while they are experts with phones, apps, cameras, televisions and games; often they must be taught even the most basic business applications such as Outlook, MS Word, and Excel. And, for the majority of young people, other digital skills (e.g., networking and/or network security skills) are likely not in their toolbox (The World Bank Group, 2015). In addition, studies on digital and information literacy indicate students' may lack the ability to assess the quality of sources and understand uses of data (Chetty et al., 2018; Ng, 2012). This is likely because tech competency is usually derived from usage and application. Thus, lacking business experience, Millenials and Gen-Z'ers lack exposure to the tech (hardware/software/systems/processes/constructs) required for common businesses functions. This means it cannot be expected that young people will be more able to get safely connected to a sponsoring employer, and to immediately interact, navigate, and produce valuable work, without pre-training and an available tech support team, unless the set-up is designed to be plug-n-play. Even then, it is reasonable to proactively expect and prepare for technical and navigation issues, and to renew our focus on instilling literacy in our students through mentoring and "deliberate instructional interventions" (Sedivy-Benton & O'Kelly, 2017, p. 39). The pandemic has highlighted many issues, one of which is the nature of education during a crisis. Downey, Jones, & Hughes (2020, paras. 2–4) refuse to consider the pre-K–16 emergency move to online as "home-schooling", "distance-learning", or even "online-schooling". Instead they call it "Covid-19 Schooling" (para. 7)—a form of crisis management (Buchholz, DeHart, & Moorman, 2020). As such, it is important to revise our expectations and methods, while keeping an eye to the creation of a pandemic-proof future solution.

Americans are beginning to understand that literacy practices required for digital citizenship go far beyond our meager expectations pre-pandemic. And, as the potential world labor market approaches 3.6 billion users, these skills will be ever-more important (The World Bank Group, 2015). Wildner (2013) proposed five language skills needed to work in an electronic setting: accessing, interpreting, exchanging, developing, and evaluating information. Warschauer (2002) taking a more holistic approach [as did Tracey & Boling (2014)], looked at technologies as enabling full participation in a society. To do this, individuals must be: 1) comfortable using a computer and able to keyboard (computer literacy); 2) able to navigate online to find information,

and then to be able to "critically evaluate" it (information literacy); 3) able to use multimedia tools to produce reports and presentations (multimedia literacy); and, 4) able to function individually and in a group in an online environment (computer-mediated communication literacy). UNESCO (2011, pg. 1) has issued a similar definition: "literacy is the ability to identify, understand, interpret, create, communicate, compute and use printed and written materials associated with varying contexts. Literacy involves a continuum of learning in enabling individuals to achieve their goals, to develop their knowledge and potential, and to participate fully in their community and wider society". Employers today contend these skills are lacking in most college graduates (Saunders & Zuzel, 2010) and millennials report they feel unprepared for Industry 4.0 (Deloitte Touche Tohmatsu Limited *DTTL*, 2018). This perspective places the burden for employment preparation on educators. While I see the lack of certain skills as an issue of maturity that may only be able to be achieved in a real-world employment environment; this employer mindset may be the reason I was seeing job posts requiring an experienced, educated, leader for an entry-level apprentice position. Historically, this was not the case, as employers hired for particular qualities, and expected to train new employees in the additional skills required for the position. The responsibility rested on the employer and the individual (Cappelli, 2015). Tammy Simmons' apprenticeship program at Machine Specialties is one in which even the responsibility to instill service to the community (as a part of a healthy, whole life) is assumed by the employer and not left to chance. In apprenticeship, it is assumed a holistic approach to moving the individual from novice to expert should not presuppose these life skills, rather should include training in these critical areas of competency.

A final note, access-limited populations often have even less experience with technology(ies) due to lack of internet and device access (Gross & Opalka, 2020; Harris, Straker, & Pollock, 2017). For this reason, if a FRADS is to become a path of inclusion for access-limited populations, pre-screening (vetting) and pre-training will be especially critical at least in the early stages of the transformation, as will an intentional focus on the simplification of the FRADS system (e.g., networking, connectivity, security, communication/collaboration, work paths, storage) over time. In addition, the Deloitte 2018 study reports Millennials recognize they lack essential communication and interaction competencies and want their employers to help in their development. Because these skills are so important to teamwork in an online environment, soft-skills training should be built into apprenticeship curriculum and modeled by workplace mentors.

An equally important understanding of potential apprentices is that readiness for remote learning and work requires emotional intelligence, work ethic, maturity, internal locus of control, and other intangible skills that are far more critical to success than mere acceptance of the construct of remote apprenticeship or the ability to utilize technology (Dray, et al., 2011; Hung, et al., 2010). This aspect of readiness is discussed in more detail under Section 5.3 Functional Equivalence, below.

5.2.2 Addressing the Concern about Stakeholder and Parental Education

Nearly all stakeholders expected FRADS to be a "tough sell", requiring employer education—their concern arising out of their own efforts to recruit employers to sponsor traditional apprenticeships. I had viewed apprenticeship as a "no brainer". I believe an employer really has nothing to lose, in that the Federal government, third-party intermediaries, state WIOA's, and even community colleges are helping provide support and funding. When an employer hires a new employee, regardless of experience, other employees must invest in the integration of that individual into the company culture, methods, processes, and procedures. While an apprentice may require more attention initially (although this may also not be the case), some of the burden is shared by the provider of the related technical instruction (RTI). In addition, research shows apprentices are better trained and more loyal than non-apprenticed employees (Indiana Apprenticeship Forum Team, 2019; Schroeder, 2016). I believe that a team approach to apprenticeship enculturation is optimal when possible. The burden of time off-task, then, is not born by only one individual. Garnering employer buy-in is critical to the apprenticeship movement as a whole. According to several stakeholders, there are still far more potential apprentices than positions. This failure of employers to embrace the construct of apprenticeship poses a potential impediment to a fully remote system, because a FRADS is only the delivery system. If the model of learning is not widely accepted, it is unknown if changing the delivery system will positively impact stakeholder views on apprenticeship as an employee recruitment tool.

Some stakeholders also expressed their belief that parental education may be necessary. Having worked with first generation students and their families in the inner-city, I believe that whole family education is warranted if the apprentice will be working from home. This includes eliciting understanding and buy-in from all members within a household, whether parents, spouse, children, brothers/sisters, and/or extended family members. Concern USA listed a number of

barriers to education that pertain most to marginalized populations. Among them are issues related to 1) inconsistency in school attendance, resulting in poor basic reading and writing skills; 2) violence and bullying in the classroom; 3) the cost associated with supplies and/or uniforms; and, 4) outbreaks and epidemics, such as the 2013-14 Ebola outbreak in West Africa which interrupted the education of 3 million children. The COVID-19 pandemic impacted the education of the nation's poor more than any other group, primarily because of the lack of access to resources (Blackburn, 2020; Guterre, 2020). Even still, because of the move to home-based e-learning as a result of the pandemic, the education of the family may require less effort going forward and remains integral to the success of the remote apprentice.

5.2.3 Redundancy, Failsafe Provision Addresses Concern about Connectivity

While the findings indicate a FRADS is a viable construct given the networking, communication, collaboration, and storage technologies and expertise available today, nearly all stakeholders expressed concern that limited or unavailable internet connectivity could present a barrier to broad acceptance, especially in remote areas. Pre-pandemic, approximately 46% of the United States lacked stable internet connectivity (Anderson & Kumar, 2019). Despite the enormous loss of life as a result of the pandemic, there are a few unexpected positive outcomes as well. The pressure on the nation's infrastructure to provide reliable access to WFH and e-Learners immediately highlighted the gaps in the network, and brought public and private sectors together in a massive effort to expand and improve internet access nationwide (Pelkey, 2020; Pelkey & FCC, 2020; Rizzo, 2020).

While most stakeholders interviewed said they had not considered the need for fail-safe processes for WFH apprentices prior to their participation in this study, the extreme circumstances of the pandemic foregrounded several best practices I would suggest, if an apprenticeship is not to be undermined by connectivity issues:

1. Users of residential internet packages may experience more downtime than those with commercial packages that carry guaranteed up-times and service agreements. While not always the case in WFH, FRADS apprenticeship agreements should include employer provision of business internet service. This acknowledges the employer's recognition of the importance of productivity and the performance of *real work* to the apprenticeship; and, also lessens the likelihood of downtime.
2. A backup form of connectivity could be provided, such as co-lo spots (rental space where companies share the cost of overhead such as rent) with 100% uptime within

walking/biking distance (i.e., community colleges, shared office space, etc.), hotspot access via cell service, redundancy through DSL (if available), or low-latency satellite (Sheetz & Petrova, 2019). Offered only as backup in cases of outages, these connections may be slower and possibly even less secure; but, redundancy allows the continuation of work and mentoring, and demonstrates the importance of apprenticeship.

3. Weekly work assignments that can be carried out with or without an internet connection should be provided as part of the apprenticeship plan so that if all forms of connectivity fail, an apprentice can still continue to produce verifiable outcomes, and make progress toward mastery. Planned redundancy contributes a low-cost tangible reminder of the employer's commitment to the apprenticeship, and makes a strong statement that the fully remote apprentice is viewed as a valuable member of the team.

The need for a fail-safe process to ensure that work can continue became apparent to our team recently in light of the widespread outage of three of the nation's largest internet providers mid-afternoon on June 3, 2020: Xfinity/Comcast, Verizon, and ATT (see Figure 1 below). Preparation for such events, by providing apprentices with alternative connections as well as the ability to work locally and upload remotely once connectivity is restored, is important to the success of a fully remote apprenticeship and should be considered a fundamental part of the delivery system.

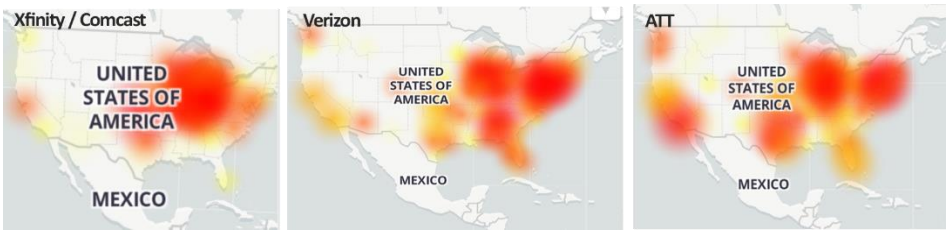

Figure 3. DownloadDetecter.com Outage Map Screenshots
06.03.2020 3:23-4:13pm EST

5.2.4 Concerns about Industry Alignment

While stakeholders believe the enabling conditions delineated by IEG in their Service Delivery Evaluation Framework, such as the political environment, public policies and regulations, data and financial systems, and procurement and supply chain systems, are relatively stable and able to facilitate and support a FRADS, they were less certain about the readiness of business and industry. Pre-pandemic, only a few Fortune 100 employers were embracing remote work; and stakeholders interviewed who are involved in manufacturing (even the digitalization and robotic automation of manufacturing) were reticent to buy-in to the possibility of apprenticing remotely.

Many stakeholders believed manufacturing should not be addressed in the first round of implementation of a FRADS, if at all. Their experience is that the majority of U.S. manufacturing either is not currently set up for remote work, or cannot be due to the nature of the business. While it is true that many manufacturing companies shut down during the pandemic along with restaurants and retail (Bureau of Labor Statistics, 2020b), I believe it is an area that has potential for a FRADS as technological changes are implemented in plants. This likely will require a staged approach—with companies more technologically advanced (or advancing) recruited first. Mid-pandemic, manufacturing appears to now be more willing to consider remote options ((Ma, et al., 2020). Should robotics and digital technologies become more the norm in the U.S., it is possible manufacturers will consider a FRADS solution as a method of mitigating the effects of global challenges such as those imposed by COVID-19.

5.2.5 Discussion as an Aid to Understanding

During the course of the interviews, all stakeholders exhibited some change in stance — many revealing a more favorable position—on a continuum ranging from acquiescence (that in some cases a FRADS might have value) to full commitment to the validity of the construct. While it became evident that a more conversational discussion was necessary in the early stages of the interviews to allow stakeholders to properly frame the questions, as I progressed through the interviews, I began to better understood how to present the questions for maximum discussion. For example, when a stakeholder failed to understand how a fully remote worker could be a full member of a team, I gave an example of our web team, all of whom work remotely. In a number of cases, this sparked understanding; and, in one case, a stakeholder was surprised to realize that their company already used remote workers. This experience made me realize that while stakeholders believe marketing and education is needed for employers, service providers and other stakeholder groups may also initially require educational support as well.

In one case, when a question concerning presence was raised, I referred to the literature on types of presence (Richardson et al., 2017). The stakeholder then extended the discussion to evaluate his perceptions of presence in a FRADS in light of the research. One stakeholder expressed his hesitancy as to whether a fully remote apprentice could really be integrated into the corporate culture without physical presence. He ruminated a bit on his response; then, went on to describe his online game play, during which he recognized that he currently has close relationships

with the other players, even those he has never met face to face. It became apparent that the lens through which he viewed remote relationship(s) had prevented him from seeing his own behaviors clearly.

Of interest is that in one case the opposite occurred. As the questions broached the reality of what a "fully remote" system would look like, the stakeholder (who had been the most positive toward a FRADS) raised concerns, based on his personality— offering personal experience as evidence of the difficulty some fully remote apprentices might have with the lack of physical presence. Discussion helped spur self-reflection in this case.

In all cases, it became apparent that in reflecting on aspects of the construct, and talking it through, the concepts of integration, presence, and "fully remote" took on new meaning. In discussing the details of what a FRADS would/should look like, the construct was clarified and mindset, suppositions, and expectations were foregrounded. This demonstrates again that if a FRADS is to experience broad acceptance, stakeholders may need help in thinking through and framing the construct within their own experiential paradigm,. This must be anticipated and accounted for within the system. In addition, this indicates that support for the other members of the system (i.e., citizen beneficiaries and mentors) should be built into the FRADS system as well. This will be discussed further in the section on Functional Equivalence.

5.2.6 Recommendations Addressing Stakeholder Concerns 1 through 4

Given the insights derived from my interaction with stakeholders, coupled with the evolution of my understanding of apprenticeship and the various players, roles, and areas of concern that emerged during the course of the interviews, a summary of recommendations regarding the presentation of a FRADS to stakeholders follows:

1. The distinction between stakeholders with/without extensive online learning and/or collaboration experience, should be anticipated and accounted for during introduction and implementation of a FRADS.
2. Honest discussion with all stakeholder groups (including extended families if they reside in the home) is critical to the acceptance and widespread use and success of a FRADS alternative. The shift in stakeholder mindset evidenced during the course of this study's interviews, demonstrates the possibility of a paradigm shift for the apprenticeship system as a whole when enough stakeholders join the conversation. It

is unknown if all stakeholder groups would have the same reaction, and leaves room for further study.

3. Because of the mental pictures evoked by the term “fully remote apprenticeship”, when presenting the construct to a new audience, examples of methods that can help to successfully integrate fully remote apprentices as well as testimonials of success stories should be provided with the introduction of the main structural components.
4. Understanding the sticking points and presenting evidence from remote learning, such as outcomes and/or reliable methods to establish presence, can help quell employer concerns.
5. Gaps in reliable internet should be addressed on a national level; while redundancy and production failsafe solutions should be evaluated and included in proposals for employers. This includes a process for manual systems that permit on-going work should all sources of internet become unavailable.

5.3 Functional Equivalence

The need to consider functional equivalence emerged during the first two stakeholder interviews, and caused me to add several stakeholders and additional interview questions to better address the most critical components of the FRADS for functional equivalency. Just as in legal, business, and economic translation, the use of functional equivalence as a means of comparison can be helpful when looking at diverse instructional systems in which absolute equivalents may be lacking. Functional equivalence in the field of translation, means that the functional equivalent has the same function as the source concept (García González, 2017). An example of this would be that an action word in Language B has the same function as an action word in Language A. Using functional equivalence then as a standard of comparison, stakeholders in this study were asked to evaluate aspects of a proposed fully remote apprenticeship delivery system (FRADS) based on the intended function of corresponding aspects/components of a face-to-face apprenticeship delivery system (F2FADS). For example, in a F2FADS environment, a mentor is physically accessible to an apprentice —modeling, instructing, monitoring, directing, responding, reviewing, assessing/evaluating, correcting, and encouraging. Stakeholders were asked their perceptions of the ability of a FRADS to facilitate the various functions of the mentor/apprentice relationship using the same standards of effort, quality, and effectiveness possible when utilizing

a face-to-face delivery system. While nearly all stakeholders believed the related learning component of the apprenticeship can be delivered remotely, and that a FRADS can be functionally equivalent to a F2FADS in many/most respects, they also believed careful planning, design, implementation, and monitoring would be necessary to produce the holistic experience and outcomes comparable to those of the current face-to-face OJI/OJT experience for the company, mentors, and apprentices.

Not every component of the apprenticeship system requires modification for a FRADS to be a viable alternative. For example, in a FRADS, the same OJT learning components—competencies, deliverables, and outcomes—would be expected. Competencies, processes, and procedures specific to the remote, technology-mediated delivery of the apprenticeship experience, however, are required in the transformation from F2FDS to FRADS. These include:

1) Technology and self-regulated learning skills assessment, development, and support;
2) Online mentoring skills assessment, development, processes, and procedures;
3) Online relational skills such as communication, collaboration, and trust-building skills assessment, development, processes, and procedures;
4) Methods, processes and procedures for remote integration of apprentices into the corporate culture and the community of practice (CoP);
5) Methods, processes, and procedures for remote assignment, delivery, and assessment of work; and,
6) Technology and delivery systems monitoring, assessment, evaluation, and oversight.

5.3.1 Elements of a Holistic Apprenticeship

A holistic apprenticeship is one in which the governing mindset is focused on the growth and development of the whole person in addition to the skills required for competency in a particular profession. The components a company incorporates into their apprenticeship model remain the same, although the method of delivery and implementation may be modified. The mentor-apprentice relationship was identified by stakeholders as integral to the success of an apprenticeship. In a face-to-face apprenticeship, this relationship is facilitated by proximity, varied types of communication, interactions (both professional and personal), shared experiences, and time. For a fully remote mentoring experience to be functionally equivalent to a face-to-face experience, technology must mediate a holistic growth environment evidenced by effective

communication, individual guidance/direction, and collaboration that engenders both learning and trust. In addition, activities (and in some cases, facilities) must be carefully designed to facilitate the integration of the apprentice into the culture and CoP.

Inclusion is not only for large providers. An exemplar inclusive room design built to facilitate a hybrid classroom with both on-site and fully remote students can be found at Kentucky Mountain Bible College (KMBC) in Jackson, KY. KMBC received a DOL grant with which they configured five classrooms and a conference room for onsite/remote attendance. Their design facilitates inclusion using a central OWL™ 360° Camera/Mic/Speaker located in the center of the classroom. Students can sit in rows, or in a circle around the OWL™ which automatically detects and focuses on the speaker. For the remote students, two 55" televisions are positioned at the front and back of the room, with the virtual software (in this case ZOOM™) set to speaker view. A Logitech™ Brio camera is mounted at a height that allows instructor communication with remote students at eye level. The camera facilitates instruction by allowing remote students to view both the SmartBoard™ and projection screen. Additional hardware includes a SmartBoard™ and projector. Remote students are able to join discussions and can also present. The system is designed for ease of use and accommodates multiple modalities. To view the layout (assistance provided by Zane Darland, Stephen Lorimer, and Kirk Babgy, 2020), see Appendix N, KCBM Inclusive Hybrid Classroom Technology Schematic. Room photos are available from KMBC upon request.

5.3.2 Apprenticeship is Bi-Directional

What became clear during the course of this study is that while IEG looks at service delivery as a one-way stream of services provided to citizen beneficiaries, apprenticeship is bi-directional—serving two separate groups of end-users (employers and citizen-beneficiaries). Even though the employer is instrumental in the provision of the apprenticeship service; the FRADS is a two-way system that enables the delivery of goods and services both to and from apprentices and the employer. It follows then, that the needs of both groups must be considered when addressing the viability of a FRADS; and, the system must capture the data necessary to evaluate the effectiveness of the entire system.

Inputs in the FRADS system include funding (provided by employers as overhead, related learning, JIT learning/mentor expense and wages; and possibly monies from public and private sources); technology(ies); systematic instruction/mentoring; work/deliverables; and human

capital—employers, mentors, support personnel (i.e., tech) and apprentices which in a FRADS may include marginally attached and/or access-limited individuals.

Basic components of a FRADS include the following:

- An Employer
- An Apprentice
- A Mentor and/or Team of Mentors
- A System to Deliver Mentoring and Other Learning to Apprentices
- Access to a Community of Practice (CoP)
- Connective, Communicative, and Collaborative Technology(ies)
- Technologies Related to the Production of Work
- Integration into the Company Culture
- Instruction (Domain knowledge, competencies, skills)
- Assessment
- Skills-based Work/Deliverables: e.g., skills evidenced through tasks performed, competencies demonstrated, product produced, time on task, quality of work, services rendered
- Processes/components to Facilitate the Delivery of an Apprentice's Work to the Employer
- System, Apprentice, and Mentor(s) Monitoring and Support Systems
- Feedback Loops and Evaluation
- Reporting

Additional Components of the system that exist to enable, support, and correct the delivery of a valid apprenticeship include:

- Core functions
- Internal Processes
- Administrative Procedures
- Relationships

Critical to, yet potentially separate from, the delivery system are federal and state policy and funding sources, educational institutions, 3rd party intermediaries who provide services such as recruitment, related technical instruction, and in some cases—mentoring, and wrap-around service providers serving ADA and other access-limited groups. A complete FRADS would accommodate integration of necessary information to and from these resources.

5.3.3 The FRADS Processes, Required Resources, and Components

The Vetting & Recruitment process map (Figure 4) below is based upon the analysis of the findings, in response to the areas stakeholders believe are most critical to functional equivalence in the initial stages of the apprenticeship. This process map assumes recruiters have the ability to funnel an apprentice into one of three paths: 1) On-site apprenticeship; 2) FRADS; and 3) A pre-apprenticeship. It addresses three areas of concern: 1) Recruitment: The recruitment, vetting, and placement of mentor and apprentice within an apprenticeship delivery system; 2) Technology: The determination, implementation, and vetting of the technology system; and, the training of the employer teams and apprentice on the components of the system; and, finally, 3) Monitoring, evaluation, and iteration through feedback loops. Early detection and resolution of problems, as well as a commitment to quality control, are essential to the ultimate success, continuance, and health of the programs.

For formatting purposes, the process map is broken into parts identifying the main components of the FRADS with many of the processes and functions potentially requiring modification to ensure functional equivalence. A key is provided below as well as a schematic of each part along with a more detailed explanation.

Recruitment, Vetting, and Pre-Training of Personnel. Both employers and apprentices participate in recruitment efforts, and often work with a recruitment facilitator (3rd party intermediary). Given the remote nature of the delivery system, recruitment may be able to be expanded outside traditional geographic boundaries, and consideration must be given to supporting apprentices living in other areas of the country (or globe). Note: State income tax laws have been reported to create some issues when recruiting outside the state and should be considered prior to the decision to hire from outside.

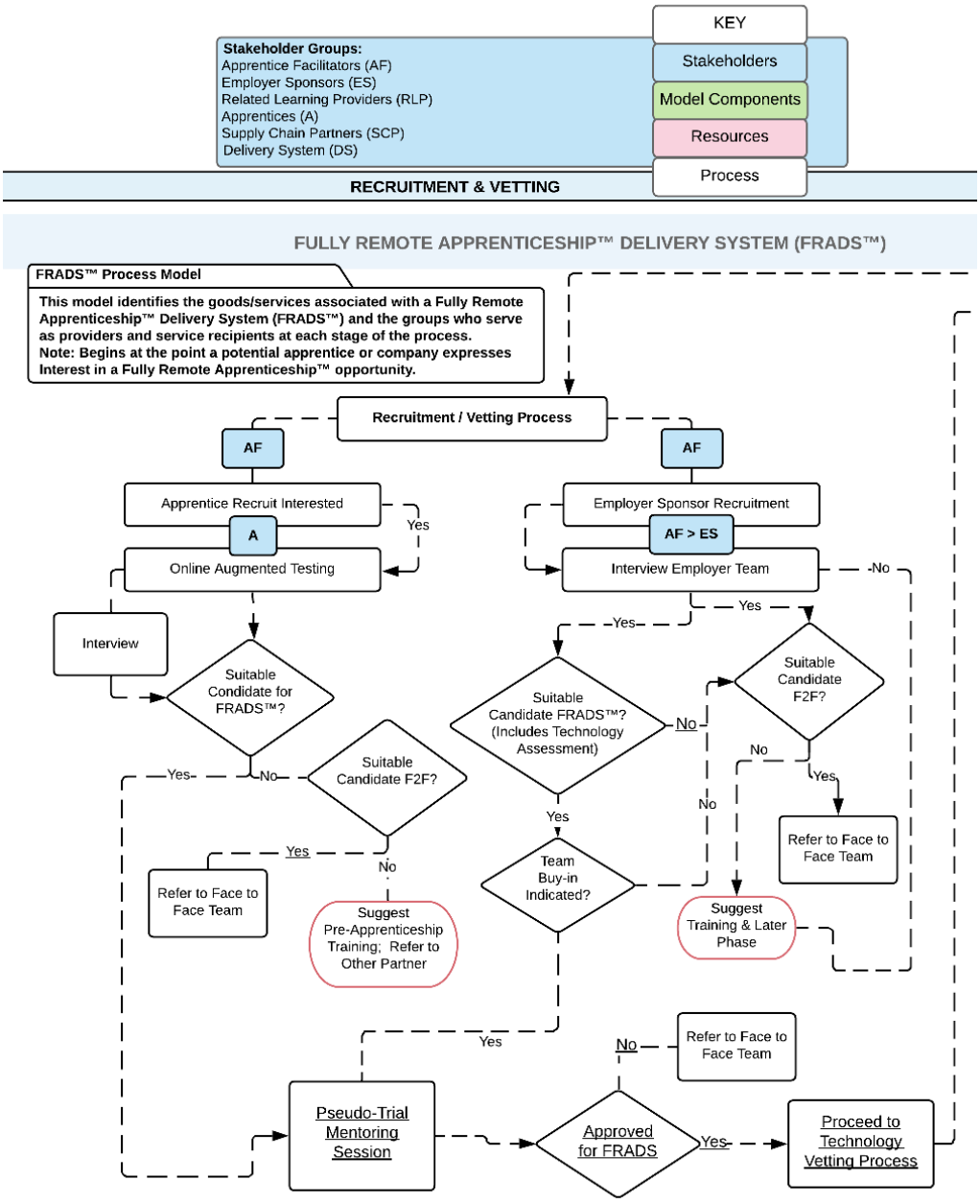

Figure 4. Vetting & Recruitment Process

Recruitment is initially intended to pair the most suitable employer with the most suitable apprentice(s). In the current environment, stakeholders facilitating recruitment of apprentice candidates have far more potential apprentices than willing employers. I believe it is possible a FRADS alternative might entice some employers to consider apprenticeship who are not in a position to bring on another on-site hire. Historically, mentors may or may not be involved at the

recruitment stage; although, my personal belief is that in a FRADS, mentors should be involved as early as possible once apprentice candidates are identified, because their involvement in the selection and matching process may help ensure successful placements.

In a F2FADS, the entire team (e.g., peers, other department personnel with which the position interacts, support personnel) also may not be initially included in apprentice support, as members are often introduced at strategic points in the process rather than immediately upon hire. In a FRADS, however, garnering the buy-in of the entire team can be very helpful in the successful integration of the remote apprentice into the culture and CoP. Bishop (2017) and Fuller & Unwin (2003) discuss the differences between an expansive and a restrictive apprenticeship, highlighting the importance of the integration of the apprentice into multiple workgroups as a means of granting personal agency in shaping the extent and content of the learning that occurs. A team can better provide just-in-time (JIT) support which is usually more needed (at least at first) in an online environment. In addition, the introduction of the apprentice to individuals with key tacit knowledge may not happen by chance, as is often the case in informal settings within a face-to-face work environment. Providing an apprentice with a support group specializing in key areas of their job requirements can significantly aid their ability to make forward progress. In addition, modeling/demo'ing can be a team effort in a FRADS, with numerous team members potentially available to share their screens in order to model a wide variety of procedures, processes, and tasks within a given project. While an understanding of the prior knowledge of the apprentice, as well as the proper sequencing and chunking of the requisite knowledge and skills critical to achieving competency is a great beginning, an introduction to the team members along with a contact list including each teammate's areas of expertise can help immensely in an environment where physical proximity is lacking.

In a FRADS, recruitment requires a few more steps to produce the same type of outcome and ensure a good fit. The technical skills of the mentor(s) and the potential apprentice(s) are much more critical to the success of the endeavor, as are the online communication and collaboration skills. In addition, a remote worker requires an internal locus of control (Severino, et al., 2011) and a propensity for self-regulated learning (Shunk, 1996) which may not play as important a role in a face-to-face employee. For this reason, the recruitment process should include additional vetting of both mentor(s) and apprentice(s) in order to gauge the presence of these qualifiers. Team members that will be involved with the fully remote apprentice will also need training, to ensure

they understand the types of attitudes, behaviors, and cohesive support that are necessary to help integrate the apprentice into the company culture and CoP.

The recruitment, vetting, and subsequent training of the employer, mentor, support team(s), and the candidates for apprenticeship, on all communication and collaboration technologies, is critically important. In addition, instruction in techniques for successful remote teamwork and autonomous, self-directed learning should be included in pre-apprenticeship training (or on-boarding) and not left to chance. The early detection and resolution of any issues that might undermine the apprenticeship help to ensure a smoother, more successful apprenticeship experience, higher completion rates, and better overall outcomes.

If it is determined that an employer, team, mentor, and/or potential remote apprentice is not a good fit, the process map shows alternate paths that can be taken, such as referral to the face-to-face recruitment team or enrollment into an apprenticeship preparation program.

Recommendations. Six recommendations follow, concerning recruitment, vetting, and pre-apprenticeship training. A thorough vetting and training process can help achieve greater mentor/apprentice success and satisfaction, and result in higher completion rates. It is important that recruitment tools and processes focus on the competencies essential to the success of the employer and key personnel as well as the potential apprentice(s). On the employer side, this includes full buy-in and commitment of the owner and C-Suite, the mentor team, the support teams (including work group and tech support team), and the Mentor/Advisor who will follow the apprentice throughout the apprenticing process.

1. Fully Remote Apprentices: The recruitment process should include vetting for an appropriate work environment, technical and personal skills, suitability for the particular role, and other critical skills necessary for success in a remote environment such as online relational skills. Potential apprentices should first be able to provide proof of a quiet place to work and the availability of redundant internet service to their chosen work location as a pre-requisite for consideration as a FRADS candidate. If they intend to work in a tech center, their agreement with the tech provider should be submitted in writing.

   Apprentices should be able to demonstrate technical skills as well as competency in their online relational skills. An assessment of suitability for online learning, including factors such as internal locus of control and self-regulated learning, should be administered during initial recruitment efforts, with pathways available for potential candidates requiring additional support.

A sample of such a survey can be found in Appendix J, Frads Apprentice survey.

Finally, an assessment of fit for the role, such as that provided by ProfileXT™ should be considered. This type of assessment looks at personal characteristics, including values and beliefs, to predict goodness of fit for a wide variety of positions.

Skills that are too often overlooked are keyboarding and spelling. Correct spelling can mean the difference between the processing of a sale or the loss of the order; while keyboarding is a competency that is important to the efficient production of work, as well as to the creation and maintenance of a working relationship. If the mentor or apprentice has to "hunt and peck" to communicate, while their counterpart waits, the relationship is likely to degrade. A keyboarding assessment should be conducted in enough time, prior to the beginning of the apprenticeship, that training can be conducted if needed. An alternative is the use of transcription software; but, this is only suggested where disability might preclude the inclusion of a candidate.

Video chat and calls are important for building relationship, but, when used for direct instruction or discussion of projects or assignments, they are only as good as the individual's memory. In this case, video chats and calls should be summarized and transcripts made available online for referral and review. A knowledge base can also serve as an effective JIT support tool for apprentices. Text chat logs can be used as additional documentation of the mentoring process—retaining key reminders as well as important process and project descriptions, instructions, and notices. A tool to manage projects is also a great help to apprentices who are struggling to learn and navigate a new domain; as are regular team meetings to go over projects, deliverables, and deadlines.

If the candidate is not suitable for online work, but, has potential as an on-site employee, recruiters can recommend them for an on-site apprenticeship. If, for any reason, an online apprenticeship is more desirable, and it is determined that any deficiencies can be addressed through training, those skills can be included in the pre-apprenticeship training program, and the apprentice candidate retained in the online apprenticeship path.

NOTE: While lack of computer literacy should not be reason for exclusion from an apprenticeship opportunity—as this may correlate with membership in an Access-Limited population—computer skills assessments should be part of the vetting process for apprentices (as well as mentors), and training and support should be provided as needed to ensure success.

2. Owners and C-Suite: If the owner, or anyone on the managerial team oppose remote work or the construct of fully remote apprenticeship, the probability of success is diminished. Viewing the team as change agents in the implementation of a FRADS, with internal and external support, can greatly

improve the chances of success (Savoy & Carr-Chellman, 2014). If the company has never used remote workers, or is in a field that has historically not been viewed as potentially remote, an educational session can help—showing impact on ROI, an overview of the measures that have been implemented to ensure quality and outcomes, as well as the training and resources available to ensure success. Stakeholders believed success stories would be important to employer and C-Suite buy-in; but, mid-pandemic, it may be that emergency WFH measures may have already provided the incentive necessary.

3. The Mentoring Team: In most cases, an apprentice may have multiple mentors. One may be the designated Advisor/Mentor/Main Contact; but, a team can also provide mentoring and direction that augments and supplements the primary area of instruction. For example, the Director of Web Development might be the primary mentor, while a graphic designer, videographer, and programmer/coder/developer might provide secondary mentoring in their areas of expertise so that the apprentice is exposed to a holistic view of web development. Each member of this mentoring team must be committed to the training and development of the apprentice because each aspect of the position is essential to the success of a completed project. One team member, who is non-responsive, or who withholds critical information, can sabotage an apprentice. It is imperative the team views the apprentice as a vital and equal member of the team, regardless of initial skillset and lack of physical presence.

   An assigned mentor is often an older employee with years of experience. Stakeholders expressed concern that mentors may not possess the needed technical and/or online mentoring skills required for a successful apprenticeship experience. Mentors do need to be tech savvy, and/or trained and supported in the collaboration technology(ies) as well as in mentoring in an online environment. The lack of these skills can negatively impact outcomes; and, in cases where an apprentice is forced to support the mentor, trust may be undermined and learning impaired. While peer-to-peer mentoring and support, and designated tech support, are an important part of a fully remote apprenticeship, they should not be the go-to in order to make up for a lack of skills on the part of the Mentor/Advisor. In addition, should the necessary technical skills be lacking, it is critical that adequate time be provided for the Mentor/Advisor to gain the necessary competency(ies) or the apprentice can be inadvertently impacted.

   In addition, careful attention must also be given to the number of apprentices any one mentor can facilitate. Mentor/apprentice capacity is a function of 1) the mentor; 2) the apprentice; 3) the position; 4) the types of projects or work; and, 5) the support systems in place. The government's mentor to apprentice ratios are based on safety factors within the work environment, according to stakeholder, Daniel Villao. The greater the risk, the more important it is that a 1:1 mentor relationship is maintained. Thus, in non-manufacturing and remote environments, the ratio could feasibly be greater than 1:1. Stakeholders personally involved in mentoring believed 2-3 apprentices might be the most

any one mentor could successfully facilitate. One stakeholder, however, knew of a successful program with a one to many (1:many) structure.

4. Work Group Support Team: When an apprentice works on-site within a work group, friendships begin to form naturally through direct interaction, problem solving, peer-to-peer mentoring, shared jokes and confidences. An apprentice who is connected remotely can easily be excluded from these day-to-day activities, unless care is taken to ensure inclusion. In a coding workgroup (group whose primary responsibility is to program and/or verify code), this may include the other members of the bench (the overall group of available personnel for a project), each working on a portion of a larger project. Synchronous connections, team collaboration tools with video, voice, and/or text chat, even autonomous robots such as GoBe™, Ohmni™, and Padbot™, can help with inclusion. But, the intentional commitment of the team is the vital ingredient. If prior to the introduction of the remote apprentice, time is spent with the work group—helping them to understand the challenges of the remote worker, the benefits of having remote workers, and the ways they can facilitate the integration of the remote apprentice into the team, the chances of a successful integration are greater. Project and task support must also be readily available.

   It should be discussed that jealousies can develop among workers who feel "forced" to work on-site toward the "lucky" ones who are able to work remotely. This is something that should be anticipated and measures taken to prevent it before the remote apprentice is brought on. I believe this is something that will become less of an issue over time as remote work becomes more the norm. Allowing workers whose positions can easily be performed remotely to work from home a day or two a week, can help alleviate the feelings of inequality; as well as having special on-site perks that make being on-site a potential advantage. Also, allowing those who prefer the on-site environment to work on-site where possible, and those who prefer remote work to work remotely where possible, regardless of location, grant a sense of autonomy valued by adults, thus increasing the level of job satisfaction (Fuller & Unwin, 2003).

5. Tech Support Team: In a fully remote apprenticeship, tech support must be available to the mentor(s) and apprentice on a JIT basis. Technology issues can undermine an apprenticeship and create confusion, dissatisfaction, and frustration. I suggest that in situations with multiple tech support personnel, one person is assigned to the remote apprenticeships. Where remote apprenticeships are offered on multiple shifts and varying time zones, this may be more difficult, and it may even be necessary to contract the support out. But, when technology is an equal determinant of success, the potential for tech issues must be mitigated. The use of assigned tech support personnel may have a secondary effect as well—that of increasing the sense of perceived value a remote apprentice places on their position because of the importance management has demonstrated in providing the support.

Support systems must be designed in advance, not created on-the-fly. A tech support plan should allow both the mentor and apprentices to access help in a timely (just in time-JIT) manner. The individual(s) designated as the FRADS tech support team should be involved in the technology vetting process in order to begin to establish the trust relationship necessary to the success of the apprenticeship. This also allows the support team to gauge the technical skill level and potential support needs of the remote apprentice candidate.

6. Trial Mentoring Session: A trial mentoring session as part of the interview process is strongly suggested. This would include the mentor introduction, with requisite skills monitoring and assessment, supported by the recruitment and tech teams. Both video conferencing and text messaging/chat should be included in the session. The trial mentoring session can serve as a gauge of the apprentice candidate's inter-personal and relational skills as well as their technical aptitude. Observation of the interaction may help head-off any potential issues that could inhibit a healthy, viable apprenticeship while providing the basis for targeted training if deemed necessary. It should be anticipated that additional targeted training and support may be needed for the first few weeks of the apprenticeship.

   I would also contend that it is not until after the trial mentoring session is completed, that the final decision should be made to enter into a formal FRADS apprenticeship agreement. Technology and personal issues can waylay the best programs. A thorough vetting and training process can help achieve greater mentor/apprentice success and satisfaction, and result in higher completion rates.

Vetting of the Technologies. Collaboration technology(ies) and instructional strategies employed are key to mentoring success (See Figure 5, Technology Testing & Training, below). Software that allows synchronous connections, break-out sessions, presentation/ demonstration, two-way remote control of devices (for certain applications), private messaging, and on-demand JIT support is essential for optimum success and the facilitation of apprentices. Consistent planned group and individual mentoring sessions as well as regular office hours will help demonstrate to apprentices the commitment and support of their mentor(s) and provide a more consistent serving of instruction.

Once an individual and employer have been deemed a potential fit, the technology assessment takes center stage. The equipment and skills necessary to connect to, and fully participate with an employer on a strictly virtual basis must be evaluated. This involves assessing both the employer's systems, security requirements, and connectivity preferences; the types of

tasks required; and the requirements for the delivery of work (such as uploading and storage). Once the first FRADS is vetted, only role-specific technologies will need to be evaluated.

In addition, the work space (location) identified by the remote apprentice candidate should be assessed, and accommodations made as indicated. This might include considerations of available internet speeds, special needs of the apprentice such as additional monitors or visual enhancements, and requirements of the work itself, such as memory intensive programs, CAD capabilities, and/or 3D printing requirements.

Collaboration and Communication Tools. In addition, the collaboration and communication tools must be identified. I asked the technology stakeholders about the best way to build an efficient and effective infrastructure. They recommended basing the choice of tools on the existing technology used by the employer. For example, if the employer uses Microsoft™ products, consider using GoToMeeting™ as the communication tool, and SharePoint™ or Teams™ to collaborate, with OneDrive™ as storage. If G-Suite™ is being used, then Google Meet™ or Zoom™, Google™ Docs, and Google™ Drive may be the best option. Where Cisco™ is used, an employer could use WebEx™, and so on. An external third-party tool is not recommended except in cases where none exists within the employer's toolbox.

Broadband connection(s)—Employer. A FRADS almost assumes an employer has high speed internet connectivity. Where this may not be the case in remote areas of the country, a word of caution is in order. Problems and frustration with technology can highjack the best plans. While not imperative, it is recommended the employer have a stable broadband solution. If this is not the case and the employer is still interested in trying to implement a FRADS, it is important to create a failsafe backup plan so that work can continue should the internet become unstable [see Section 5.2.3 Redundancy, Fail-safe Provisions].

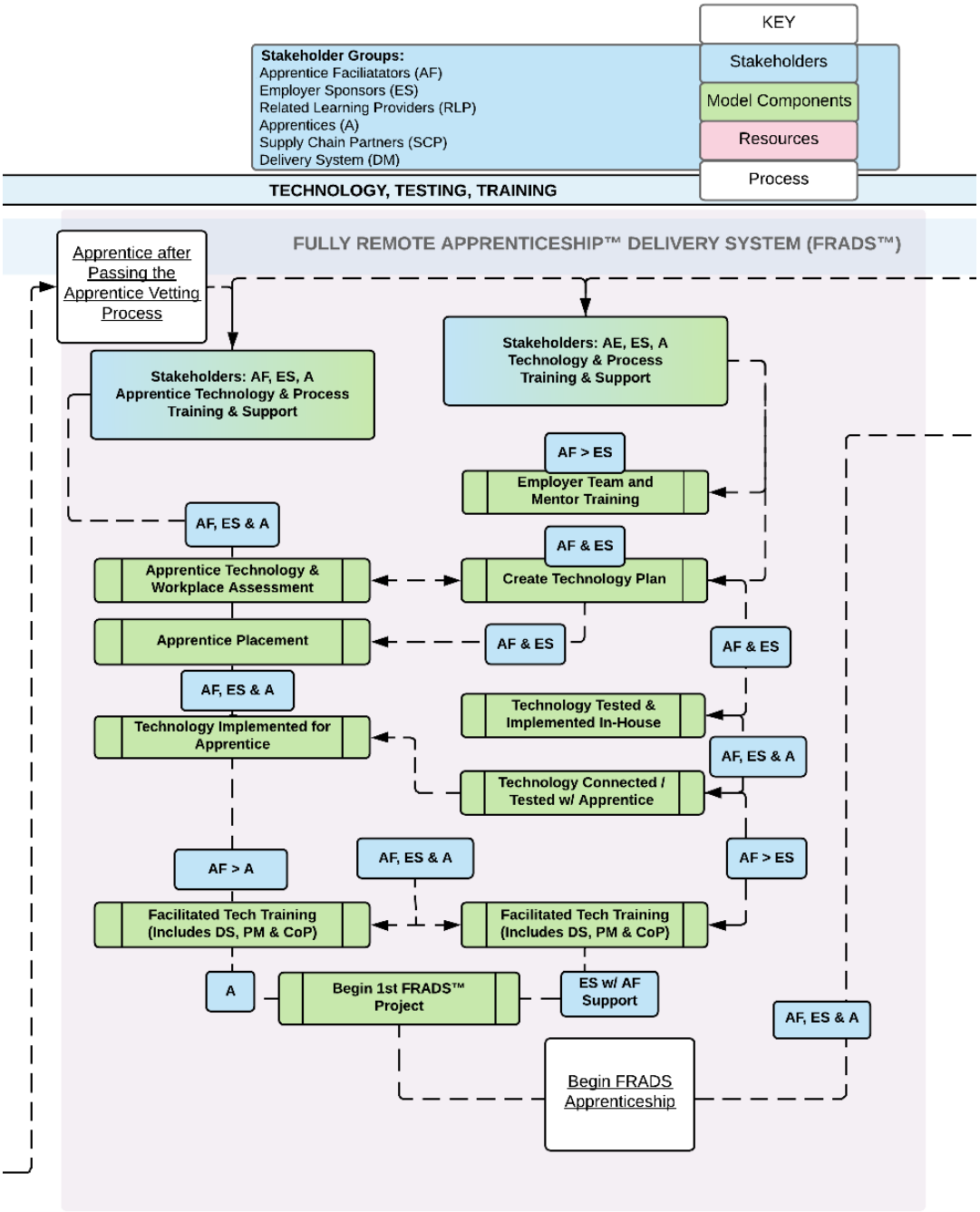

Figure 5. Technology Testing & Training

Redundant broadband connection(s)—Fully Remote Apprentice. Technology stakeholders recommended redundant internet sources be identified. This may be a combination such as Cable and DSL, 5G with hotspot and low-latency satellite, or a strictly manual system to be used when

the internet is unavailable. A manual back-up plan is easy to implement and allows work to continue should all sources fail. This may include project work that can be done without an internet connection, with deliverables uploaded once the connection is resumed. Whatever the plan, having a back-up can help lessen frustration and ensure the apprenticeship can progress in a timely manner.

Connection Security. If a secure connection is critical, and a product such as Sophos is being used by an employer, a remote ethernet device (RED) is a simple to use hardware solution that can be configured with access and security settings that ensure a secure connection and role-assigned access within the organizational structure. VPN solutions are widely available as well, such as Cisco AnyConnect™. Most large employers have a VPN solution for use by C-Suite and IT with access and roles managed from within the network. Restricted roles can be created to allow fully remote apprentices to access the areas needed for their communication, collaboration, and work functions. If no VPN is available, and a shop uses Chrome, entry can be provisioned to browsers and restricted by IP address. It is important to work with the tech team to find the most secure solution while requiring a nominal learning and support curve. Also important is a solution that offers the fewest potential points of failure.

Monitoring and Evaluation. Monitoring should be determined prior to the beginning of the apprenticeship, with evaluation serving as a guide. Areas of importance include: mentor/apprentice interactions and interaction time (duration); apprentice interactions with others in the company (peers, C-Suite) and in the CoP; time to produce deliverables (inverse relationship to time on job: production time); competency assessments; errors, returns, failure to deliver on time, edits, reworks, cost to profit; apprentice reflections on daily experience; mentor monthly evaluations; apprentice periodic formative evaluations; and delivery system failures or trouble tickets. (See Figure 6 *Formative Evaluation & Iteration Feedback Loop, below.)*

While collaboration software and many Learning Management Systems (LMS) are able to track interaction times; and logging of events is also possible in many network applications; a solid plan that includes the use and reporting of the results is fundamental with balance between time and report value serving as the key governor. This ensures systems (including processing and storage) designed to track data will not result in a waste of time and resources.

Evaluation. As learning is progressing, formative evaluations (i.e., informal or formal surveys, interviews) periodically solicit the level of mentor and apprentice satisfaction with the

FRADS experience (Kirkpatrick, 1998). It is also possible to solicit input from the workgroup and support team members, as this may reveal insight into ways to make the experience better for all involved. Formative evaluations are only as good as the degree to which an individual's perceptions are considered and responded to. If suggestions are made and not addressed within a reasonable time-frame, individuals will begin to see the evaluations as inconsequential. When used as an employer tool to show support to team members, the effectiveness of formative evaluations represent an inverse relationship: The longer the time between report and action, the lower the level of confidence in the value of one's opinions/suggestions.

Weekly short surveys (per cohort) during the first month can be helpful, both in heading off any major problems as well as building trust in the team that their opinions and concerns matter. After the first month, monthly surveys for the next six months would be sufficient, and then quarterly after that. Apprentices and mentors should always feel comfortable bringing concerns to light at any time, just as in the traditional F2FADS. The monitoring of interactions between apprentices and mentors also can help ensure mentors are intentionally communicating and providing direction and support. Because more "touches" may be required in a remote environment (at least at first and especially with younger apprentices) to establish a trusting relationship and to ensure apprentices are properly onboarded and trained, the level of interaction should not be left to chance.

A practice that can greatly inform and improve any apprenticeship, whether face to face or fully remote, is daily reflection. This can be used as a type of formative evaluation, or as a means to help the remote apprentice solidify the lessons learned each day. A study in a call center compared the learning (evidenced by criteria used to gauge effectiveness) of two groups of new hires (Di Stefano, 2014). The first group handled calls all day until the end of their shift. The second group stopped taking calls 15 minutes prior to the end of the shift and spent the remaining time reflecting on the happenings of the day—problems they encountered, things they learned, issues that remained unresolved, and the like. After 30 days, the reflection group was far out-performing the control group and retained their performance 90 days after the end of the experiment. Because of the potential for a remote apprentice to feel isolated, it can be beneficial to make daily reflection a practice. Reflections can be kept private, or can be shared with mentors on a weekly basis, helping build and cement relationships, while reinforcing learning and serving to off-set the lack of face-to-face contact.

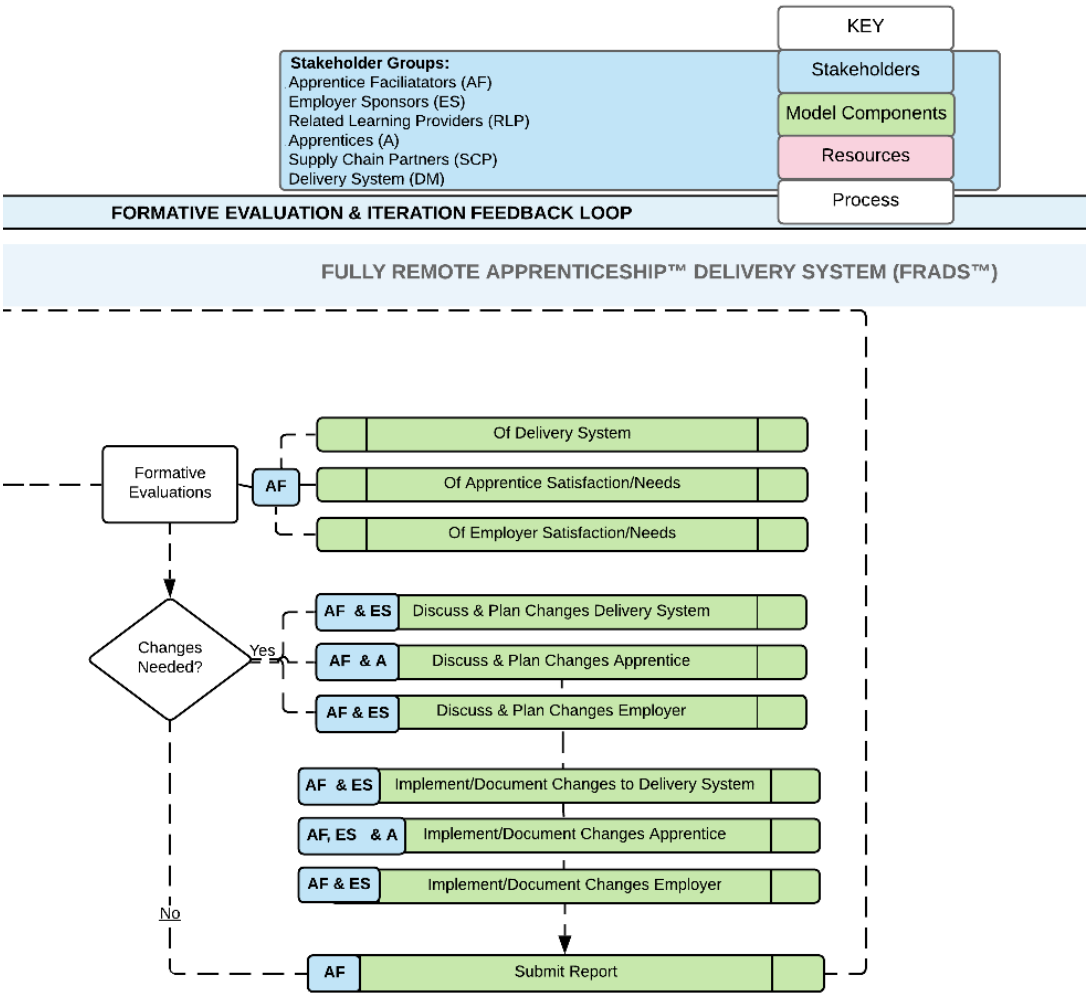

Figure 6. Formative Evaluation & Iteration Feedback Loop

Summative Evaluations. Summative evaluations are used at the end of an apprenticeship or at the end of a phase of an apprenticeship, depending on the structure. Summative evaluations are not intended to make the experience better for the reporting participants. They ask questions of a more universal nature, looking at the experience as a whole, and asking for insights into broader issues. For example, a question might be: Given your experience thus far as a fully remote apprentice, what would you tell someone considering a fully remote apprenticeship experience? Another might be: How might we better integrate future fully remote apprentices? Summative evaluations may also go further and evaluate the effectiveness of the training to meet the company

objectives (Kirkpatrick, 1998) and/or ROI (Phillips & Phillips, 2003). The purpose of summative evaluations is to improve the program. The changes may only benefit future cohorts.

Delivery-System Evaluation. While face-to-face apprenticeship may require an evaluation of the apprentice, the mentor, and their relationship; a FRADS also requires an evaluation of the delivery system. Both apprentice and mentor should have periodic input (outside of the day to day support requests) into the way the delivery system is functioning. Suggestions for efficiency and effectiveness, ease of use, navigation, collaboration, and so on, should be solicited and implemented where practical/possible. A ticketing system is a good way to track the system change requests and responses. It is important to inform apprentices as to the status of their suggestion as this helps engender trust that their opinion matters. This can be done by automatic emails sent upon resolution of the ticket(s).

Credentialing. Credentialing may require modifications to the proof(s) of competency(ies) assessments based on the nature of the skills required for the particular position. Assessments must be equal and fair between fully remote and on-site apprentices; and creativity may be required to design an assessment that is functionally equivalent for the fully remote apprentice. For example, presence may be an assessment criteria for a face-to-face apprentice. A fully remote apprentice is not usually observed entering the room, nor can one observe all of the elements of presence possible when face-to- face, including eye contact. In this case, the face-to- face assessment would be adapted to that which is possible remotely, looking for attentiveness, appropriate responses, appropriate questions, follow-up comments, and so on. Likewise, a remote apprentice can theoretically work in pajamas. When appearance is important to the position, requiring a similar dress code of the remote apprentice that is required of a face-to-face apprentice demonstrates consistency and fairness. Some employers require a tidy workspace as well.

Stakeholders expressed concern about the acceptance by employers of fully remote credentials. This is similar to the concern with Industry Recognized Apprenticeship Programs (IRAPs) which the discussion of a FRADS unexpectedly foregrounded. Stakeholders pointed out the issues of portability/mobility of the credentials earned by apprentices in SA vs OA states; and expressed concern that without proper planning, the introduction of fully remote apprenticeships may compound this problem further. This concern is reminiscent of the rationale behind Canada's establishment of the Red Seal credential (Canadian Council of Directors of Apprenticeship, 2016),

and touches on both the question of viability and of functional equivalence, speaking directly to the need for a universal, nationally recognized system of standards.

The credentialing component of any apprenticeship is partly the responsibility of the marketing/branding function, and should be addressed at every stage from the initial awareness campaign, to recruitment, implementation, and follow-up; although no amount of branding will redeem a poor program and poorly trained apprentices. If high quality apprentices graduate the program, credibility will not be an issue indefinitely, as their demonstrated skillset will prove the value of the apprenticeship through the work they produce. Companies hosting remote apprentices will also be instrumental in championing the credibility of their programs; while Public Service Announcements can be created to help educate and mold public perception.

Other considerations. A holistic approach to apprenticeship recognizes that the responsibility of such a program is to attend to the development of the whole person rather than simply the skillset necessary for a position of hire. Part of this development is the phenomenon of legitimate peripheral participation in which an apprentice becomes fully integrated into the Community of Practice (CoP) (Lave & Wenger, 1991). While some stakeholders were unsure whether a fully remote apprenticeship could provide a truly holistic experience, and questioned whether it is possible for a fully remote apprentice to be integrated into the workgroup, the culture, and the CoP, my response would be that all things are possible, but, some will require effort, and a creative and thoughtful approach to design and implementation.

Daily events, such as ad hoc meetings, water cooler chats, and outside social activities are often a part of the workplace. These can preclude the inclusion of a fully remote apprentice. Requiring scheduled meetings and documentation of all interaction(s) copied to all of the team, as well as planning virtual social events are ways to facilitate the integration of a fully remote employee into the team. Partnerships with national non-profits can provide volunteer opportunities in which team members, participating in different locations, can contribute to the same event, instilling the culture through shared experience. Pre and post virtual team events can help solidify the values of the culture. Periodic online meet-ups with C-Suite, vendors, and clients as well as webinars and employer-sponsored online association memberships can also help the apprentice experience involvement in the CoP. Weekly mentor reports to the C-Suite can help bridge the gap that may exist between managers and onsite versus virtual apprentices; keeping them abreast of the development and needs of the remote apprentices. If the opportunities afforded by proximity

to onsite apprentices are carefully considered, and efforts are made to ensure those opportunities are available to fully remote apprentices, the perceived value of a face-to-face apprenticeship should equal that of a fully remote apprenticeship.

Stakeholders stressed the need for a well-planned, well-developed program if a fully remote apprenticeship is to become a viable alternative to face-to-face apprenticeship. I believe intentionality to be the main determinant of the success of achieving a functionally equivalent fully remote apprenticeship experience for mentor and apprentice. Adaptation of methods used to teach life skills, to socialize together, to experience contact with the C-Suite and broader community will require thoughtful effort, but are certainly possible. I do not believe they will happen, however, without an intentional decision to make integration of the apprentice into the culture and CoP a priority.

5.4 Path of Inclusion for Access-Limited Populations—Possible but Phased

Access-limited individuals encounter impairments, barriers, or constraints that impede their ability to participate fully in common opportunities such as apprenticeship. While a FRADS has the potential to open the door to access-limited populations, stakeholders believed widespread adoption is more likely if access is provided initially to all potential apprentices— integrating over time those individuals who currently are not participating in apprenticeship, as the opportunity for a fully remote apprenticeship becomes more ubiquitous. While I resisted this notion at first, as more stakeholders related their experience and the potential downfalls associated with an aggressive program targeting only underserved populations (given the requirements/constraints of grant programs), I realized a staged approach holds a greater likelihood of paving an alternative path of inclusion. Stakeholder Dr. Rebecca Lake gave an example that demonstrates the wisdom of this approach:

> The difficulty is that if you say that only those who are different or have limited-access…are the ones who can use those funds. Sometimes, those funds never get used, and they sit there. Or, they only use a percentage and they sit there. And, they can't do that. Because Feds and States come back and say, "Okay, we gave you $200,000, so you needed to spend it on something." And, so, "Well, we waited and they never came." Well, you can do all the outreach and if the kids don't come, they don't come. So, one of the things you might want to do in that regard is say, we have $200,000 and we must have 10-15% given away to limited-access people who need it...maybe do a step-up, people who live in poverty. And then, there's another percentage, those who are career changers. So, you can stage it like that. But, if you

> get money from the Feds, or even if you took it from the Joy Foundation, or wherever, they would want to see at the end of 6 months… and the end of the year, "Okay, we gave you $200,000. You were supposed to serve 10 people or at least 15%, so how did you do." "Well we really couldn't find it." “Well then, you didn't need this money”. So, you have to be very careful.

In addition, support for Access-Limited populations must be deliberate and purposeful if FRADS are to become a viable path to employment for these individuals. Some stakeholders held a broader view of individuals experiencing access limitations, but expressed difficulty in finding a way to reach and/or serve them. Others—employers who were experiencing difficulty finding qualified workers and/or struggling to recruit appropriate apprentices—were unaware of the potential labor market hidden behind the numerous barriers to employment and apprenticeship. While it is understandable that employers might not be aware of the potential of these populations, a national campaign unveiling this hidden workforce could greatly aid recruitment efforts.

One misconception that emerged was that access-limited individuals may not be motivated and/or lacked basic levels of competency requisite for training: for example, that Hispanics lacked language skills. In actuality, Hispanic/Latino children are often fluent in both English and Spanish, and many of their parents communicate in English as well. Language assimilation increases with every generation and by the 3rd generation, only a minority retain bilingualism (Alba, 2005). While apprentices from access-limited populations may need additional supports until they become adept in the domain, wrap-around services are available in many cases, and can be coordinated with the employer.

While I understand through stakeholder responses and personal experience that the introduction of new services can easily fall by the wayside unless properly planned and managed, I do have one concern in offering a staged approach. Michael Trucano, Senior Education & Technology Policy Specialist and Global Lead for Innovation in Education for the World Bank, refers to a phenomenon known as “The Matthew Effect” in which services designed to improve conditions for marginalized groups end up only utilized by groups already served. If fully remote apprenticeships simply replace face-to-face apprenticeships, serving the same groups of individuals that are already benefitting, then the power of the FRADS is diminished, as the ability to better serve access-limited individuals is inherent in the system (Trucano, 2013).

Most stakeholders believed a FRADS could increase opportunities for access-limited individuals; but, concerns were raised in the following areas:

1. Recruitment. Stakeholders believed some candidates could be recruited using the current recruitment channels and strategies; but, many access-limited individuals are not in the high schools or Community Colleges, and may be marginally attached or under-employed. but not frequenting WIOAs, (agencies formed under the Workforce Innovation and Opportunity Act). Thus, new strategies for recruitment may be necessary. It is possible that a parental campaign and/or social media campaign may be helpful as a way to promote the benefits of apprenticeship opportunities that open doors for these populations. In addition, some recruiting programs look for candidates in gaming forums. Social media and interest forums are other places to find potential candidates.

2. Quality of Candidates. Some stakeholders thought that access-limited individuals may be unable to work as effectively as traditional apprentices due to family responsibilities, transportation issues, and other access-limiting factors. In fully remote employment, positions that require set hours could be impacted by family obligations. In this case, expectations should be agreed upon prior to engaging in the apprenticeship agreement, and a system of accountability similar to that for on-site employees should be used. Where synchronous work is less important, especially later in an apprenticeship or in project work where one individual's work is not impacted by the delivery of another, an apprentice may be given the flexibility to work around family obligations as long as projects are completed on time. In this case, a system of accountability is still necessary throughout the life of the apprenticeship. In reality, many of the limiting factors, such as transportation and/or physical or emotional limitations, cease to be a factor in a FRADS apprenticeship.

5.5 Trends Supporting a Transformational Change

The Evolution of Technology. All stakeholders acknowledged that tech is quickly evolving; and solutions now exist for training and production challenges that were once thought impossible. AI, AR, VR, and haptic devices, as well as 3D printers and CNC machines with small footprints, all hint at the enormous potential of the *future of work*. The expansion of collaboration tools to include video chat, instant messaging, group chat, embedded tools, and scheduling can facilitate the establishment of a trust environment; but, all technology is only as good as the human component driving it. Below are three key principles to keep in mind when using technologies to accomplish work-related goals:

1. Intentionality is critical to the implementation of technologies.
2. Technology is only a facilitator. Keeping a proper perspective of the tools and their capabilities as peripheral to and supportive of the purpose of the apprenticeship is paramount.

3. It is best not to over-estimate or under-estimate the value of technology. Use only the technology(ies) necessary to accomplish the goals. Extraneous technology only complicates and confuses.

Artificial Intelligence (AI), Virtual Reality (VR), and Augmented Reality (AR) are possible solutions to some of the training issues that may exist in some sectors. While only a few of the stakeholders were familiar with the capabilities of VR, this video demonstrates the use of Wrench Oculus Rift™ VR and haptic gloves to teach how to build an engine and is an excellent example of a hands-on skill being taught using virtual reality, and evidences the potential for FRADS in manufacturing environments: https://www.youtube.com/watch?v=CdZCjfWkdZY

The impact of the COVID-19 pandemic on work from home (WFH) has begun the change in mindset so critical for a FRADS. As the transformation continues, it will become much easier to demonstrate the viability of apprenticeship in a WFH environment.

5.6 Final thoughts

The implementation of FRADS represents a transformational large systems change and approaching it as such is integral to potential viability. Including members of all stakeholder groups, and evaluating the system through the eyes of the Citizen Beneficiaries (Apprentices) upon implementation are critical to its success (Caceres et al., 2016). The effects of societal disruption on today's labor market highlights the importance of this study, especially as we can see in real-time the impact of the COVID-19 2020 global pandemic on U.S. apprenticeship.

Anytime a model of learning is adapted for a particular purpose, we risk its potential watering down (Brockmann, et al., 2010; Fuller & Unwin, 2003)—in this case, a redefining of the construct of apprenticeship—in the name of expediency. When I began this study in 2017, there were few instances of remote apprenticeship. The only one I found was a Canadian model that utilized a training center in remote areas of the country in which mentors interacted at set times via livestream. When the second round of U.S. Federal funding was announced, ads for apprenticeships began to appear on many job boards. Few, however, represented true apprenticeships—many requiring years of experience and some even a relevant degree.

Note, for example, this ad on October 1, 2020:

> 1st Shift Toolroom Apprentice. Genesis Products - Goshen, IN $17 - $20 an hour. Tool and Die Experience preferred. Able to use grinding tools. Good with math, reading prints, using calipers, and good with computers.

The concept of apprenticeship is that an employer hires a novice, and teaches him the craft. In most cases of true apprenticeship, a novice should not be expected to already have experience in the field and be adept at even the basics.

The pandemic spawned another type of employment post, virtual apprenticeships. Again, those I have found belie the definition of apprenticeship and seek instead fully qualified workers, with onboarding being promoted as apprenticeship. In cases where an apprenticeship is truly being conducted remotely as a result of the move to WFH, it is unknown whether the mentors, systems, and processes are adequate to facilitate outcomes comparable to a F2FADS.

One example of the redefining of the apprenticeship model of learning to fit a remote delivery system is the replacement of workgroup mentors with virtual mentors from outside the company and workgroup, such as in the case of cybersecurity virtual apprenticeships offered by IQ4 [see http://iq4.com]. While a main construct of mentoring is that one's mentor should not also be one's supervisor, in the apprenticeship model it is important that the novice be apprenticed by their immediate team of experts, which may include their supervisor if that supervisor is a high level expert in the same field. The modeling, oversight, correction, purveyance of tacit knowledge all depend on the close relationship between the expert and the novice apprentices in the conduct of real daily work. It is the close relationship between the mentor(s), the apprentice, and the work that maximizes learning. Please see Appendix L for my personal experience apprenticing an employee using a FRADS.

5.7 Implications for Educators

Apprenticeship has historically been relegated to CTE programs. With the numerous initiatives propagated in response to the labor shortage, more Community Colleges and 3rd Party Intermediaries entered the system. But, only recently, did 4-year Higher Ed assume a role (Huchel, 2019). Youth apprenticeships have become a focal point in the U.S., but, are really in the early

stages; and, 3rd party programs often focus more on skill attainment than the development of the whole person. The 4-year college and university system could help ensure a stricter adherence to the model by designing a program especially suited to the fully remote apprentice. This would mean a focus that is less theoretical—more practical; and would be geared to those individuals who would not normally seek a college degree, but who could benefit from the more holistic approach of higher education. This represents a seeming compromise on the part of the Academe; but, I believe it is merely a transformation that should have happened a long time ago; and, may counter the movement away from college to CTE/OJT. We know adult learners need different methods of instruction (Knowles, 1979). We know that every learner is different and that personalized learning is critical to success (Hwang, et al., 2012). We know more instruction is being delivered remotely and will continue to be in the future. And, WFH is on its way to becoming a norm. The Academe can be a major player in this movement to a FRADS if willing to look at and embrace apprenticeship (including the practical skills/competencies) as within their circle of influence.

5.8 Implications for Research

As a new approach to the delivery of the apprenticeship model of learning, a fully remote apprenticeship delivery system requires a systematic approach to determine the methods and modifications required to ensure outcomes and completion rates comparable to the traditional F2FADS apprenticeships. This study identified key variables that can serve as a basis for future experimental studies:

1) Requisite tech skills (apprentices/mentors)
2) Requisite online relational skills (apprentices/mentors—including collaboration and communication)
3) Methods most effective in building trust relationships necessary for work and learning in a FRADS
4) The Employer Mindset and the importance to the success of a FRADS
5) Best practices for ensuring continual work without disruption
6) Best practices for mentoring in a FRADS including the maximum ratio of mentors to apprentices
7) Current models called apprenticeships and virtual apprenticeships

8) Best practices to integrate a FRADS apprentice into the company culture
9) Best practices to integrate a FRADS apprentice into the community of practice (CoP)
10) An apprentice and mentor vetting process
11) A technology vetting process
12) A system evaluation process
13) Best practices for adjusting assessments for fairness (FRADS vs F2FADS)
14) Critical evaluation points to determine the success of a FRADS: Outcomes, integration, support, deliverables, timeliness, quality of output, overall satisfaction with the experience
15) Need for credentialing criteria for comparing apprenticeships

This study opens the door to numerous opportunities for future research. An Arkansas initiative led by the Arkansas Center for Data Science is moving forward with a FRADS model, and has invited me to participate in the process. This provides an opportunity to study the vetting and delivery processes of their model; although it is unknown at this time if there will be a face-to-face program to provide a basis of comparison of outcomes.

Because of this study, researchers can now *see* some of the components of a FRADS. In the future, researchers can select from the variables identified in this research to design experimental studies that can help refine the FRADS model and demonstrate efficacy; or, conduct research to validate these findings. The relative importance of technology skills, personal and relational skills, and overall fit for a FRADS should be examined. Types of architectures could be defined and compared to determine if some are more suitable to a successful FRADS than others; as well as whether an optimal architecture exists. In regard to the potential for inclusion of access-limited populations, it is important to identify sub-groups of access-limited populations (perhaps by unique solution set) to determine the need for and feasibility of customized delivery systems by sub-group: e.g., individuals with physical disabilities given special technologies; or individuals with social or emotional disabilities using a personalized mentoring solution. Due to the difficulty in identifying access-limited individuals, this focus on sub-groups could also provide the basis for a plan for recruitment.

A study of apprentices/citizen beneficiaries will be important as soon as a model is available. Once a defined model is implemented, it is important to compare its outcomes to a

F2FADS. A longitudinal study looking at the career paths of apprentices in FRADS programs compared to F2FADS programs can lend important insight into the ability of the delivery system(s) to produce similar outcomes. It will also be important to look at a FRADS that utilizes a strategy for integration of apprentices into the corporate culture and CoP to help determine the ability of a FRADS to match the F2FADS experience. In addition, the outcomes, completion rates, and self-reported satisfaction of apprentices assigned to a FRADS experience (including the technology and online interaction, sense of integration into the team and company culture, and evidenced integration—both reported and identified through levels of involvement and interactions) can be studied and compared to F2FADS apprentices to determine the overall equivalency of the construct.

Because of the numerous manifestations of virtual apprenticeships resulting from the pandemic, and the apparent dilution of the construct to include mentoring outside of the workplace, group mentoring in a training context outside of the workplace, and other variations, it will be important to examine the differences in the various approaches identified as FRADS, to catalog them, and to study their respective outcomes. In addition, with the move to WFH, a study that considers the impact of the pandemic on valance and efficacy as they relate to the potential viability of a FRADS could be of interest. Of most benefit, would be a study in which the delivery system is isolated for its contribution to the process by holding all else equal.

This study also demonstrates a methodology for qualitative exploratory studies using a framework to undergird and guide the direction of the study. This methodology can be used by researchers interested in assessing the value of conducting research prior to investing inordinate amounts of resources.

5.9 Informing Theory

While the purpose of exploratory research is not to test or confirm theory, this study successfully used the IEG Service Delivery Evaluation Framework (SDEF) to examine the potential viability of a hypothetical fully remote apprenticeship delivery system. By using the SDEF framework early in the study—even in the identification and selection of key informants (stakeholders)—I demonstrate the value of the framework as a tool to aid in delivery system conceptualization and design. This means that even without the ability to assess implementation and results, the framework can contribute greatly to the exploration of the potential viability of a

new delivery system by leading the examination process through each of the critical components that are integral to viability. In addition, integrating Weiner's (2009) indicators of readiness into the SDEF Enabling Conditions helped me examine key informants' perceptions of the readiness of both the critical stakeholder groups as well as the various market sectors. The stakeholder assessments of readiness helped identify a strategy for introduction and scaling of a FRADS; while their agreement that readiness is critical to the success of the delivery system lends weight to Weiner's theory. In applying the SDEF to apprenticeship, the bi-directional nature of apprenticeship became apparent, and thus revealed the uni-directional nature of the current version of the IEG Service Delivery Evaluation Framework. This suggests the possibility of expanding the IEG framework to account for a bi-directional flow of goods and services. In Summary

The technological stage is set and the pandemic has helped disrupt the status quo—moving work from home closer to the norm. The apprenticeship expansion movement was funded pre-COVID and has an army of facilitators working across the U.S. While unemployment is currently double what it was in January 2020, 6 million jobs remain unfilled (US Bureau of Labor Statistics, 2020a). For those companies who are able to use remote workers, and those who recognize the bottom line benefits of not housing labor, a FRADS could be an important part of their hiring strategy. Apprenticeship as a model of learning is proven. It is time to see if it can be as effective when mediated by technology.

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APPENDIX A. PARTICIPANT INFORMATION AND BIOS

Policy Makers

Daniel Villao | Apprenticeship and Labor National & State Policy

Dr. Pamela Howze | Apprenticeship National & State Policy

Pat McLagan | Expert Large Systems Change

Service Providers

Lonnie Emard | Director of Apprenticeships, ACDS; Former Department of Labor SME

Jackie Allen | Past Program Manager Apprenticeship Works

Lucinda Curry | Director Apprenticeship Works
Richard C. Byrd Institute (RCBI) of Advanced Manufacturing (First-tier supplier to the Department of Defense)

Front Line Providers

Tony Bryan | Providing Apprenticeship Programs and Training

Tammy Simmons | Providing Apprenticeships & Co-Founder of Guilford Apprenticeship Partners

Dr. Rebecca Lake | Apprenticeship Expansion, Apprenticeship Sponsor, & Training Provider

Chris Motz, EJD | Expert in Online Learning

Dr. Gary Bertoline | Dean of Purdue Polytechnic Institute, Recipient of DOL Grant for CyberSecurity Apprenticeship Expansion in Indiana

Dr. Nathan Hartman | Expert in Advanced Manufacturing, Higher Ed, & The Digitization of Manufacturing

Terry Gour | Technology and Managed Services Provider

Kerry Vickers | Technology & Training

Chris Motz, EJD, Vice President, Academic Outreach at University of Maryland
Website: purdueglobal.edu
Contact information: wmotz@purdueglobal.com | linkedin.com/in/chris-motz-ejd-374b629 | @cmotz

Bio: Before being named Regional Vice President of Partnerships & Strategy of Purdue University Global in 2018, W. Christopher Motz was president of the Kaplan University campuses in both Hagerstown and Rockville, Maryland, a position he held since 1998. During his early years at Hagerstown Business College (HBC), Chris demonstrated his commitment to quality of education and his ability to envision growth opportunities.

Starting out as academic dean of the Hagerstown Kaplan campus, over the years, Chris played major roles establishing critical community partnerships; utilizing technology to enhance operations and services; ensuring federal and state compliance; and overseeing operations of two Kaplan campuses. Under Chris' leadership, on-campus enrollment increased from 350 to 950 students, and revenue from $2M to $11M. Leading the institution to achieve regional accreditation, Chris also established workforce development programs generating in excess of $100k annually, initiated international partnerships in Asia, and successfully opened a branch campus in Frederick, Maryland, and a learning center in Rockville, Maryland. Today after transitioning to a four-year bachelor and master's degree granting institution, approximately 30,000 students enrolled at Kaplan University are Purdue University Global students.

Chris' experience includes facilities development, technology expansion, student success initiatives such as incorporating student internships into Career Services, and expanding virtual support services for remote students. He received a B.A. in religion from Huntington College, Indiana, and holds two graduate degrees: a master's degree in divinity from Huntington and a master's degree in higher education from Ball State University, also in Indiana. He is also a graduate of the Institute for Educational Management at Harvard University's Graduate School of Education; and, most recently received his EJD from the Concord Law School at Purdue University Global.

Awards and Affiliations (A sampling)
2018 Washington County Business Person of the Year
2010 Kaplan Higher Education Developing People Award
2000 Kaplan Higher Education President of the Year
Member, Society for Human Resource Management
Immediate Past Chair, The Greater Hagerstown Committee
Member, Board of Directors, OnTrack Washington County
Member, Executive Board, Mason-Dixon Council, Boy Scouts of America

Presentations
Co-Presenter: The Importance of Community Engagement in the U.S. and its Application in China. Guangzhou Bureau of Media Specialists, Hagerstown, Maryland, June 2016

Presenter: Managing Overseas Employees. Society for Human Resource Management China 2015. HR Summit, Beijing, China, September 2015

Presenter: Emerging Trends in American Higher Education. State Administration of Foreign Expert Affairs Meeting, Beijing, China, November 2011

Daniel Villao, Chief Executive Officer, Intelligent Partnerships | Former Deputy Administrator, Office of Apprenticeship, U.S. Department of Labor

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Statement: Leading Transformation Through Value Driven Impact Design
With workplace technology evolving at such a rapid pace, it is becoming increasingly important for companies to find appropriate blended strategies for workforce solutions in order to retain priceless institutional knowledge and valuable human capital.

Bio: With decades of experience in policy development, Daniel Villao has had proven success in innovative supplier-access design and training. An agent of change and value-oriented problem solver, Daniel specializes in implementing an innovative and accessible workforce design that transforms businesses and adds value to all aspects of organizations. He excels in working closely with stake-holders to drive positive organizational change, having successfully helped major employers such as Microsoft™, Lufthansa™, Zurich, and AON adopt apprenticeship to create workforce development systems in his capacity as Deputy Administrator. Daniel has dedicated his career to analyzing the ever-changing workplace landscape and helping organizations navigate the world of work to create jobs that make sense in emerging models.

Daniel holds a BA and MBA from Phoenix University, and has served as Council Representative to the LA/OC Building & Construction Trades Council; State Director of the UCLA Labor Center; Program Manager—Labor Equity for the City of Seattle; and prior to his most recent position as Principal—Managing Partner at Intelligent Partnerships, he served as Deputy Administrator for the U.S. Department of Labor, Office of Apprenticeship.

Publications: Nationally acclaimed author of Beyond Green Jobs (UCLA Press 2013)

Affiliations and Positions Held:

Former Deputy Administrator, U.S. Office of Apprenticeship, U.S. Department of Labor
Chairman of the Board, Association of Latino Professionals for America (ALPFA)
Created diversity access for minority and disenfranchised contractors and workforces
Architect of the City of Seattle's Labor Equity Program

Areas of Expertise:
Registered Apprenticeships

Impact Job Creation
World of Work
Business Value in Work-force Design
Market Capture Through Inclusion Strategies
Employees as Passion Drivers

Dr. Gary Bertoline, Dean & Distinguished Professor, Polytechnic Institute at Purdue University
Website: https://polytechnic.purdue.edu/
Contact information: bertoline@purdue.edu | linkedin.com/in/gary-bertoline-8947713 | @GaryBertoline

Bio: Since 2011, Dr. Gary R. Bertoline has served as Dean of the Purdue Polytechnic Institute and a Distinguished Professor of Computer Graphics Technology and Computer & Information Technology at Purdue University. He earned his PhD at The Ohio State University before coming to Purdue University in 1990. He co-founded the Indiana Next Generation Manufacturing Competitiveness Center (IN-MaC) as well as the Polytechnic Institute initiative at Purdue University.

The Polytechnic initiative at Purdue is a major effort to transform the learning experience of students to better prepare graduates for life and work in the digital age. Gary also is the visionary leader for the Purdue Polytechnic High School – Indianapolis a charter school that opened on July 31, 2017. The high school will help close the educational gap for many underserved Indianapolis students.

He has authored numerous papers in journals and trade publications on engineering and computer graphics, computer-aided design, and visualization research. He has authored and co-authored seven text books in the areas of computer-aided design and engineering design graphics. Gary is a futurist with research interests in scientific visualization, interactive immersive environments, distributed and grid computing, and workforce and STEM education.

Awards and Honors (Sampling)

2014 Purdue Excellence in Research Award
2012 Ohio State Career Achievement Award
2008 Mira Award for Indiana Technology Leaders
2004 Distinguished Service Award
2003 Honorary Doctorate of Technology, Norther Michigan University

National and International Offices and Leadership Positions (Sampling)

McGraw Hill Publishing Company, K-12 Engineering & Technology STEM Education Advisory Board
Appointment by the PI of NSF XD grant to lead $160million National Campus Bridging Program Grant
Co-Chair NSF Task Force for Cyberlearning & Workforce Development

Related Publications (Sampling)

Fundamentals of Graphics Communications, Gary R. Bertoine and Eric N. Wiebe

Chandramouli, M., Bertoline, G., Elbadwi A.Q. I. (2014) Geometry and Graphics for Developing a Multimodal Multidimensional Desktop Virtual Reality framework, Proc. of the Annual Conf. of the International Association of Journals & Conferences, Orlando, FL.

Chandramouli, M., Takahashi, & Bertoline. G. R. (2014) Desktop VR Centered Project Based Learning in ET Courses Using a Low-cost Portable VR System, Proc. of the American Association of Engineering Education Conference, Indianapolis, IN.

Dr. Nathan Hartman, Dauch Family Professor of Advanced Manufacturing and Department Head, Computer Graphics Technology at Purdue University
Website: polytechnic.purdue.edu/profile/nhartman
Contact information: nhartman@purdue.edu | linkedin.com/in/nathanhartman | @CGT_Purdue

Bio: In 2011, Professor Hartman was designated a University Faculty Scholar. Professor Hartman's research areas focus on the process and methodology for creating model-based definitions; the use of the model-based definition in the product lifecycle; developing the model-based enterprise; geometry automation; and data standards, interoperability, and re-use; and digital transformation of the manufacturing enterprise.

Professor Hartman's industry research partners include Rolls Royce, Cummins, Boeing, GM, Collins Aerospace, Textron, Gulfstream, Procter & Gamble, GM, Honda, and others. He has also done funded research work through NSF, DMDII, and NIST programs. Professor Hartman has been PI, Co-PI, or Senior Personnel on grant proposals to support his academic interests which have resulted in direct funding totaling over $10,000,000.

As an active leader of industry research and engagement in the Polytechnic Institute, Professor Hartman is currently serving as the Purdue principal investigator for the MxD Institute (formerly DMDII), and serves as a subject matter expert in PLM and digital transformation for the U.S. Air Force, U.S. Navy, and several corporations. Prior to his tenure at Purdue University, Professor Hartman worked for Fairfield Manufacturing, Caterpillar, and Rand Worldwide. He holds and BS in Technical Graphics and an MS in Industrial Technology form Purdue University, and a Doctorate in Technology Education (with emphases in cognitive psychology and training and development) from North Carolina State University.

Research Grants and Awards
Implementation Plan Support for Digital Engineering Center of Excellence (Jan '20)
Product Lifecycle Management Center of Excellence (PLM) (Jul '19)
Completing the Model-Based Definition: Capturing Product Behavioral and Contextual Characteristics (Jun '18)
Product Lifecycle Management Center of Excellence (PLM) (Jun '18)
Expanding Augmented Reality Technologies in Cummins - Service Engineering and Field Service Applications to Deliver Rapid Information Access (Feb '18)
Development of Model Based Engineering (MBE) Processes
Creating a Prosperous Economic Ecosystem in the Wabash Heartland

Dr. Pamela Howze, Partner at American Apprenticeship Center, LLC

Contact information: asnpam@carolina.rr.com | linkedin.com/in/phowze |@drpamhowze

Bio: Dr. Pamela Howze is Executive Director of the Wake Tech Apprenticeship, Customized Training, and Work Based Learning. Previously she served as a Program Director for the National Fund for Workforce Solutions in Washington, DC to expand apprenticeships and work based learning across the nation. Prior to joining the National Fund, she was the statewide director of Apprenticeship, Business and Veterans Services for the North Carolina Department of Commerce/NC-Works. Prior to that she worked in private industry for both Siemens and Merck as a Chief Learning Officer focusing on Workforce Development and Apprenticeships for five years.

Dr. Howze has taught in both the North Carolina and South Carolina Community College systems for more than 20 years. She began her career as a U.S. Army Officer and served for seven years both on active duty and in the S.C. National Guard. She earned a B.S. degree from Western Carolina University and an M.S. degree from Troy State University. She was awarded a Doctorate of Education in Adult and Community College Education in August 2015 by North Carolina State University for her research in career technical education and apprenticeship publishing a phenomenology study on Youth Apprenticeships.

Publications

Making Youth Apprenticeship Equitable and Effective: Lessons from NC (Case Study)
Industry Recognized Apprenticeships (Blog)
Building Community Partnerships for Youth Apprenticeships: A Systems Thinking Approach (Blog)
Talent Development Pipeline for Youth Creating a Career Ready Workforce in NC (Policy Brief)
Talent Development Pipeline for Youth: Creating a Career Ready Workforce in North Carolina (Fact Sheet)
American Apprenticeship as a Transformative Learning Experience: A Phenomenology (Dissertation)
Beyond Reflective Practices (Book Review)

Affiliations

Veteran, US Army
Apprenticeship State Expansion Grants, Maher and Maher
Technical Advisor - Partners to Advance Youth Apprenticeship

Dr. Rebecca Lake, Dean, Workforce and Economic Development
Website: harpercollege.edu
Contact information: rlake@harpercollege.edu | rslake1@comcast.net (next 30 days) | linkedin.com/in/rebecca-lake-03156686 | ph. 708-655-5151

Bio: Rebecca Lake is the Dean of Workforce and Economic Development at Harper College. She is an Apprenticeship USA Leader and oversees Harper's strategic registered apprenticeship activities. Before coming to Harper, Lake created the Community College Leadership (CCL) doctoral program at National Louis University, serving as program director for 10 years.

Dr. Lake spent the first half of her professional life involved in health planning, hospital and health care administration, and nursing while the second half in community college teaching and administration. Dr. Lake has held community college positions of faculty, assistant dean, career and technology (CTE) dean, and academic vice-president. She also served as Midwest Regional Director, National League of Cities, Chicago, IL.

Publications:
The Secret Is Out: The Potential for Apprenticeship
Community colleges in a global society: An evolution of models and student trends
Undertaking higher education global research: A practical endeavor
The Concept of Globalization in the Curriculum: Hidden or Embedded Programming at Community Colleges

Jackie Allen, Former Program Manager, Robert C. Byrd Institute for Advanced Manufacturing
Website: rcbi.org
Contact Information: jackieinwv@yahoo.com| linkedin.com/in/jackie-allen-19553416

Bio: Jackie Allen's background includes managerial experience in manufacturing, providing critical expertise for her position as Program Manager at the Robert C. Byrd Institute for Advanced Manufacturing. Part of Marshall University in Huntington, WV, RCBI is the recipient of a DOL grant to expand apprenticeship in manufacturing. Jackie's role was to present the Apprenticeship Works program to manufacturing companies, manufacturing associations and governmental agencies throughout the U.S. She also processed contracts and apprenticeship paperwork and utilized ToolingU (an manufacturing competencies LMS) to administer the apprentice related training.

Jackie has served as manager of internal and external customer relationships, operations manager, production supervisor; and has managed and mentored technicians in electronic gaming, oxygen sensor manufacturing, and telecommunications. She has overseen TS-16959, ISO-14001, OSHA, Gaming regulations and monitored (Lean Six Sigma) kosu (productivity) and (Mozukuri) budomari (defect rate goals). Jackie was Production Manager at NGK Spark Plugs (USA), Inc., and Operations Area Manager for Lucent Technologies. In 2017 she became President of the Calhoun County Board of Education.

Jackie holds a BBA from the University of Kentucky with Departmental Honors in Decision Sciences and Information Systems.

Kerry Vickers, Chief Information Security Officer, Aunalytics
Website: aunalytics.com
Contact information: kerry.vickers@microintegration.net |linkedin.com/in/kerry-vickers-73026817

Bio: As CIO for Aunalytics, Kerry's main role is to provide management and oversight for Security and Compliance, Risk Management, Research and Development. He has served as Vice President of IT for both a large manufacturer as well as a Senior Technical Trainer/Consultant for a national technology training firm. His previous work experience includes 9 years in the United States Navy as an Aviation Electronics Technician. Over the years, for various employers (including Signal Learning), Kerry developed curriculum to train employees in things such as ERP systems and security, facilitated online training for remote students, and participated in policy making as a member of the leadership team(s).

Kerry, a Desert Shield/Desert Storm Veteran, also spent 3 years teaching electronics at the Navy's Aviation Electronics School. Kerry holds an undergraduate degree from Southwest Tennessee. He also serves on the Board of Directors for BOSCO Uganda, and supports long-term technical strategy, and project planning for the non-profit organization.

Certifications:

Sophos™ Certified Engineer & Architect (2017)
Citrix™ CCEE, CCEA, CCI (current platforms for 2011)
Microsoft™ MCSE: Security, MCITP, MCT (current platform 2008)
Cisco™ CCNA (2005 platforms)

Specialties: Network infrastructure services, solution consulting, technical training, virtualization & application delivery solutions, network security services, Exchange 2007 & 2010, IT services management, Citrix solutions expert

Lonnie Emard, Apprenticeship Director, Arkansas Data Science Center
Website: acds.co | @ARDataSciences
Contact information: lemard@acds.co | linkedin.com/in/lonnie-emard-9687b2131 | @LonnieEmard

Bio: With over 35 years in the Information Technology profession, Lonnie Emard's versatile background combined with his leadership and technical knowledge provide a valuable set of organizational design, human capital and business strategy capabilities, helping ASDC become one of the nation's leaders in the field. His national experience and work as a DOL SME has proven instrumental in the development of a dynamic Apprenticeship Program for the state of Arkansas and surrounding areas.

As Co-Founder of IT-oLogy in collaboration with the CIO of BCBSSC (Blue Cross Blue Shield South Carolina), IBM and the University of South Carolina, Lonnie helped bring together hundreds of companies, universities, tech colleges, social service organizations and economic development leaders with the mission of collaboratively advancing IT talent in the US. He designed and implemented three initiatives to advance IT talent from K-12 (Promote IT) through higher-Ed (Teach IT) and into the workforce with professional development (Grow IT) as a supply chain management strategy.

Also responsible for the non-profit consortium, Lonnie helped raise over $20 million in revenue since its inception, reaching over 100,000 students and career changing adults and increasing enrollment by more than 30% in computing and IT related fields. Lonnie specializes in connecting employers, education providers and diverse candidate pools to complete registered apprenticeships, as well as facilitating the creation of large networks of collaborating non-profit organizations and agencies along with public and private sectors to produce more cost effective community programs.

Lucinda Curry, Director of Apprenticeship Works, Robert C. Byrd Institute
Website: rcbi.org
Contact information: lcurry@rcbi.org | linkedin.com/in/lucinda-curry-63839925 | @RCBIMfg

Bio: Lucinda has over 30 years of experience in workforce development, enrollment management, and customized training. She has been at the Robert C. Byrd Institute at Marshall University for the last 11 years as the Director of Workforce Development/Director of Apprenticeship Works, leading the National Advanced Manufacturing Apprenticeship Partnership (NAMAP) team under a DOL American Apprenticeship Initiative (AAI) grant. In this capacity, Lucinda's duties include coordinating public programs in partnership with community colleges. She has also helped design curriculum with RCBI partners for online related instruction. These include associate degree programs in machining and welding and CNC. She also directs and coordinates the customized training for industrial clients.

In leading the Marshall University Research Corporation American Apprenticeship Initiative Grant, Lucinda supervises project managers and technical trainers; does outreach on the national level; and, works with partner organizations around the country to develop and expand apprenticeship in advance manufacturing occupations.

She is involved in and is a WIOA board member; and has served on two (WIOA) boards in two different regions. Currently, she is on Region 3 in West Virginia, and has a hand in some policy development. At the State level, she attends the State Workforce Board meetings and has presented on manufacturing as an industry, highlighting their training needs. As a part of her work with the AAI grant, she also works with the Governor's Association giving recommendations for policy.

Lucinda has over two decades of experience in education. Prior to her work at RCBI, Lucinda was Director of Enrollment at Mountain State University. Her experience also includes Associate Director at West Virginia Junior College and Office Manager at University of Southern California, European Division, Germany. While living in Germany, she attended the University of Maryland, European Division and earned a Bachelor of Science degree in Organizational Leadership Management and Development from Mountain State University. Lucinda holds a master's degree in non-profit and public agency leadership from Marshall University.

For more than 30 years RCBI has provided access to cutting edge technology and technical training to manufacturers across the region. Operating Advanced Manufacturing Technology Centers in Huntington, Charleston, and Bridgeport, its mission includes developing a quality, just-in-time supplier base for the Department of Defense, NASA and the commercial sector.

Pat McLagan, CEO at McLagan International, Inc.
Website: mclaganint.com
Contact information: patmclagan@gmail.com | linkedin.com/in/patmclagan | patmclagan
Statement: Leading change and learning in our tech-enhanced, information-filled, networked world.

Bio. Pat's life and work focus on personal and institutional transformation and learning. She has been a key player in the midst of decades of institutional change. She writes, speaks and consults on leadership, strategy execution, the learning enterprise, and on the successful implementation of major changes, especially changes focused on transcending traditional boundaries across levels and organization silos and other boundaries. She draws extensively on both experience and on the world's research into what works to achieve sustained results and change in organizations and across supply chains and value networks.

Pat's vision and strategies promote and support participative governance, partnerships across the value stream, high levels of personal accountability, optimization of leader-follower relationships, and creating learning and development cultures. She believes that we are living through a time of transformation of human institutions and the human spirit where everyone has an opportunity and responsibility to significantly influence the future She talks about, writes about, and helps leaders and institutions act on today's leadership, citizenship, productivity, and innovation challenges. She also focuses on integrating technology and people in ways that help both the organization and its people to flourish.

Experience: Extensive work with NASA executives during the transition years between the moonwalks and space shuttle; with General Electric (corporate and various businesses) during its major shift from conventional to electronic technology in the 70's and 80's; and with AT&T and Baby Bells during the telecommunications renaissance of the 80's and 90's. More recently, she guided major strategy execution, leadership development and change projects in technology companies, financial services institutions, utilities, government agencies —including work with the Defense Intelligence Agency in the aftermath of 911 and with the Governor of the State of Georgia on a major statewide transformation initiative. She has worked on major projects with organizations on 6 continents, including extensive work on large-scale change projects in South Africa since the mid-80's.

Publications
Unstoppable You: Adopt the New Learning 4.0 Mindset and Change Your Life (May 2017)
Unleash Unstoppable Learning: A Guide for Learning Professionals
The Shadow Side of Power: Lessons for Leaders
Change Is Everybody's Business
The Age of Participation: New Governance for the Workplace and the World
On The Level: Performance Communication That Works
Helping Others Learn: Designing Programs for Adults

Awards & Honors
Thought Leadership Award, Instructional Systems Association
Top 100 Distinguished Alumni of the Century, University of Minnesota College of Adult and Human Development
Honorary Professor, Human Resource Management
Gordon Bliss Memorial Award
Phi Beta Kappa International
Adult and Continuing Education Hall of Fame

Tammy Simmons, Partner at American Apprenticeship Center, LLC | VP Marketing & Culture Machine Specialties, Inc.

Website: Machspec.com

Contact information: tammy@machspec.com | linkedin.com/in/tammy-simmons-727aa04a

Bio: Tammy Simmons is Vice President of Marketing & Culture at Machine Specialties Inc. (MSI) in Greensboro NC, a producer of machined parts for the Aerospace, Medical, Military, Commercial and Energy Industries. MSI has parts on the Mars Rover, the space station, and multiple aircraft programs. They also manufacture surgical replacement parts.

Tammy has been instrumental in designing and implementing Guilford Apprenticeship Partners (GAP) in Guildford County, NC and RockAtop in Rockingham County, NC. She uses apprenticeships in her business to hire and train for highly skilled advanced manufacturing positions. Her company currently has 16 registered youth apprentices. Tammy is also a speaker throughout NC promoting apprenticeships and advising other apprenticeship programs.

Relevant Experience:
Designer/Founder Guilford Apprenticeship Partners
National Apprenticeship Panelist—Aspen Institute
National Apprenticeship Panelist—New America Institute
Addressed U.S. Congress in 2017 and 2018 on behalf of apprenticeship programs

Terry Gour, Cloud & Managed Services President & COO
Website: aunalytics.com
Contact information: tgour@microintegration.net | linkedin.com/in/terry-gour-5396303 | @Aunalytics

Bio: Terry Gour oversees the operations of Aunalytics Cloud and Managed Services division. As a young entrepreneur, in the early years of personal computers, Terry started his first company in 1999 with a $2000 loan—enough for one and a half month's rent and one PC. He quickly realized that the money wasn't in building individual PC's; rather in networks. Without the funds to pay for classes to become a CNE (Novell Networking's credential at the time), Terry sold a Novell network, figured out how to make it work, and used the money to start earning credentials.

As protocols began to change, Terry became one of the area's first IP, email, and hosting providers. A Microsoft™ Gold partnership soon followed, and with it Microsoft's™ networking solution, Windows NT Server. Terry, now an MSCE, built a team, serving both as President and chief engineer. A data center followed and around 2005, Terry became one of the first cloud-based solutions providers, working with Plato Courseware to provide a hosted standards-based online learning solution for over 10,000 students and adults.

Evolving into a provider of managed services in the Cloud environment with ten (10) data centers, MicroIntegration (now Aunalytics) has continued to expand—providing scalable, secure, and flexible solutions to Fortune 100 clients; including medical, government, banking, and education customers. Terry has since stepped out of the engineering role and into operations and leadership development.

Tony Bryan, Executive Director, CyberUp
Website: wecyberup.org
Contact information: tony@wecyberup.org | linkedin.com/in/anthonybryan1 | @lead_the_way

Bio: Tony is a U.S. Army veteran, lover of St. Louis, and a self-proclaimed "nonprofit nerd." He has served the regional nonprofit ecosystem for over 10 years in varying roles and currently serves as the Executive Director of CyberUp. When he is not working, he enjoys spending time with his wife Addie and their four children. He obsesses over football way too much. He plays way too many video games (Apex is his current favorite) and helps other nonprofits meet their goals through volunteering and board service.

At CyberUp, Tony helps connect employers and apprentices. His unique service offerings include serving as an employment intermediary; providing the educational component through stacked credentials specifically geared toward cybersecurity; and, providing mentoring services using Slack, meetups, and monthly check-ins. In the military, Tony served as both a drill sergeant and training sergeant, as well as working in supply chain logistics. Populations of special interest to Tony and CyberUp include women, people of color, and veterans. CyberUp offers opportunity to both youth and adults. Tony sees apprenticeship as the future of employment, and envisions a future wherein CyberUp is able to offer security services to small businesses in rural communities that don't have the required infrastructure.

Publications

Open Source Collaboration, 2019. Trajectory. https://trajectorymagazine.com/open-source-collaboration

Affiliations and Honors

Co-Chair, National Initiative for Cybersecurity Education (NICE) Apprenticeship Working Group
Member of 2014 Vision Leadership Program
The Top 40 Under 40 Military Class of 2011
Commandant's List for Drill Sergeant School

APPENDIX B. IEG ANALYTICAL PROTOCOL (Caceres, et al., 2016)

IEG Analytical Protocol

Guidance Questions for each item in the Framework (figure 3.1)

I. BASIC PROJECT INFORMATION

I. A. Country

I. B. Region

I. C. Country Type

I. D. Project

I. E. Project Approval

I. F. Project Closing

I. G. Financing Institution

I. H. Sector

I. I. Services Relevant to SD

I. J. Components Unrelated to SD

I. K. SD Screening Question: Project has nothing to do with SD (If yes, skip remaining questions)

II. ENABLING CONDITION

II. A. Was Political Economy Analysis included?

II. A.1. If included, describe findings in relation to service delivery or the model of service delivery?

II.A.2. If yes, for which level?

II.B. Was Leadership Development included?

II. B.1. If included, describe how it is related to service delivery or the model of service delivery?

II.B.2. If yes, for which level?

II. C. Was Policy Development included?

II.C.1. If yes, describe its relation to service delivery or the model of service delivery?

II.C.2. If yes, for which level?

II. D. Was Capacity Development included?

II.D.1. If yes, describe its relation to service delivery or the model of service delivery?

II.D.2. If yes, for which level?

II.E. Was Budgeting included?

II.E.1. If yes, describe its relation to service delivery or the model of service delivery?

II.E.2. If yes, for which level?

II.F. Was Regulatory and Legal Development included?

II.F.1. If yes, describe its relation to service delivery or the model of service delivery?

II.F.2. If yes, for which level?

II.G. Was Data systems included?

II.G.1. If yes, describe its relation to service delivery or the model of service delivery?

II.G.2. If yes, for which level?

II.H. Was Supply chain (i.e., production of goods and materials to be used in service delivery) included?

II.H.1. If yes, describe its relation to service delivery or the model of service delivery?

II.H.2. If yes, for which level?

II.I. Was Public Financial Management included?

II.I. 1. If yes, describe its relation to service delivery or the model of service delivery?

II.I .2. If yes, for which level?

II.J. Was country procurement system chain included?

II.J.1. If yes, describe its relation to service delivery or the model of service delivery?

II.J. 2. If yes, for which level?

II.K. Was any other enabling condition included? If yes, specify.

II.K.1. If yes, describe its relation to service delivery or the model of service delivery?

II.K.2. If yes, for which level?

II.I. Did the PAD describe contextual conditions that impinge directly on service delivery (such as inadvertent gender differences between service providers and service beneficiaries)?

II.I.i. If yes, did design, planning, or implementation explicitly take account?

II.I.1a. How?

III. SERVICE DELIVERY INPUTS:

III.A. Did PAD describe Funding for capital, operation, and maintenance?

III.B. Did PAD discuss Service Providers and Managers? How?

III.B.1. Was training provided for Service providers and managers

III.B.2. If yes, what was focus of training

III.C Was Technology included?

III.D Was design of service delivery supported?

III.D.1 Identification of beneficiaries- were citizen beneficiaries specified.

III.D.1.a. What was the basis for determining beneficiaries.

III.D.1.b. Are beneficiaries discussed by groups?

III.D.1.c. Which groups of beneficiaries are described?

III.D.1.d. Did the appraisal document describe barriers to the service for beneficiaries?

III.D.1.e. Which barriers were reported?

III.D.1.f. Did planning take barriers into account? If so, how?

III.D.3. Was there end to end implementation planning?

III.D.4. Were service standards established?

III.D.5.Was there provision for operation and maintenance?

III. D.6. Was a service monitoring and improvement system developed?

III.D.6.a. Who monitors services

IV. SD IMPLEMENTATION

IV.A. Which model was selected?

IV.B. Central government provision, why was this model selected?

IV.B. 1.Were beneficiaries voice collected in relation to selection of SD model? (skip to selected model)

IV.C. Central govt finance with contracting, why was this model selected

IV.C.1 Contract with whom?

IV.C.2 Type of contract?

IV.C.3 What are government roles?

IV.D. Decentralized govt provision, why was this model selected?

IV.D.2 Was there an analysis of needs?

IV.D.2.a. Was the analysis conducted in relation to service provider or manager needs or capacity? Describe what was identified.

IV.D.2.b. Was the analysis conducted in relation to citizen beneficiaries needs or expectations? Describe what was identified.

IV.D.2.c. Was the analysis done for particular groups of beneficiaries? Which ones?

IV.D.2.d. Was there analysis of the existing SD model and its suitability?

IV.E. Decentralized govt financing with contracting, why was this model selected?

IV.E.1. Contract with whom

IV.E.2. Type of contract?

IV.E.3. What are government roles?

IV.F. Hybrid between central and decentral govt finance with contracting, why was this model selected

IV.F.1 Contract with whom?

IV.F.2 Type of contract?

IV.F. 3. What are government roles at each level?

IV.G. Hybrid between Central and decentral govt provision, why was this model selected?

IV. G1. What are government roles at each level?

IV.H. Private sector provision, why was this model selected? IV.H1. Which type of operating license for the service?

IV.I. Public-private partnerships, why was this model selected?

IV.I.1. What is contract type?

IV.I.2. What are roles between private and government for design, build, operate, and maintain (if new)? If existing (operate and maintain)

IV.I.3. Are there rules in how the government selects and manages the PPP?

IV.J. Citizen-directed provision, why was this model selected? IV.J1. Did citizen design services such as CDD?

IV.J.2. Did citizen influence market such as voucher? If yes, explain

IV. K. Other innovative provision- (specify), why was this model selected?

IV. L. Is there cost recovery or subsidy mechanism? If yes, describe

IV. M. Is there a feedback loop?

IV.M.1. Was feedback used to adapt implementation If yes, explain.

V. SERVICE OUTPUTS

V. A. Were outputs tracked in relation to service provider performance? If yes, specify

V. B. Is there an accountability mechanism?

V.B.1. Which mechanism?

V. B.2. Which group is involved?

V. B.3. How does this mechanism hold service managers and providers accountable?

V. C. Was there a mechanism to control service quality?

V.D . Are other service outputs tracked?

VI. SERVICE OUTCOME

VI. A. Which service outcomes were tracked?

VI.B. Did the project collect disaggregated data? How are data disaggregated?

Are beneficiary outcomes tracked? Which ones?

Are trend data tracked?

VII. LESSON LEARNED ABOUT SERVICE DELIVERY MODEL

VII. A. Is the SD model achieving the expected results?

VII. B. Is the SD model meeting citizens' expectations?

VII.C. Did enabling conditions or inputs impact implementation of SD model? If yes, how?

VII.D. Are lessons evident from SD model as implemented? If yes, summarize.

VII.E. Are changes to the SD model being considered?

Adaptation of IEG Early Version of Analytical Protocol (IEG, 2016, Appendix G)	Notes for Cataloging Responses
Country	USA
Project	Fully Remote Apprenticeship Delivery System
Service Delivery Component	
Project Approval Date	
Project Closing Date	
I. SERVICE DEFINITION (SECTOR-WIDE LEVEL)	
A. Sector/ Sub-sector	Education
(subsector)	Apprenticeship
B. Services being delivered	Apprenticeship (knowledge and practical skills training)
C. Level of Support	
	Note references to unique entities requiring support
Direct	
To beneficiaries (individual users)	
To front-line providers	
Indirect	
To managers	
Of which, non-state managers (NGOs, private sector)	
Of which, state managers (central govt, decentralized govt, semi-autonomous public entity)	
D. Service Delivery Arrangement	
Central government	In this case the Federal Government
Central govt financing with contracting	
Central govt provision	
Of which, capital/investment costs (infrastructure)	
Of which, operational costs	
Local govt	In this case, states, reservations, cities, towns, etc.

Local govt financing with contracting	
Local govt provision	
Of which, capital/investment costs (infrastructure)	
Of which, operational costs	
Clients	Citizen Beneficiaries
Client power — contracts	
Client power — self monitoring providers	
Client power — community control, vouchers	
Client power — imitate market	
E. Service Area	Note also if Global is mentioned
National	
Regional	
Municipal	
Municipal region	
Community/ neighborhood	
Other	Specifically note if remote locations are mentioned
F. Point of Use	Note any mentions of "where"
Facility	
Of which, networked to other facilities	
Via technology or mobile	NOTE: For purposes of this study
Local system	
Of which, roads	
Of which, water supply	
Of which, sanitation	
Other	
G. Service Fee (paid by)	Note any discussion of funding
Government	Federal / State
Users	
Other	Industry
H. Service Fee (financing mechanism)	Note any references to financing
Cost recovery (full or partial)	
Tariffs (e.g., integrated tariff systems, polluter pays)	
Subsidy	
User fees	
Concession	
Carbon bonds	
Mobility fund	
Other	
No cost recovery mechanism	
Govt funded (including Bank through project lending)	
Donor funded (not including Bank loan, but other development partners)	
Industry funded	
Other	

I. Service Reaching Poor Users	NOTE: Access-limited for this study
Intended to reach the poor	
How are "poor" defined?	
II. PROJECT DESIGN & IMPLEMENTATION	
A. Prior analytic work	Note any known prior work
Assessment of users	
User needs (includes lack of knowledge)	
User demand/ voice	
Assessment of providers/managers	
Implementation capacity	
Assessment of state	
Institutional capacity	
Identification of barriers to service delivery (source: PAD Sect 2, Annex on Sector Social Assessment section 2, Annex on sector background or social assessment)	
Heterogeneity of users	
Accessibility (point of use, all users including disabled)	NOTE: All AND logistically challenged for this study
Affordability (defining poor, how much to subsidize, willingness to pay)	
Efficiency	
Gender equality	
Safety	
Environmental implications	
Other	Note barriers
B. Service Delivery Arrangements	Note if mentioned as a method
Implementation Model	
Central government	
PMU Central government	
Mainstreamed into Ministry	
Decentralized government	
Frontline professionals	
Private organization	
Community	
Public/private partnerships	
Other	
Characteristics of Access to Service Facilities	Homes / Centralized Public Access / Private Cubicles
Densely populated group of users	
Walking distance	Outside walking distance to traditional Apprenticeship
Geographic barriers	NOTE: Relevance = Infrastructure (Access)
Other	

C. Key Design Features (and comments on whether it was implemented as planned)	This is Pre-Work: Which are applicable?
User targeting mechanism	X
Formal mechanism to identify beneficiaries	X
Of which, mechanism to reach the poor	Note: Access-limited
Activities to generate demand among users	X
Support for Quality of services	X
Providers' training/certification standards	X
User education/training/orientation in using service	X
State-of-the-art technology	X
Technical standards	X
Other	
Innovations in service delivery (e.g., technology)	X
Accountability	X
State	
Measures to increase accountability of state	X
Providers	
Measures to increase accountability of providers to the state	X
Measures to increase accountability of providers to beneficiaries	X
Citizens (Beneficiaries)	
Measures to increase accountability of Citizen Beneficiaries	
Measures to increase participation	Note if mentioned
Participatory design (tailor services to demand)	
Participatory implementation/ management	
Participatory monitoring/feedback	
Of which, includes incentives for citizens to monitor	
Measures to increase voice	Note if mentioned
Monitoring and Evaluation	
Source of monitoring	
Government	
Project implementation unit	
Third party	
Frontline professionals	
Community	
User (Citizen beneficiaries)	
Other	
Evaluation mechanism	Note if mentioned
Regular monitoring (e.g., MIS)	
Learning cycle (learning/providing feedback/adjusting delivery model)	
Surveys	
Planned impact evaluation	
Other	

Monitoring characteristics	Note if mentioned
Easy to monitor	
Done in real time	
Other	
Assessing fidelity	Note if mentioned
Includes plan for dissemination/sharing	
Other	
III. PROJECT PERFORMANCE/OUTCOMES	This will be assumptions/suggestions
A. Outputs	
Facilities	
Supplies	
Personnel	
Other	
B. Service Delivery Outcomes	
Among the project population	
Total # direct beneficiaries	
Access/Coverage	
Quality	
Efficiency	
Affordability	
Other	
Expected Outcomes among the poor (if any)	NOTE: For this study "among the access-limited"
Contextual factors that *may impact* service delivery (source: ICR section 2)	Explore
External (beyond providers' control)	
Political commitment at high level of government	
Political transitions due to elections/coup	
Adequate budgetary support	
Supportive policy/regulatory environment	
Bureaucratic environment	
Functioning decentralization	
Overall economic growth	
Other	
Internal	
Institutional capacity (govt)	
Institutional capacity (direct service provider)	
Partnerships	
Multisectoral coordination	
Management/supervision arrangements	
Learning cycle	
Other	
C. Institutional impact (including accountability)	

Positive impacts
Negative impacts

D. Monitoring and evaluation (source: ICR)
Design (e.g., choice of indicators)
Implementation (e.g., quality of data, quality of monitoring arrangements, conducting of evaluations)
Pilot
Special Project with external support
With mostly external support and limited host country support
With heavy host country support Design (e.g., choice of indicators)
Routinized government activity

Positive impacts
Negative impacts

Utilization (e.g., use of data, dissemination of results)

E. Sustainability (scale and financial sustainability)

APPENDIX C. IEG 2016 SERVICE DELIVERY EVALUATION FRAMEWORK (Caceres, et al., 2016)

Enabling Conditions	Inputs	Service Delivery Implementation	Service Outputs	Service Outcomes
Political Economy Analysis Leadership Policy Development Capacity Development Budgeting Regulatory and Legal Data Systems Supply Chain Country Procurement Systems Public Financial Management	Funding (e.g., capital, operation, maintenance) Human Capital (e.g., service providers and managers) Technology **Service Delivery Design:** Identification of citizen beneficiaries Needs analysis (beneficiaries, providers, managers, existing SD model) End-to-end implementation planning Establishment of service standards Plan for operation and maintenance Development of Monitoring and Improvement system Design of feedback loops (e.g., accountability)	Service Delivery Model Central Government Provision or Contracting Decentral Government Provision or Contracting Hybrid between Central and Decentral Government Provision or Contracting Public Private Provision Private Sector Provision Citizen-directed Provision (e.g., CDD, voucher) Other Innovative Provision Other Implementation Processes	**Related to Service Delivery Activity:** Service Provider Performance Service Monitoring Service Quality Control Mechanism for Accountability (e.g., report cards, complaint resolution)	**Related to Service Use:** Coverage of Service Quality of Service Affordability of Service Reliability of Service Satisfaction of Citizen Beneficiaries Sector-specific Beneficiaries Outcomes Sustainability of the Service Beyond Initial Project Periods

Lessons Learned about Service Delivery Model

Feedback Loop

APPENDIX D. CODE OF FEDERAL REGULATIONS—REGISTERED APPRENTICESHIPS

US Department of Labor
Code of Federal Regulations Labor Standards for the Registration of Apprenticeship Programs
Title 29 - Part 29 | October 29, 2008
Code of Federal Regulations Labor Standards for the Registration of Apprenticeship Programs
Authority: Section 1, 50 Stat. 664, as amended (29 U.S.C. 50; 40 U.S.C. 276c; 5 U.S.C. 301) Reorganization Plan No. 14 of 1950, 64 Stat. 1267 (5 U.S.C. App. P. 534).

Full Text	Simplified	Coded
29.1 Purpose and scope.	**Purpose and Scope**	**Purpose and Scope**
(a) The National Apprenticeship Act of 1937, section 1 (29 U.S.C. 50), authorizes and directs the Secretary of Labor ‘‘to formulate and promote the furtherance of labor standards necessary to safeguard the welfare of apprentices, to extend the application of such standards by encouraging the inclusion thereof in contracts of apprenticeship, to bring together employers and labor for the formulation of programs of apprenticeship, to cooperate with State agencies engaged in the formulation and promotion of standards of apprenticeship, and to cooperate with the Office of Education under the Department of Health, Education, and Welfare	Authorization and Delegation of Secretary of Labor to create and promote labor standards in behalf of apprentices and to create structure of cooperation between employers, State agencies, Office of Education, and labor to form apprenticeships	Purpose Defined and Authority Delegated
29.2 Section 2 of the Act authorizes the Secretary of Labor to ‘‘publish information relating to existing and proposed labor standards of apprenticeship,’’ and to ‘‘appoint national advisory committees”	Authority given to Secretary of Labor to appoint and publish	Authorization
(b) The purpose of this part is to set forth labor standards to safeguard the welfare of apprentices, promote apprenticeship opportunity, and to extend the application of such standards by prescribing policies and procedures concerning the registration, for certain Federal purposes, of acceptable apprenticeship programs with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship. These labor standards, policies and procedures cover the registration, cancellation and deregistration of apprenticeship programs and of apprenticeship agreements; the recognition of a State agency as an authorized agency for registering apprenticeship programs for certain Federal purposes;	Purpose / Intent of the Standards 1. Safeguard welfare of apprentices 2. Promote apprenticeship opportunity 3. Extend application of standards by prescribing policies and procedures for registration	Purpose

and matters relating thereto.

29.3 Eligibility and procedure for registration of an apprenticeship program.	**Registration of Apprenticeship Program**	**Apprenticeship Program Registration**
(a) Eligibility for registration of an apprenticeship program for various Federal purposes is conditioned upon a program's conformity with the apprenticeship program standards published in this part. For a program to be determined by the Secretary as being in conformity with these published standards, the program must apply for registration and be registered with the Office of Apprenticeship or with a State Apprenticeship Agency recognized by the Office of Apprenticeship. The determination by the Secretary that the program meets the apprenticeship program standards is effectuated only through such registration.	29.3.a Eligibility Program must conform to the standards To conform: **Must apply** for Registration **Must be registered** with Office of Apprenticeship OR with a State Apprenticeship Agency recognized by OA	Program Eligibility Standards
(b) Only an apprenticeship program or agreement that meets the following criteria is eligible for Office of Apprenticeship or State Apprenticeship Agency registration:	29.3.b Criteria for Program Eligibility	Eligibility Criteria
(1) It is in conformity with the requirements of this part and the training is in an apprenticeable occupation having the characteristics set forth in § 29.4 of this part; and	29.3.b.1. In conformity with the requirements AND the training is an apprenticeable occupation having characteristics in 29.4	Must conform to requirements AND be one of the Apprenticeable occupations (29.4)
(2) It is in conformity with the requirements of the Department's regulation on Equal Employment Opportunity in Apprenticeship and Training in 29 CFR part 30, as amended.	29.3.b.2. in conformitity with the requirements of Equal Employment Opportunity in Apprenticeship & Training in 29 CFR part 30 as amended (see worksheet below)	In conformity with EEO 29 CFR 30
(c) Except as provided under paragraph (d) of this section, apprentices must be individually registered under a registered program. Such individual registration may be affected:	29.3.c Except as provided in 29.3.d, apprentices must be individually registered under a registered program by:	Registration of individual apprenticeships
(1) By filing copies of each individual apprenticeship agreement with the Registration Agency; or	29.3.c.1 File copies of each individual apprenticeship agreement with the Registration Agency	File copies of apprenticeship agreements
(2) Subject to prior Office of Apprenticeship or recognized State Apprenticeship Agency approval, by filing a master copy of such agreement followed by a listing of the name, and other required data, of each individual when apprenticed.	29.3.c.2 If program is not approved, file a master copy of apprenticeship agreement and list the name, and other required data, of each individual when apprenticed	Process in case program not yet approved
(d) The names of persons in probationary employment as an apprentice under an apprenticeship program registered by the Office of Apprenticeship or a recognized State Apprenticeship Agency, if	29.3.d This is the exception to 29.3.c: Apprenticeship employment of Registered Program is limited to 45 days during a probationary period before individual names must	Probationary employment period limited to 45 days

not individually registered under such program, must be submitted within 45 days of employment to the Office of Apprenticeship or State Apprenticeship Agency for certification to establish the apprentice as eligible for such probationary employment.	be submitted for certification to establish the apprentice is eligible for probationary employment.	without individual names
(e) The appropriate Registration Agency must be notified within 45 days of persons who have successfully completed apprenticeship programs; and of transfers, suspensions, and cancellations of apprenticeship agreements and a statement of the reasons therefore.	29.3.e Notification within 45 days of successful completions must be made to Registration Agency; as must transfers, suspensions, and cancellations of apprenticeship agreements. Reason(s) must be provided.	45 day limit on notification of: completions, transfers, suspensions, cancellations
(f) Operating apprenticeship programs, when approved by the Office of Apprenticeship, are accorded registration evidenced by a Certificate of Registration. Programs approved by recognized State Apprenticeship Agencies must be accorded registration and/or approval evidenced by a similar certificate or other written indicia. When approved by the Office of Apprenticeship, National Apprenticeship Guideline Standards for policy or guidance will be accorded a certificate.	29.3.f Certificates of Registration are provided approved Registered Programs: Both Office of Apprenticeship and State Agencies must also provide evidence/certificates.	Certificates must be provided
(g) Applications for new programs that the Registration Agency determines meet the required standards for program registration must be given provisional approval for a period of 1 year. The Registration Agency must review all new programs for quality and for conformity with the requirements of this part at the end of the first year after registration. At that time:	29.3.g New programs that meet the approval standards must be given provisional approval for 1 year. All new programs must be reviewed for quality and conformity at the end of the first year.	Provisional approval for 1 year; then review
(1) a program that conforms with the requirements of this part:	29.3.g.1 After one year, if the program conforms it may be	Program Conformity
(i) may be made permanent; or	29.3.g.1.i made permanent	Permanent Status
(ii) may continue to be provisionally approved through the first full training cycle.	29.3.g.1.ii may continue provisionally through first full training cycle	Choice of Provisional Status
(2) a program not in operation or not conforming to the regulations during the provisional approval period must be recommended for deregistration procedures.	29.3.g.2 If not in operation or not conforming to regulations during the provisional year, must be recommended for deregistration	Deregistration
(h) The Registration Agency must review all programs for quality and for conformity with the requirements of this part at the end of the first full training cycle. A satisfactory review of a provisionally approved program will result in conversion of provisional approval to permanent registration. Subsequent reviews must be conducted no less frequently than every five years. Programs not in operation or not conforming to the regulations must be recommended for deregistration procedures.	29.3.h Audit must be conducted by Registering Agency at end of first full training cycle. If satisfactory: convert to permanent; then, reviewed every 5 years. If not in operation or conforming, see 29.3.g.2 above.	Audit Requirement and Cycle
Any sponsor proposals or applications for modification(s) or	29.3.i Sponsor proposals, applications for modification to	Modifications

change(s) to registered programs or certified National Guidelines for Apprenticeship Standards must be submitted to the Registration Agency. The Registration Agency must make a determination on whether to approve such submissions within 90 days from the date of receipt. If approved, the modification(s) or change(s) will be recorded and acknowledged within 90 days of approval as an amendment to such program. If not approved, the sponsor must be notified of the disapproval and the reasons therefore and provided the appropriate technical assistance.	register programs, or changes to Certified Naitonal Guidelines must be submitted to the Registration Agency. Must make decision within 90 days from date of receipt. If approved, recorded and acknowledged within 90 days of approval. If not approved, sponsor notified. Reasons given. Technical assistance provided.	
(j) Under a program proposed for registration by an employer or employers' association, where the standards, collective bargaining agreement or other instrument provides for participation by a union in any manner in the operation of the substantive matters of the apprenticeship program, and such participation is exercised, written acknowledgement of union agreement or no objection to the registration is required. Where no such participation is evidenced and practiced, the employer or employers' association must simultaneously furnish to an existing union, which is the collective bargaining agent of the employees to be trained, a copy of its application for registration and of the apprenticeship program. The Registration Agency must provide for receipt of union comments, if any, within 45 days before final action on the application for registration and/or approval.	29.3.j When union is involved in the operation of substantive matters of the apprenticeship program, written acknowledgment of the union agreement OR no objection to the registration is required (?). If the union is not involved, the employer must provide a copy of its application for registration and of the apprenticeship program to the union. Union must be able to comment for 45 days before a decision is made for registration or approval.	If Union
(k) Where the employees to be trained have no collective bargaining agreement, an apprenticeship program may be proposed for registration by an employer or group of employers, or an employer association.	29.3.k If not union, apprenticeship program may be proposed by employer, group of employees, or employer association	Non-Union Initiators of Program Proposal
29.4 Criteria for apprenticeable occupations.	**29.4 Criteria for apprenticeable occupations**	**Eligible occupations**
An apprenticeable occupation is one which is specified by industry and which must:	Specified by Industry and MUST	If Industry Specified:
(a) Involve skills that are customarily learned in a practical way through a structured, systematic program of on-the-job supervised learning;	29.4.a Involve skills learned in practical way through OJ supervised learning	Skills must be practical and learned under OJI supervision
(b) Be clearly identified and commonly recognized throughout an industry;	29.4.b Clearly identified and have industry recognition	Industry recognition and Alignment
(c) Involve the progressive attainment of manual, mechanical or technical skills and knowledge which, in accordance with the industry standard for the occupation, would require the completion of at least 2,000 hours of on-the-job learning to attain; and	29.4.c Involve progressive competency attainment that would require 2000 hours OJT, and	Work toward competency OJT

(d) Require related instruction to supplement the on-the-job learning.	29.4.d Require RIT	Have related instructional component
29.5 Standards of apprenticeship.	**29.5 Standards of Apprenticeship**	**Apprenticeship Standards**
An apprenticeship program, to be eligible for approval and registration by a Registration Agency, must conform to the following standards:	To be eligible for registration	Standards of Eligibility
(a) The program must have an organized, written plan (program standards) embodying the terms and conditions of employment, training, and supervision of one or more apprentices in an apprenticeable occupation, as defined in this part, and subscribed to by a sponsor who has undertaken to carry out the apprentice training program.	29.5.a Must have organized, written plan (program standards delineating the program including supervision in apprenticeable occupation, subscribed by the sponsor	Written plan detailing commitment
(b) The program standards must contain provisions that address:	29.5.b Program standards must address	Plan Components:
(1) The employment and training of the apprentice in a skilled occupation.	29.5.b.1 Employment/Training in skilled occupation	Employment and training/ skilled occupation
(2) The term of apprenticeship, which for an individual apprentice may be measured either through the completion of the industry standard for on-the-job learning (at least 2,000 hours) (time-based approach), the attainment of competency (competency-based approach), or a blend of the time-based and competency- based approaches (hybrid approach).	29.5.b.2 Term of apprenticeship: 2,000 hours OJI (time-based); Attainment of competency; Hybrid	Term: time-based/competency
(i) The time-based approach measures skill acquisition through the individual apprentice's completion of at least 2,000 hours of on-the-job learning as described in a work process schedule.	29.5.b.2.i Work process schedule details apprentice's skill acquisition	OJI 2000 hours: Work process schedule
(ii) The competency-based approach measures skill acquisition through the individual apprentice's successful demonstration of acquired skills and knowledge, as verified by the program sponsor. Programs utilizing this approach must still require apprentices to complete an on-the-job learning component of Registered Apprenticeship. The program standards must address how on-the-job learning will be integrated into the program, describe competencies, and identify an appropriate means of testing and evaluation for such competencies.	29.5.b.2.ii Competency-based relies on successful demonstration of acquired skills and knowledge verified by sponsor. MUST STILL COMPLETE OJI component of registered apprenticeship. Standards address the integration of OJI, describes competencies, means of evaluation.	Verifiable Competency-based knowledge and skillset
(iii) The hybrid approach measures the individual apprentice's skill acquisition through a combination of specified minimum number of hours of on-the- job learning and the successful demonstration of competency as described in a work process schedule.	29.5.b.2.iii Hybrid specifies minimum # of hours of OJL and successful demonstration of competency outlined in work process schedule	Hybrid
(iv) The determination of the appropriate approach for the program	29.6.b.2.iv Program Sponsor determines approach.	Sponsor/Registering

standards is made by the program sponsor, subject to approval by the Registration Agency of the determination as appropriate to the apprenticeable occupation for which the program standards are registered.	Registration Agency determines if is appropriate to the occupation.	Agency Alignment
(3) An outline of the work processes in which the apprentice will receive supervised work experience and training on the job, and the allocation of the approximate amount of time to be spent in each major process.	29.5.b.3 Outline of work processes must be provided with time appropriated for each	Work Process Map
(4) Provision for organized, related instruction in technical subjects related to the occupation. A minimum of 144 hours for each year of apprenticeship is recommended. This instruction in technical subjects may be accomplished through media such as classroom, occupational or industry courses, electronic media, or other instruction approved by the Registration Agency. Every apprenticeship instructor must:	29.5.b.4 Provision for RTI / minimum 144 hours per year. Medium is not dictated; but, curriculum must be approved.	Provision for RTI
(i) Meet the State Department of Education's requirements for a vocational-technical instructor in the State of registration, or be a subject matter expert, which is an individual, such as a journeyworker, who is recognized within an industry as having expertise in a specific occupation; and	29.5.b.4.i Instructors must meet Dept of Ed requirements for state's vocational-technical instructor; be a SME, and	Instructor requirements 1
(ii) Have training in teaching techniques and adult learning styles, which may occur before or after the apprenticeship instructor has started to provide the related technical instruction.	29.5.b.4.ii Have training in teaching and adult learning (can be acquired after training begins)	Instructor requirements 2
(5) A progressively increasing schedule of wages to be paid to the apprentice consistent with the skill acquired. The entry wage must not be less than the minimum wage prescribed by the Fair Labor Standards Act, where applicable, unless a higher wage is required by other applicable Federal law, State law, respective regulations, or by collective bargaining agreement.	29.6.b.5 Wages must increase as skill is acquired. Entry must be >= minimum wage	Wage increases
(6) Periodic review and evaluation of the apprentice's performance on the job and in related instruction; and the maintenance of appropriate progress records.	29.5.b.6 Periodic reviews of both job performance and RTI and records of progress required	Periodic review
(7) A numeric ratio of apprentices to journeyworkers consistent with proper supervision, training, safety, and continuity of employment, and applicable provisions in collective bargaining agreements, except where such ratios are expressly prohibited by the collective bargaining agreements. The ratio language must be specific and clearly described as to its application to the job site, workforce, department or plant.	29.5.b.7 Ratio of apprentices to Journeymen: proper supervision, training, safety, continuity of employment, collective bargaining agreements. Ratio language must be specific including location (jobsite, workforce, dept, plant)	Ratio of apprentices to Journeymen
(8) A probationary period reasonable in relation to the full	29.5.b.8 Probationary period relative to full term if credit is	Probationary period

apprenticeship term, with full credit given for such period toward completion of apprenticeship. The probationary period cannot exceed 25 percent of the length of the program, or 1 year, whichever is shorter.	given toward completion cannot be > than 25% of program or 1 year; whichever is shorter	
(9) Adequate and safe equipment and facilities for training and supervision, and safety training for apprentices on the job and in related instruction.	29.5.b.9 Safety: equipment, facilities, training	Safety
(10) The minimum qualifications required by a sponsor for persons entering the apprenticeship program, with an eligible starting age not less than 16 years.	29.5.b.10 Minimum age: 16	Age
(11) The placement of an apprentice under a written Apprenticeship Agreement that meets the requirements of § 29.7 or the State apprenticeship law of a recognized Registration Agency. The agreement must directly, or by reference, incorporate the standards of the program as part of the agreement.	29.5.b.11 Standards must be incorporated into the apprenticeship agreement	Standards in the AA
(12) The granting of advanced standing or credit for demonstrated competency, acquired experience, training, or skills for all applicants equally, with commensurate wages for any progression step so granted.	29.5.b.12 All advancement must be equal, transparent, fair	Terms of advancements stated
(13) The transfer of an apprentice between apprenticeship programs and within an apprenticeship program must be based on agreement between the apprentice and the affected apprenticeship committees or program sponsors, and must comply with the following requirements:	29.5.b.13 Transfers must be agreed to by apprentice and sponsors, AND COMPLY WITH	Transfers / must be agreed to by both parties
(i) The transferring apprentice must be provided a transcript of related instruction and on-the-job learning by the committee or program sponsor;	29.5.b.13.1 Transcript of RTI and OJL must be provided upon transfer	Transcripts
(ii) Transfer must be to the same occupation; and	29.5.b.13.ii Transfer must be to SAME OCCUPATION	Transfers / same occupation
(iii) A new apprenticeship agreement must be executed when the transfer occurs between program sponsors.	29.5.b.13.iii Requires a NEW apprenticeship agreement	Transfers / new agreement
(14) Assurance of qualified training personnel and adequate supervision on the job.	29.5.b.14 Must provide assurance of qualified trainers and adequate supervision OTJ	Qualified trainers / supervision
(15) Recognition for successful completion of apprenticeship evidenced by an appropriate certificate issued by the Registration Agency.	29.5.b.15 Must provide certificate from Registration Agency	Provision of Certificate
(16) Program standards that utilize the competency-based or hybrid approach for progression through an apprenticeship and that choose to issue interim credentials must clearly identify the interim credentials, demonstrate how these credentials link to the components of the	29.5.b.16 If CBE and/or Hybrid, and use interim credentialing (Badges), must clearly identify the credentials, and demonstrate the link to the occupation, and establish assessments of competency associated with the	Competencies and badges

apprenticeable occupation, and establish the process for assessing an individual apprentice's demonstration of competency associated with the particular interim credential. Further, interim credentials must only be issued for recognized components of an apprenticeable occupation, thereby linking interim credentials specifically to the knowledge, skills, and abilities associated with those components of the apprenticeable occupation.	interim credential. Can only be used for recognized components of the Occupation, linking them to specific Knowledge, Skills and abilities	
(17) Identification of the Registration Agency.	29.5.b.17 Must identify the Registration Agency	Identify Registering Agency (RA)
(18) Provision for the registration, cancellation and deregistration of the program; and for the prompt submission of any program standard modification or amendment to the Registration Agency for approval.	29.5.b.18 Must make provision for registering, canceling and deregistering the program. Must make provision for modifications	Provision for changes and cancellations of program
(19) Provision for registration of apprenticeship agreements, modifications, and amendments; notice to the Registration Agency of persons who have successfully completed apprenticeship programs; and notice of transfers, suspensions, and cancellations of apprenticeship agreements and a statement of the reasons therefore.	29.5.b.19 Must make provision for registering apprenticeship agreements and modifications; and notice to RA with reasons of completions, transfers, suspensions, and cancellations	Provision for registering AA's, changes, notice with reason
(20) Authority for the cancellation of an apprenticeship agreement during the probationary period by either party without stated cause; cancellation during the probationary period will not have an adverse impact on the sponsor's completion rate.	29.5.b.20 Make provision for Authority for cancellation of apprenticeship agreement during probation period by either party without stated cause.	Cancellation during probation
(21) Compliance with 29 CFR part 30, including the equal opportunity pledge prescribed in 29 CFR 30.3(b); an affirmative action plan complying with 29 CFR 30.4; and a method for the selection of apprentices authorized by 29 CFR 30.5, or compliance with parallel requirements contained in a State plan for equal opportunity in apprenticeship adopted under 29 CFR part 30 and approved by the Department. The apprenticeship standards must also include a statement that the program will be conducted, operated and administered in conformity with applicable provisions of 29 CFR part 30, as amended, or, if applicable, an approved State plan for equal opportunity in apprenticeship.	29.5.b.21 Must comply with EEO and have a method for apprentice selection per 29 CFR 30 or the parallel state plan. Must include EEO statement	EEO compliance, apprentice selection plan
(22) Contact information (name, address, telephone number, and e-mail address if appropriate) for the appropriate individual with authority under the program to receive, process and make disposition of complaints.	29.5.b.22 Must include contact info for person with authority to manage complaints	Complaints
(23) Recording and maintenance of all records concerning apprenticeship as may be required by the Office of Apprenticeship or recognized State Apprenticeship Agency and other applicable law.	29.5.b.23 Must record and maintain all records required	Record keeping

29.6 Program performance standards.	**29.6 Program Performance Standards**	**Program Performance Standards**
(a) Every registered apprenticeship program must have at least one registered apprentice, except for the following specified periods of time, which may not exceed 1 year:	29.6.a Must have 1 or more registered apprentices except (not to exceed a year)	1 or more apprentices with breaks only
(1) Between the date when a program is registered and the date of registration for its first apprentice(s); or	29.6.a.1 Between date of registration and first apprenticeship	between program reg and 1st apprentice
(2) Between the date that a program graduates an apprentice and the date of registration for the next apprentice(s) in the program.	29.6.a.2 Between date of graduation and date of registration for next group	between graduation and registration of new group
(b) Registration Agencies must evaluate performance of registered apprenticeship programs.	29.6.b Registration Agencies Evaluation	RA's must evaluate
(1) The tools and factors to be used must include, but are not limited to:	29.6.b.1 Tools and Factors at LEAST include	**Evaluation includes**
(i) Quality assurance assessments;	29.6.b.1.i QA assessments	QA
(ii) Equal Employment Opportunity (EEO) Compliance Reviews; and	29.6.b.1.ii EEO Compliance Reviews	EEO compliance
(iii) Completion rates.	29.6.b.1.iii Completion Rates	Completion Rates
(2) Any additional tools and factors used by the Registration Agency in evaluating program performance must adhere to the goals and policies of the Department articulated in this part and in guidance issued by the Office of Apprenticeship.	29.6.b.2 Additional tools/factors for evaluation must adhere to the goals and policies of the Department of Labor issued by Office of Apprenticeship	Additional tools
(c) In order to evaluate completion rates, the Registration Agency must review a program's completion rates in comparison to the national average for completion rates. Based on the review, the Registration Agency must provide technical assistance to programs with completion rates lower than the national average.	29.6.c Determining Completion Rates; RA reviews completion rates compared to national averages. If fall short, RA provides tech assistance.	Completion rates and follow-up
(d) Cancellation of apprenticeship agreements during the probationary period will not have an adverse impact on a sponsor's completion rate.	29.6.d Cancelling apprenticeship agreements during probationary period do not negatively impact completion rates	Cancellation of AA during probation
29.7 Apprenticeship agreement.	**29.7 Apprenticeship Agreement**	**Apprenticeship Agreement**
The apprenticeship agreement must contain, explicitly or by reference:	Apprenticeship agreement MUST contain:	Agreements must include:
(a) Names and signatures of the contracting parties (apprentice, and the program sponsor or employer), and the signature of a parent or guardian if the apprentice is a minor.	29.7.a Names and signatures: apprentice, sponsor, employer, union or association if applicable, and parent/guardian if apprentice is a minor	contact info and signatures / parents if minor
(b) The date of birth and, on a voluntary basis, Social Security number of the apprentice.	29.7.b Date of birth, SS# (voluntary???)	DoB / SS (voluntary)
(c) Contact information of the Program Sponsor and Registration Agency.	29.7.c Contact info Program Sponsor and Registration Agency	Contact info Sponsor and RA

(d) A statement of the occupation in which the apprentice is to be trained, and the beginning date and term (duration) of apprenticeship.	29.7.d Occupation description, term of duration / start-end dates	Description of occupation, term/duration
(e) A statement showing:	29.7.3.e Statement detailing terms:	Terms delineated
(1) The number of hours to be spent by the apprentice in work on the job in a time- based program; or a description of the skill sets to be attained by completion of a competency-based program, including the on-the-job learning component; or the minimum number of hours to be spent by the apprentice and a description of the skill sets to be attained by completion of hybrid program; and	29.7.3.e.1 # of hours OJI and/or description of skills/competencies to be attained; or minimum hours and skillsets if hybrid	hours OJI and /or competencies and/or both
(2) The number of hours to be spent in related instruction in technical subjects related to the occupation, which is recommended to be not less than 144 hours per year.	29.7.3.e.2 # of hours of RTI; no less than 144/year	Hours of RTI
(f) A statement setting forth a schedule of the work processes in the occupation or industry divisions in which the apprentice is to be trained and the approximate time to be spent at each process.	29.7.3.f Schedule of the work processes in occupation divisions and approximate time in each process	Work processes / Time to complete
(g) A statement of the graduated scale of wages to be paid to the apprentice and whether or not the required related instruction is compensated.	29.7.3.g Graduated wage scale and terms of cost of RTI (if paid by company or not)	Wage increases / Cost of RTI / who pays
(h) Statements providing:	29.7.3.h Statements (other)	Other
(1) For a specific period of probation during which the apprenticeship agreement may be cancelled by either party to the agreement upon written notice to the registration agency, without adverse impact on the sponsor.	29.7.3.h.1 Probation period during which agreement can be cancelled by either party with written notice to RA; without impact on sponsor	Cancellation terms during probation
(2) That, after the probationary period, the agreement may be:	29.7.3.h.2 Terms after probation period	After probation
(i) Cancelled at the request of the apprentice, or	29.7.3.h.2.i May be cancelled by apprentice	Apprentice
(ii) Suspended or cancelled by the sponsor, for good cause, with due notice to the apprentice and a reasonable opportunity for corrective action, and with written notice to the apprentice and to the Registration Agency of the final action taken.	29.7.3.h.2.ii May be suspended or cancelled by sponsor for good cause, with due notice to apprentice and opportunity for corrective action; and written notcie to apprentice and RA of final action taken	Sponsor processes to cancel after probation
(i) A reference incorporating as part of the agreement the standards of the apprenticeship program as they exist on the date of the agreement and as they may be amended during the period of the agreement.	29.7.3.i Must include standards of the program at the date of the Apprentice Agreement and any amendments since date	Standards must be in an AA including amendments
(j) A statement that the apprentice will be accorded equal opportunity in all phases of apprenticeship employment and training, without discrimination because of race, color, religion, national origin, or sex.	29.7.3.j EEO statement	EEO Statement
(k) Contact information (name, address, phone, and e-mail if appropriate) of the appropriate authority designated under the	29.7.3.k Contact info of authority designated to receive, process, and make disposition of controversies that move	Contact info in case of dispute

program to receive, process and make disposition of controversies or differences arising out of the apprenticeship agreement when the controversies or differences cannot be adjusted locally or resolved in accordance with the established procedure or applicable collective bargaining provisions.

beyond the local level

APPENDIX E. ALIGNMENT RESEARCH QUESTIONS TO INTERVIEW QUESTIONS & IEG SDEF FRAMEWORK

Research Questions	Notes	Federal Guidelines	IEG SDEF	IEG Analytical Protocol	Interview Questions
What are the perceptions of critical stakeholders as to the viability of fully remote apprenticeships:	The interview gathered stakeholder perceptions which were then analyzed in relationship to the extant knowledge presented in the literature, the Federal Guidelines, and the IEG Service Delivery Framework and Analytical Protocol. EC=Enabling Condition IN=Inputs SDI=Implementation SOP=Service Outputs SOC=Service Outcomes SDM=Service Delivery Measurement	Viability is determined first by meeting core requirements for registered apprenticeships set forth by the US Department of Labor Code of Federal Regulations Labor Standards for the Registration of Apprenticeship Programs 29 CFR — Part 29. All Registered Apprenticeship programs consist of the following five core components – direct business involvement, OJT, related instruction, rewards for skill gains, and a national occupational credential: 29.3 Sponsor Eligibility 29.4 Criteria for Eligible Occupations 29.5 Standards of Eligibility 29.6.a Program Performance Requirements 29.6.b Evaluation Requirements 29.7 Apprenticeship Agreement Requirements	EC-F-R&L EC-G-DS EC-H-SC IN-A-F IN-B-HC IN-C-Tech IN-D-SDD-CB IN-D-SDD-E2E-IP IN-D-SDD-SS IN-D-SDD-OM IN-D-SDD-MIS IN-D-SDD-DFBL SDI-A-SDM SDI-B-CGPC/C-DGPC SDI-D-PSP SDI-E-PPP SDI-F-ODP	II: Enabling Condition (EC) A. Political Economy B. Leadership Dev C. Policy Dev D. Capacity Dev E. Budgeting F. Regulatory/Legal G. Data Systems H. Supply Chain I. Public Fin Mgt J. Country Procurement System Chain K. Other L. Contextual Interference of SD? III. Inputs (IN) A. Funding B. Human Capital Service Providers & Managers C. Technology D. Supports Service Delivery Design 1. Identify Citizen Beneficiaries 2. Needs Analysis 3. End to End Implementation Planning 4. Service Standards 5. Operation/Maintenance 6. Development of Monitoring and Improvement System 7. Design of Feedback Loop IV. Implementation (SDI) A. Service Delivery Model B-C. Governmental Model D. Private Sector Provision E. Public-Private Partnership F. Citizen-Directed Provision	d1, d2, d3, d4 Q6, Q7, Q8, Q9, Q12, Q13, Q16, Q17, Q18, Q19, Q20, Q21

			SDI-G-OP SDI-H-CRM SDI-I-FBL	G. Other Provision H. Cost Recovery or Subsidy Mechanism I. Feedback Loop	
As a delivery system	This study only looks at the delivery of apprenticeship and not at the curriculum or instruction.	Delivery requirements are specified in 29.4.a: Structured, systematic, OJI/OJL, and supervised	SOP-A-SPT SOP-B-SM SOP-C-SQC SOP-D-OMFA	V. Service Outputs A. Service Performance Tracking B. Accountability Mechanism / Monitoring C. Quality Control Mechanism D. Other Mechanism Accounting	d1, d2, d3, d4 Q2, Q3, Q4, Q5, Q8, Q16
As an accessible alternative to the current face-to-face system	To address an alternative, one must be familiar with the status quo to use it as a basis of comparison.	29 CFR — Part 29 29.3 Eligibility 29.4 Criteria for Eligible Occupations 29.5 Standards of Eligibility 29.6.a Program Performance Requirements 29.6.b Evaluation Requirements 29.7 Apprenticeship Agreement Requirements	SOC-A-CoS SOC-A-QoS SOC-A-AoS SOC-A-RoS SOC-C-SoCB SOC-C-SSCBO SOC-D-SUS	VI. Outcome (SOC) A. Outcomes Tracked 1. Coverage of Service (CoS) 2. Quality of Service (Qos) 3. Affordability of Service (AoS) 4. Reliability of Service (RoS) B. Disaggregated Data Collection C. CB Outcomes Tracked 1. Satisfaction of CBs (SoCB) 2. Sector-Specific CB Outcomes D. Trend data tracked 1. Sustainability (SUS) VII. Lesson Learned — SDM A. Achieving Expected Results B. Meet Expectations C. Enabling Conditions or Inputs (May) Impact Implementation	d1, d2, d3, d4 Q1, Q2, Q7, Q8, Q9, Q10, Q11, Q12
As a path of inclusion for access-limited populations?	Access-limited is broadly defined to include anything that impedes an individual's opportunity to participate.	Only groups covered under EEO are currently required for registration: 29.6.b.1.ii and 29 CFR—Part 30.	SDI-CBS SDI-NA	III.D.1 Identification of CB's III.D.2 Needs Analysis	d1, d2, d3, d4 Q14, Q15

APPENDIX F. INTERVIEW PROTOCOL

Stakeholder Perceptions of a Fully Remote Apprenticeship Delivery System

Following are sample questions. Insert Actual Questions

"This study is concerned with the perception of stakeholder viability of an alternative delivery system for apprenticeships, one that is fully remote and uses technology to mediate the current face to face on the job instructional (OJI) portion of the apprenticeship process. The following questions are meant to elicit your perspective of the construct of a fully remote apprenticeship delivery system; but, you may offer additional insights at any time if you believe them to be important to the discussion. You will also be given an opportunity at the end of the interview to return to a question or to address something not attended to; and if after the interview you have things you would like to add, you may schedule a time to talk or feel free to email them to me and I will include them in the study."

"Have you had a chance to review the study information sheet I sent? Do you have any questions or concerns before we begin?"

Demographic Questions:

Question d1: What is your current position?

Question d2: What is your background or area of focus?

Question d3: How many years have you been involved in this sector?

Question d4: Do you have any other experience that relates to apprenticeship, education, and/or the delivery of instruction using technology?

Apprenticeship in General

1) **Question:** Please talk about what you understand the structure and function of the current U.S. apprenticeship system to be, to the extent that you are familiar with it?

   Prompts: Have you had any experience or exposure to apprenticeship personally and/or through another person? Have you been following the conversation as presented in the media? Have you had any exposure to apprenticeship in any other

country? Value? Effectiveness? Viability in US compared to other countries?

Fully Remote Apprenticeships as a Construct (The OJI portion of apprenticeship)

2) **Question:** What comes to mind when I say fully remote apprenticeships?
3) **Question:** Are you aware of any current efforts to offer fully remote apprenticeships? In the United States? If so, can you talk about that?
4) **Question:** A fully remote apprenticeship delivery system would consist of many parts—policy, infrastructure, service providers, specific technologies, and so on. Can you share any personal experience or expertise that you have had that might enable you to lend insight into any aspect(s) of implementing a fully remote apprenticeship delivery system?
5) **Question:** Thinking about a synchronous, technology-mediated apprenticeship (the OJI portion) in the United States, what do you envision it might look like?

   Prompts: What structural elements (e.g., components, processes, systems, workflow? **When/timeframe**? **Why** might stakeholders want a fully remote system? **Who** would need to be involved: Government, Industry, Front-Line Providers, Citizen Beneficiaries? **Who** might benefit? **Where** would be the most reasonable place to start?
6) **Question:** What barriers and/or challenges do you foresee to a fully remote apprenticeship delivery system becoming a reality?

   Question: Is there any part of the construct of a fully remote apprenticeship that you have strong reservations about, or that you believe pose challenges/barriers that cannot be overcome?

Community of Practice: *In 1991, Lave & Wenger published their work on the importance of integration into the Community of Practice as an integral component of apprenticeship.*

7) **Question:** What are your thoughts on the ability of fully remote apprenticeships to facilitate the integration of an apprentice into the community of practice?

Quality of Experience

8) **Question:** Is there anything you believe would need to be done to ensure the apprentice(s) receive(s) a comparable experience to that of a face-to-face apprenticeship?

9) **Question:** Is there anything you believe would need to be done to ensure the corporate sponsor receives an employee of the same caliber as that produced by a face-to-face apprenticeship?

Prompt: Do you believe the experience and outcomes can be patently "identical" in quality?

Fit

10) **Question:** What are your thoughts on fully remote apprenticeships serving as **an acceptable and accepted alternative** to the current face-to-face apprenticeship?

11) **Question:** Can you think of cases/industries where fully remote apprenticeships might be an *especially* good fit? Why?

12) **Question:** Can you think of any cases where they might not be a good fit? Impossible? Why?

13) **Question:** What advantages or disadvantages, if any, might be associated with offering fully remote apprenticeships?

Access-Limited Populations

Access-limited individuals are those who encounter impairments, barriers, or constraints that impede their ability to participate fully in common opportunities.

14) **Question:** What do you think of when I say "access-limited" populations?

a. Prompt: How might you define access-limited?

15) **Question:** Can you reflect on fully remote apprenticeships as **a path of inclusion** for access-limited populations?

Prompts:

Who (what groups) might benefit most? Should it be made available to everyone or only to certain populations? Any concerns about public policy, technology and infrastructure, consumer (apprentice) and industry acceptance, associated costs, other?

Technology

16) **Question:** Do you have any thoughts about the technology that might be required or used to successfully facilitate a fully remote apprenticeship delivery system?

Prompts: Who/what companies and/or individuals might (should be) be involved? What infrastructure? Are there any limitations to current technology that must be overcome? Are there any technologies you know of that might expedite the implementation of a fully remote apprenticeship system? Are you using any technology currently that could be adapted for this use?

Key Players

17) **Question:** Who do you believe would be most suited to develop a fully remote apprenticeship delivery system? e.g., Industry, government, Higher Ed, 3rd party vendors, other?

18) **Question:** Who do you believe would be best to oversee the system to ensure quality control?

19) **Question:** How would you envision a fully remote apprenticeship delivery system being evaluated?

Next Steps

20) **Question:** What do you see as a possible next step in the examination of fully remote apprenticeships as an alternative to the current face-to-face delivery system?

21) **Question:** Do you have any additional thoughts, suggestions, concerns, or insights you would like to share?

22) **Question:** May we keep your email for follow-up, and to send you the transcript and summary of your interview for member checking? If we have questions as we read through your transcript, may we ask them via email?

Closing*:* *If you have any additional thoughts in the coming weeks, please feel free to email or call me. I greatly value your input, and believe your voice is of great importance to this discussion. I will do my best to work your ideas into my final analysis. If you feel you would like more time to discuss the questions with me, please feel free to email some available times and I would be happy to continue our discussion.*

APPENDIX G. RESEARCH PARTICIPANT STUDY SOLICITATION EMAIL

Stakeholder perceptions of the viability of a fully remote apprenticeship delivery system

Dr. Marisa Exter, P.I.

Curriculum and Instruction

Purdue University

Title: Interview on your thoughts on a Fully Remote Apprenticeship Delivery System

Dear [First Last Name],

[If I have already had contact with them:] I appreciate your willingness to consider participation in this research study looking at stakeholder perceptions of the viability of a fully remote apprenticeship delivery system.

[If they are referred by someone else:] **[Name]** referred me to you because they felt you might be interested in this study, based on your expertise in [their area of expertise]. I am conducting a study on the viability of fully remote apprenticeships.

As part of my dissertation study and subsequent reports, your voice will add to the conversation on fully remote apprenticeships, and the potential they have for providing a path to apprenticeship for access-limited populations in the United States.

If you are interested in participating, I would like to set up a time for a 90-120 minute phone or teleconference interview at a time that works best for you. Would you please provide me with **times you would be available for an interview**, and the **best means to reach you?** Because of the nature of your work, timeframes will be suggested for reviews/responses, but, your schedules will ultimately be the drivers of the timeline. You are invited to indicate if you need additional time and your schedule will be accommodated. Reviews are optional.

Your response to this email will indicate your consent to participate in the study. You are also agreeing to have your name, current position, and title used where appropriate for individual contributions and quotations.

Upon receipt of your response, I will send you an informational email with a preliminary set of interview questions. Please feel free to reach out to me with any questions you may have.

I look forward to hearing from you!

Terri S. Krause
PhD Candidate, Learning Design and Technology
College of Education
100 N. University St.
Purdue University
West Lafayette, IN 47907
269.262.1999

APPENDIX H. EMAIL CONFIRMING TIME OF INTERVIEW

Dear [First Last Name],

Thank you for your kind response and your willingness to participate in this research study. Per your email, I would like to reserve [Date / Time] to conduct the interview with you. I will plan to send you a Zoom invitation unless you prefer another form of communication. Please feel free to request an alternative means of communication.

Attached, please find the project overview and interview protocol. The interview will be semi-structured, and you may spend more time on areas in which you have experience and/or expertise, and/or feel more comfortable.

I will send you a calendar invitation as well as a Zoom invitation one week before your scheduled interview. If you need to reschedule, you may email me or contact me at the phone number below.

Please feel free to reach out to me with any questions you may have.

I look forward to speaking with you!

Terri

Terri S. Krause
PhD Candidate, Learning Design and Technology
College of Education
100 N. University St.
Purdue University
West Lafayette, IN 47907
269.262.1999

APPENDIX I. RESEARCH PARTICIPANT STUDY INFORMATION SHEET

Stakeholder perceptions of the viability of a fully remote apprenticeship delivery system

Dr. Marisa Exter, P.I.

Curriculum and Instruction

Purdue University

Key Information

Please take time to review this information carefully. This is a request for you to participate in a research study. Your participation is voluntary which means that you may choose not to participate **at any time** for any reason. You may also ask questions of the researchers about the study at any time. If you decide to take part in the study, your email response in which you indicate your availability for an interview will serve as your agreement of consent to participate. Please be certain you understand what your involvement will be, as well as any possible risks or benefits (see below).

What is the purpose of this study?

Apprenticeship is currently of global concern because of the misalignment of competencies/skillsets of the current and future employee pool with the types of jobs that are/will be available. However, the apprenticeship model in the U.S. and globally has remained virtually unchanged over time. This study will begin the discussion of the viability of a fully remote apprenticeship delivery system by asking critical stakeholders for your perceptions of the construct and the players, systems, processes, components, and environmental factors that you believe would be critical to the establishment, success, and sustainability/viability of a such a system. We request your participation in a 90-120 minute interview, after which you will be asked to review and amend both the initial and coded transcripts for clarity and accuracy, if you desire to do so. You may also send us additional information, comments or materials at any time.

You are being asked to participate because of your placement within one of the stakeholder groups identified by the Federal Government, IEG's Service Delivery Evaluation Framework, and/or your expertise in a related field.

We would like to enroll a maximum of 30 people in this study.

What will I do if I choose to be in this study?

Step 1. This interview will take place via the medium of your choice (telephone, teleconferencing software, or an alternative of your preference). Interview questions will be open-ended (semi-structured) allowing you flexibility in the direction of your responses. You may schedule a follow-up interview or share additional materials should you so desire.

Step 2. If you agree to review your initial transcript, the transcription will be emailed to you so that you can correct any errors and/or add any clarifying statements. If you would like to have files sent through an alternative service, we would be happy to accommodate. The review should take at most 30 minutes unless you wish to add to and/or clarify your responses.

NOTE: Only the initial interview is required for participation in the study. It is understood that your time limitations may preclude your continued involvement.

How long will I be in the study?

The initial interview is expected to take 90-120 minutes. You may elect to talk longer, request multiple shorter sessions, schedule follow-up interviews, or follow up via email.

You will also be afforded an opportunity to review your transcript. This is optional and should take approximately 30 minutes unless you wish to add to and/or clarify your statements.

What are the possible risks or discomforts?

There is minimal risk (no greater than normal daily activity) for participation in this study. Member checking (your review of your initial transcript and/or coded transcript) is intended to obviate any potential misunderstanding/ misrepresentation of your thoughts/perceptions.

If at any time (either during or after the interview) you decide you would like something you said to be omitted from the transcript for any reason, please just let us know.

Are there any potential benefits?

Your expertise will contribute to a larger conversation about fully remote apprenticeships, which may be of benefit to the larger apprenticeship community and potentially to future groups of access-limited populations for whom face-to-face apprenticeship is an impossibility. In addition to these benefits to the larger community, you will also receive an Executive Summary of results.

<u>This section provides more information about the study</u>

Will information about me and my participation be kept confidential?

The project's research records may be reviewed by the study sponsor/funding agency, Food and Drug Administration (if FDA regulated), US DHHS Office for Human Research Protections, and by departments at Purdue University responsible for regulatory and research oversight.

Due to the nature of your position and the relevance of your thoughts and experience to the discussion, we will include your name and relevant demographic information (current position/title, years of related experience) when presenting individualized data (comments, ideas, quotes).

What are my rights if I take part in this study?

Should you choose to participate in this study, you may withdraw at any time for any reason. Data already collected to the point of withdrawal will be included in the analysis and report, although you may request for any portion of the transcript to be omitted until the final coded transcript has been reviewed.

Who can I contact if I have questions about the study?

If you have questions, comments or concerns about this research project, you can contact one of the researchers:

Please contact: Terri Sue Krause, PhD Candidate, tkrause@purdue.edu, 574.904.3540

P.I.: Dr. Marisa Exter, Assistant Professor, Curriculum and Instruction mexter@purdue.edu 765.496.3358

To report anonymously via Purdue's Hotline see www.purdue.edu/hotline

If you have questions about your rights while taking part in the study or have concerns about the treatment of research participants, please call the Human Research Protection Program at (765) 494-5942, email (irb@purdue.edu) or write to:

Human Research Protection Program - Purdue University
Ernest C. Young Hall, Room 1032
155 S. Grant St.
West Lafayette, IN 47907-2114

APPENDIX J. FRADS APPRENTICE SURVEY

These are some sample questions that can help assess readiness to work in an online environment. These cover such things as basic technical skills, organizational skills, interpersonal skills, self-directed learning, and skills required for online work such as reading online and collaboration; as well as the suitability of the home environment for working from home. A number of separate instruments have been used and statistically verified; but, none encompasses all of the dimensions of a remote apprentice. This is a compilation, with some additional pertinent questions added.

Questions:

I have a specific place in mind where I can work each day without interruption. Yes / No

I have support from my family and friends regarding my commitment to work remotely. Yes / No

I see difficulties as challenges to be overcome. Yes / No

Time management is sometimes an issue for me. Yes / No

I prefer to see a project through to the end. Yes / No

I find ways to complete difficult tasks even if the answer is not immediately apparent. Yes / No

I usually get everything done on time. Yes / No

I have worked on line in the past. Yes / No

I have taken online courses in the past. Yes / No

I know how to login to a computer. Yes / No

I have logged into different websites. Yes / No

If my computer is having a problem, I know how to get help? Yes / No

What is the first thing you do? _____

I struggle with reading. Yes / No

I find learning new things: 1. Exciting 2. Fun 3. Difficult 4. Draining

If I have a problem in school, I usually go directly to the teacher/instructor. Yes / No

I usually expect to do well at whatever I try. Yes / No

I feel comfortable trying new technologies. Yes / No

I like to work independently. Yes / No

I prefer to work in a group. Yes / No

I don't believe you can have close relationships with people you only know online. Yes / No

I use social media. Yes / No

Which social media? _____

I play video games online with a group. Yes/No

Which games? _____

I have used online collaboration tools like facetime or hangouts, zoom, WebEx, etc. Yes / No

Which have you used? _____

I use email:

daily / several times a week / weekly / once in a while

I know how to add attachments to an email. Yes / No

I have used a word processing program to create documents. Yes / No

Name: _____

I have used spreadsheet software. Yes / No

Name: _____

I have used presentation software: Yes / No

Name: _____

I have been trained in internet etiquette (netiquette). Yes / No

I understand the need to protect my computer and how to do that. Yes / No

I have used a camera on my computer or phone. Yes / No

I have uploaded photos to my computer or the cloud. Yes / No

I use the web to find information. Yes / No

Sites you use often: _____

I spend some of my leisure time on the computer. Yes / No

I can only read on the computer for short periods of time. Yes / No

It is difficult for me to get to a jobsite every day. Yes / No

Please explain your situation? _____

My home is quiet during the day. Yes / No

I have my own room in my home that is quiet where I can work uninterrupted. Yes / No

I can get high speed internet where I live. Yes / No / Don't Know

I have multiple providers of internet where I live. Yes / No / Don't Know

I enjoy learning new computer programs. Yes / No

I know how to find answers to my questions. Yes / No

What is the first thing you do/try when you don't know an answer? _____

I sometimes need to be reminded about due dates. Yes / No

I sometimes miss details in written instructions. Yes / No

I am kind of an on-the-fly type of person. I get my tasks done, but, often at the last minute. Yes / No

I understand the difference between discussing and arguing. Yes / No

I enjoy a good discussion. Yes / No

I am a member of some online forums and contribute to them on a frequent basis. Yes / No

List a few of the forums: _____

I am a little worried about never working in the office or meeting my co-workers face to face. Yes / No

I have worked on online projects with teams before. Yes / No

Describe your role on one of the teams?

_____

APPENDIX K. CORONAVIRUS TIMELINE US RESPONSE THROUGH APRIL 24, 2020

December 31, 2019: China reports the discovery of the coronavirus to the World Health Organization.

January 3, 2020: CDC Director Robert Redfield sent an email to the director of the Chinese CDC, George Gao, formally offering to send U.S. experts to China to investigate the coronavirus.

January 5, 2020 CDC Director Redfield sent another email to the Chinese CDC Director, George Gao, formally offering to send U.S. experts to China to investigate the coronavirus outbreak,

January 6, 2020 The Centers for Disease Control and Prevention (CDC) issued a level I travel notice for Wuhan, China due to the spreading coronavirus.

January 7, 2020 The CDC established a coronavirus incident management system to better share and respond to information about the virus.

January 11, 2020 The CDC updated a Level 1 travel health notice for Wuhan, China.

January 17, 2020 The CDC began implementing public health entry screening at the 3 U.S. airports that received the most travelers from Wuhan – San Francisco, New York JFK, and Los Angeles.

January 20, 2020 Dr. Fauci announces the National Institutes of Health is already working on the development of a vaccine for the coronavirus.

January 21, 2020 The CDC activated its emergency operations center to provide ongoing support to the coronavirus response.

January 23, 2020 The CDC sought a “special emergency authorization” from the FDA to allow states to use its newly developed coronavirus test.

January 27, 2020 President Trump tweeted that he made an offer to President Xi Jinping to send experts to China to investigate the coronavirus outbreak.

January 27, 2020 The CDC issued a level III travel health notice urging Americans to avoid all nonessential travel to China due to the coronavirus.

January 27, 2020 The White House Coronavirus Task Force started meeting to help monitor and contain the spread of the virus and provide updates to the President.

January 29, 2020 The White House announced the formation of the Coronavirus Task Force to help monitor and contain the spread of the virus and provide updates to the President.

January 31, 2020 The Trump Administration declared the coronavirus a public health emergency. Announced Chinese travel restrictions. Suspended entry into the United States for foreign nationals who pose a risk of transmitting the coronavirus.

January 31, 2020 The Department of Homeland Security took critical steps to funnel all flights from China into just 7 domestic U.S. airports.

February 3, 2020 The CDC had a team ready to travel to China to obtain critical information on the novel coronavirus, but were in the U.S. awaiting permission to enter by the Chinese government.

February 2, 2020 The CDC expanded enhanced entry screening to eight major airports across the nation.

February 4, 2020 President Trump vowed in his State of the Union Address to “take all necessary steps” to protect Americans from the coronavirus.

February 5, 2020 The Trump Administration and health officials briefed lawmakers on the Federal Government's coronavirus response efforts.

February 6, 2020 The CDC began shipping CDC-Developed test kits for the 2019 Novel Coronavirus to U.S. and international labs.

February 7, 2020 President Trump told reporters that the CDC is working with China on the coronavirus.

February 9, 2020 The White House Coronavirus Task Force briefed governors from across the nation at the National Governors’ Association Meeting in Washington.

February 11, 2020 The Department of Health and Human Services (HHS) expanded a partnership with Janssen Research & Development to “expedite the development” of a coronavirus vaccine.

February 12, 2020 The U.S. shipped test kits for the 2019 novel coronavirus to approximately 30 countries who lacked the necessary reagents and other materials.

February 14, 2020 The CDC began working with five labs to conduct “community-based influenza surveillance” to study and detect the spread of coronavirus.

February 22, 2020 A WHO team of international experts arrives in Wuhan, China.

February 24, 2020 The Trump Administration sent a letter to Congress requesting at least $2.5 billion to help combat the spread of the coronavirus.

Febraury 25, 2020 HHS Secretary Azar testified before the Senate HELP committee on the Administration's coronavirus response efforts.

February 26, 2020 President Trump discussed coronavirus containment efforts with Indian PM Modi and updated the press on his Administration's containment efforts in the U.S. during his state visit to India.

February 29, 2020 The Food and Drug Administration (FDA) allowed certified labs to develop and begin testing coronavirus testing kits while reviewing pending applications.

February 29, 2020 The Trump Administration announced a level 4 travel advisory to areas of Italy and South Korea. Barred all travel to Iran. Barred the entry of foreign citizens who visited Iran in the last 14 days.

March 3, 2020 The CDC lifted federal restrictions on coronavirus testing to allow any American to be tested for coronavirus, "subject to doctor's orders."

March 4, 2020 The Trump Administration announced the purchase of approximately 500 million N95 respirators over the next 18 months to respond to the outbreak of the novel coronavirus.

March 4, 2020 Secretary Azar announced that HHS was transferring $35 million to the CDC to help state and local communities that have been impacted most by the coronavirus.

March 6, 2020 President Trump signed an $8.3 billion bill to fight the coronavirus outbreak. The bill provides $7.76 billion to federal, state, & local agencies to combat the coronavirus and authorizes an additional $500 million in waivers for Medicare telehealth restrictions.

March 11, 2020 President Trump announced travel restrictions on foreigners who had visited Europe in the last 14 days. Directed the Small Business Administration to issue low-interest loans to affected small businesses and called on congress to increase this fund by $50 billion. Directed the Treasury Department to defer tax payments for affected individuals & businesses, & provide $200 billion in "additional liquidity." Met with American bankers at the White House to discuss coronavirus.

March 13, 2020 President Trump declared a national emergency in order to access $42 billion in existing funds to combat the coronavirus.

March 13, 2020 President Trump announced public-private partnerships to open up drive-through testing collection sites. A pause on interest payments on federal student loans. An order to the Department of Energy to purchase oil for the strategic petroleum reserve.

March 13, 2020 The Food & Drug Administration granted Roche AG an emergency approval for automated coronavirus testing kits. Issued an emergency approval to Thermo Fisher for a coronavirus test within 24 hours of receiving the request.

March 13, 2020 HHS announced funding for the development of two new rapid diagnostic tests, which would be able to detect coronavirus in approximately 1 hour.

March 14, 2020 The Coronavirus Relief Bill passed the House of Representatives.

March 14, 2020 The Trump Administration announced the European travel ban will extend to the UK and Ireland.

March 15, 2020 HHS announced it is projected to have 1.9 million COVID-19 tests available in 2,000 labs this week.

March 15, 2020 All 50 states were contacted through FEMA to coordinate "federally-supported, state-led efforts" to end coronavirus.

March 16, 2020 President Trump held a tele-conference with governors to discuss coronavirus preparedness and response. Participated in a call with G7 leaders who committed to increasing coordination in response to the coronavirus and restoring global economic confidence. Announced that the first potential vaccine for coronavirus has entered a phase one trial in a record amount of time. Announced "15 days to slow the spread" coronavirus guidance.

March 16, 2020 The FDA announced it was empowering states to authorize tests developed and used by labs in their states.

March 16, 2020 Asst. Secretary for Health confirmed the availability of 1 million coronavirus tests, and projected 2 million tests available the next week and 5 million the following.

March 17, 2020 President Trump announced CMS will expand telehealth benefits for Medicare beneficiaries. Relevant Health Insurance Portability and Accountability Act penalties will not be enforced. The Army Corps of Engineers is on "standby" to assist federal & state governments.

March 17, 2020 President Trump spoke to fast food executives from Wendy's, McDonald's and Burger King to discuss drive-thru services recommended by CDC

March 17, 2020 President Trump met with tourism industry representatives along with industrial supply, retail, and wholesale representatives.

March 17, 2020 Treasury Secretary Steve Mnuchin met with lawmakers to discuss stimulus measures to relieve the economic burden of coronavirus on certain industries, businesses, and American workers.

March 17, 2020 Secretary of Agriculture Sonny Perdue announced a partnership between USDA, Baylor University, McLane Global, and Pepsi Co. to provide one million meals per weak to rural children in response to widespread school closures.

March 17, 2020 The Treasury Department contributed $10 billion through the economic stabilization fund to the Federal Reserve's commercial paper funding facility. Deferred $300 billion in tax payments for 90 days without penalty, up to $1 million for individuals & $10 million for business.

March 17, 2020 The Department of Defense announced it will make available to HHS up to five million respirator masks and 2,000 ventilators.

March 18, 2020 President Trump signed the Families First Coronavirus Response Act, which provides free testing and paid sick leave for workers impacted by the coronavirus.

March 18, 2020 President Trump announced temporary closure of the U.S.-Canada border to non-essential traffic. Plans to invoke the Defense Production Act in order to increase the number of necessary supplies needed to combat coronavirus. FEMA has been activated in every region at its highest level of response. The U.S. Navy will deploy USNS Comfort and USNS Mercy hospital ships. All foreclosures and evictions will be suspended for a period of time.

March 18, 2020 Secretary of Defense Mark Esper confirmed 1 million masks are now immediately available. The Army Corps of Engineers is in NY consulting on how to best assist state officials.

March 18, 2020 HHS temporarily suspended a regulation that prevents doctors from practicing across state lines.

March 18, 2020 President Trump spoke to doctors, physicians, and nurses on the front lines containing the spread of coronavirus.

March 19, 2020 President Trump announced very encouraging progress shown by anti-malaria drug Hydroxychloroquine for fighting coronavirus. Carnival Cruise Lines will make ships available for use as hospitals in impacted areas to use for non-coronavirus patients.

March 19, 2020 Vice President Pence announced tens of thousands of ventilators have been identified that can be converted to treat patients.

March 19, 2020 The State Department issued a global level 4 health advisory, telling Americans to avoid all international travel due to coronavirus.

March 19, 2020 President Trump directed FEMA to take the lead on the Federal Government's coronavirus response & visited FEMA HQ with Vice President Pence for a video call with Governors.

March 20, 2020 The U.S. and Mexico agree to mutually restrict nonessential cross-border traffic.

March 20, 2020 Secretary Mnuchin announced at the direction of President Trump that tax day will be moved from April 15 to July 15 for all taxpayers and businesses.

March 20, 2020 President Trump spoke with Sen. Schumer about coronavirus response & stimulus measures. Held a call with over 12,000 small business owners to discuss relief effort. Announced the CDC will invoke Title 42 to provide border patrol with tools to secure the borders

March 20, 2020 The Department of Education announced it will not enforce standardized testing requirements for the remainder of the school year. Allow federal student loan borrowers to stop payments without penalty for 60 days

March 20, 2020 Secretary Azar announced FEMA is coordinating and assisting coronavirus testing at labs across the country. The CDC is suspending all illegal entries to the country based on the public health threat, via Section 362 of the Public Health & Security Act

March 20, 2020 Secretary Azar sent a letter to all 50 Governors that the federal government is buying and making available 200,000 testing swabs

March 21, 2020 Vice President Pence announced to date over 195,000 Americans tested for coronavirus and have received their results

March 21, 2020 The Trump Administration announced HHS placed an order for hundreds of millions of N95 masks through FEMA

March 21, 2020 The FDA announced it had given emergency approval to a new coronavirus test that delivers results in hours, with an intended rollout of March 30

March 21, 2020 Adm. Giroir confirmed 10 million testing kits had been put into the commercial market from March 2 through March 14

March 22, 2020 President Trump approved major disaster declarations for Washington State, California

March 22, 2020 President Trump announced, Governors will remain in command of National Guard forces & the federal govt will fund 100% of operations cost. He directed the federal govt to provide 4 large federal medical stations with 2,000 beds for CA & 1,000 beds for NY & WA.

March 22, 2020 President Trump confirmed his administration was working with Peru & Honduras to return Americans stranded in both countries as a result of travel restrictions.

March 22, 2020 Vice President Pence announced, the testing backlog will be resolved by midweek. To date, over 254,000 Americans have been tested for coronavirus and received their results.

March 22, 2020 President Trump announced that the USNS Mercy will be deployed to Los Angeles.

March 22, 2020 FEMA issued guidance for tribal governments to seek federal assistance under the President's emergency declaration.

March 23, 2020 President Trump signed an executive order invoking section 4512 of the Defense Production Act to prohibit the hoarding of vital medical supplies.

March 23, 2020 VP Pence announced 313,000 Americans were tested for the coronavirus & received results. FEMA established a supply chain stabilization task force so Americans get supplies they need. HHS will have commercial labs prioritize testing for hospitalized patients.

March 23, 2020 The White House Office of Science & Technology Policy announced a public-private consortium to advance coronavirus research. Provide access to computing technology and resources for researchers.

March 23, 2020 Attorney General Barr announced, The Justice Department held a National Task Force meeting on hoarding and price gouging. Each of the 93 U.S. Attorney General offices is designating a lead prosecutor to prevent hoarding.

March 23, 2020 President Trump announced HHS is working to designate essential medical supplies as "scarce" to prohibit hoarding of these items.

March 23, 2020 The Treasury Department announced it is working with the Federal Reserve to lend up to $300 billion to businesses and local governments.

March 24, 2020 President Trump announced the Army Corps of Engineers & the National Guard are constructing four hospitals and four medical centers in New York.

March 24, 2020 President Trump approved a major disaster declaration for the state of Iowa related to the coronavirus outbreak.

March 24, 2020 Vice President Pence confirmed FEMA sent New York 2,000 ventilators. Announced individuals who have recently been in New York should self-quarantine for 14 days.

March 24, 2020 Dr. Deborah Birx announced the U.S. has conducted more coronavirus tests in the last week than South Korea has over the prior eight weeks.

March 24, 2020 The U.S. Army issued orders for three army hospitals to deploy their health care professionals to New York and Washington state, at the direction of Secretary of the Army Ryan McCarthy.

March 25, 2020 President Trump approved major disaster declarations related to the #coronavirus outbreak for: Texas, Florida, North Carolina

March 25, 2020 President Trump & Vice President Pence held a conference call with 140 non-profit organization leaders, including The Salvation Army & The Red Cross, to discuss coronavirus response efforts.

March 25, 2020 President Trump signed a bill reauthorizing The Older Americans Act, which supports senior citizens by providing meals, transportation, and other crucial services.

March 25, 2020 Vice President Pence held a conference call with equipment manufacturers to discuss on-going coronavirus response efforts. Announced 432,000 Americans have been tested for coronavirus and received results. Confirmed 4,000 ventilators were delivered to New York.

March 25, 2020 Vice President Pence held discussions with multiple governors, including the Governor of Indiana & the Governor of Michigan

March 26, 2020 President Trump approved major disaster declarations related to the coronavirus outbreak for: Illinois, New Jersey, Maryland, Missouri

March 26, 2020 President Trump announced the USNS Comfort will depart for NYC on Saturday to assist in the coronavirus response.

March 26, 2020 President Trump participated in a video conference with the leaders of the G20 to discuss the global coronavirus response & the need for countries to share information and data on the spread of the virus.

March 26, 2020 President Trump held a phone call with Chinese President Xi Jinping to discuss the coronavirus.

March 26, 2020 Vice President Pence announced 552,000 Americans have been tested for coronavirus and received their results.

March 26, 2020 Dr. Fauci announced the Federal Government is working with companies to speed up production of potential coronavirus vaccines while those drugs are still in the trial phase.

March 27, 2020 President Trump signed The Coronavirus Aid, Relief, and Economic Security (CARES) Act into law.

March 27, 2020 President Trump signed a Defense Production Act memorandum ordering General Motors (GM) "to accept, perform, and prioritize federal contractors for ventilators.

March 27, 2020 President Trump signed an executive order allowing the military to activate members of the Selected Reserve and Ready Reserve to active duty to assist with the Federal response to the coronavirus.

March 27, 2020 President Trump approved major disaster declarations related to the coronavirus outbreak for: South Carolina, Puerto Rico

March 27, 2020 President Trump appointed Office of Trade and Manufacturing policy director Peter Navarro to serve as the Defense Production Act Policy Coordinator.

March 27, 2020 President Trump announced that 100,000 ventilators are projected to be manufactured in the next 100 days, three times the amount typically manufactured in one year.

March 27, 2020 President Trump announced that Boeing offered the use of three "Dreamlifter" cargo air crafts to transport medical supplies across the country.

March 27, 2020 Partnering with FEMA, the CDC, and the Coronavirus Task Force, Apple released a coronavirus app which allows users to screen for their symptoms.

March 27, 2020 President Trump spoke with British Prime Minister Boris Johnson about the global coronavirus response and committed to helping provide ventilators to the U.K. where possible.

March 27, 2020 Vice President Pence announced that 685,000 Americans have been tested for coronavirus and received their test results.

March 27, 2020 Emory University began enrolling participants for a phase one clinical trial, sponsored by the NIH's National Institute of Allergy and Infectious Diseases (NIAID), of a new, potential coronavirus vaccine.

March 27, 2020 FEMA Administrator Pete Gaynor spoke to the director of each of the state's emergency operations about the state-led, federally-supported coronavirus response effort.

March 27, 2020 The USNS Mercy arrived in the port of Los Angeles to help relieve the strain on hospital facilities in Southern California.

March 28, 2020 President Trump visited Norfolk, VA to send off the USNS Comfort to New York City where it will help relieve the strain on local hospitals.

March 28, 2020 President Trump approved major disaster declarations related to the coronavirus outbreak for: Guam, Michigan, Massachusetts, Kentucky and Colorado

March 28, 2020 President Trump spoke with New York Governor Andrew Cuomo and Florida Governor Ron DeSantis regarding the coronavirus response effort.

March 28, 2020 The CDC issued new guidance for residents of New York, New Jersey, and Connecticut to avoid non-essential domestic travel for 14 days to #StopTheSpread of the coronavirus within the U.S.

March 29, 2020 President Trump announced that CDC guidelines will be extended through April 30 to promote #socialdistancing and other measures to stop the spread of the #coronavirus.

March 29, 2020 President Trump approved major disaster declarations related to the coronavirus outbreak for: Connecticut, Oregon, Georgia, and Washington D.C.

March 29, 2020 President Trump met with supply chain distributors including FedEx, Cardinal Health, and UPS to discuss ways to get state and local governments necessary medical supplies to combat the coronavirus.

March 29, 2020 President Trump congratulated the Army Corps of Engineers for having completed construction on a 2,900 bedroom temporary hospital at the Javits Center in New York.

March 29, 2020 President Trump tweeted his support for the FDA to expedite the approval process to approve mask sterilization equipment produced by Battelle.

March 29, 2020 President Trump announced the on-going study of 1,100 patients in New York being treated with Hydroxychloroquine for coronavirus.

March 29, 2020 President Trump directed the Treasury & Labor Departments to look at reinstating deductions of business expenses at restaurants, bars, and entertainment businesses to help the hospitality industry.

March 29, 2020 The first "Project Airbridge" shipment of medical supplies from abroad, organized by FEMA, landed at JFK airport, carrying 80 tons of masks, face shields, and other vital medical supplies.

March 29, 2020 President Trump announced that Cigna and Humana are waving co-pays for coronavirus treatment.

March 29, 2020 Vice President Pence sent a letter to hospital administrators requesting that hospitals across the country report their coronavirus data to the Federal Government in addition to state authorities.

March 29, 2020 Adm. Giroir announced that 894,000 Americans have been tested for coronavirus and received their results.

March 29, 2020 HHS accepted 30 million doses of Hydroxychloroquine, donated by Sandoz, and one million doses of Chloroquine, donated by Bayer Pharmaceuticals, for clinical trials and possible treatment of coronavirus patients.

March 30, 2020 President Trump announced that one million Americans have been tested for coronavirus and received their results.

March 30, 2020 President Trump approved major disaster declarations related to the coronavirus outbreak for: Alabama, Kansas, Pennsylvania, and Rhode Island

March 30, 2020 Secretary Azar announced that the FDA has approved Battelle's N95 mask sanitization process for use to decontaminate tens of thousands of masks per day.

March 30, 2020 President Trump announced further private sector commitments to manufacture personal protective equipment by MyPillow, Honeywell, Jockey, Procter & Gamble, and United Technologies.

March 30, 2020 President Trump announced, to date, FEMA has dedicated $1.3 billion to assist New York State's coronavirus response.

March 30, 2020 President Trump announced "more than 14,000" National Guard service members have been activated to respond to the coronavirus outbreak.

March 30, 2020 President Trump spoke with the nation's governors about their need for medical supplies.

March 30, 2020 President Trump announced that in the coming days the Federal Government will be delivering: 400 ventilators to Michigan, 300 ventilators to New Jersey, 150 ventilators to Louisiana, 150 ventilators to Illinois, 50 ventilators to Connecticut

March 30, 2020 President Trump spoke to Prime Minister Giuseppe Conte of Italy and pledged to send $100 million of medical supplies to aid Italy's battle against coronavirus.

March 30, 2020 Answering President Trump's call for the private sector to join the fight against the #coronavirus, Ford Motor Company committed to producing 50,000 ventilators in the next 100 days.

March 30, 2020 On coronavirus testing, Secretary Azar announced that the U.S. is currently testing nearly 100,000 samples per day.

March 30, 2020 HHS took steps to accelerate a clinical trial of a potential coronavirus vaccine developed by Janssen Research & Development.

March 30, 2020 CMS announced new regulatory changes to cut red tape and give flexibility to America's health care workers by relaxing hospital workforce regulations, expanding child care, meal, and laundry services for health care workers, expanding tele-health reimbursement, and more.

March 30, 2020 The USNS Comfort arrived in New York Harbor, providing more than 1,000 more hospital beds for patients without coronavirus, to relieve pressure on local hospitals.

March 30, 2020 The USNS Mercy began treating patients in Los Angeles.

March 31, 2020 President Trump officially issued "30 Days To Slow The Spread" guidance to mitigate the outbreak of coronavirus.

March 31, 2020 President Trump approved major disaster declarations related to the coronavirus outbreak for: Ohio and Montana

March 31, 2020 President Trump participated in a conference call with executives of American Network Service Providers to promote connectivity amid social distancing.

March 31, 2020 President Trump announced that the federal government is stockpiling 10,000 ventilators to be urgently distributed as needed once the coronavirus pandemic hits its peak in the U.S.

March 31, 2020 President Trump announced that the Treasury Department and SBA are rapidly mobilizing money from the CARES Act's $349 billion paycheck protection program, with the program set to be "up and running" by April 3.

March 31, 2020 President Trump spoke to Michigan Governor Whitmer about the state's need for ventilators.

March 31, 2020 President Trump announced the Army Corps of Engineers & FEMA will construct 8 facilities with 50,000 bed capacity in California, a field hospital with 250 bed capacity in Michigan, 2 field hospitals in Louisiana with 500 bed capacity, and an alternative care sight in New Orleans with a 3,000 bed capacity

March 31, 2020 President Trump spoke with Turkish President Recep Tayyip Erdogan about the international effort to defeat the coronavirus and support the global economy.

March 31, 2020 President Trump and the First Lady spoke with their Majesties King Felipe VI and Queen Letizia of Spain about efforts to combat the coronavirus.

March 31, 2020 Vice President Pence announced that 10 states now have access to federal funding for The National Guard to respond to the coronavirus outbreak.

March 31, 2020 Vice President Pence announced that 17,000 National Guard Servicemen have been activated across the country to assist in the coronavirus response.

March 31, 2020 Vice President Pence announced that 1.1 million coronavirus tests have been completed.

March 31, 2020 Adm. Giroir & Surgeon General Adams issued an open letter to the U.S. health care community about how to optimize the use of ventilators.

March 31, 2020 The FDA issued an emergency use authorization for a two-minute coronavirus antibody test developed by Bodysphere Inc.

March 31, 2020 The Treasury Department and IRS launched the employee retention credit, created by the CARES Act to incentivize businesses to keep their employees on payroll, and said businesses can begin using it.

March 31, 2020 The VA announced that it had expanded virtual services to veterans, continuing to provide care while limiting in-person interactions that could potentially harm vulnerable populations at VA facilities.

April 1, 2020 President Trump approved a major disaster declaration related to the coronavirus outbreak for: North Dakota, Hawaii, and The Northern Mariana Islands

April 1, 2020 President Trump spoke to Walmart CEO Doug McMillon about the need to procure gowns for hospitals

April 1, 2020 President Trump spoke to military families whose relocation or reunion with loved ones was impacted by the coronavirus.

April 1, 2020 President Trump announced that the construction & refurbishing of two additional hospital ships like the USNS Mercy and USNS Comfort are being considered.

April 1, 2020 Vice President Pence announced that 1.2 million coronavirus tests have been completed.

April 1, 2020 The White House, HHS, and the FDA worked with Senator Rob Portman to acquire and authorize for use over two million gowns donated to the Strategic National Stockpile by Cardinal Health.

April 1, 2020 Dr. Birx announced that the White House issued a challenge to universities and states to develop ELISA, or Enzyme-Linked Immunosorbent Assays, tests to detect coronavirus antibodies in larger communities more quickly.

April 1, 2020 The Treasury Department released FAQs to help small and medium businesses understand the paid sick and family leave tax credits now offered under the Families First Coronavirus Response Act.

April 1, 2020 The Department of Labor posted a temporary rule to implement the Families First Coronavirus Response Act in order to provide paid sick and family leave.

April 1, 2020 In New York City, the USNS Comfort began treating its first patients.

April 1, 2020 The VA opened its East Orange, NJ medical center to serve non-veteran coronavirus patients to assist the state and FEMA in their response to coronavirus.

April 1, 2020 The Treasury Department announced that Social Security recipients, including senior citizens, disabled Americans, and low-income Americans who do not file tax returns will have their coronavirus relief payments directly deposited into their bank accounts.

April 2, 2020 President Trump invoked the Defense Production Act to direct 3M to produce more N95 respirator masks.

April 2, 2020 President Trump invoked the Defense Production Act to help 6 companies (General Electric, Hill-Rom Holdings, Medtronic, ResMed, eRoyal Philips, and Vyaire Medical) get the supplies they need to make ventilators.

April 2, 2020 President Trump approved major disaster declarations related to the #coronavirus outbreak for Virginia, Tennessee, and The U.S. Virgin Islands

April 2, 2020 President Trump discussed the production of ventilators with GM CEO Mary Barra.

April 2, 2020 President Trump announced that The Javits Center temporary hospital will be converted into a coronavirus hospital.

April 2, 2020 President Trump announced that the Department of Defense will be establishing 48 more ICU beds in New York.

April 2, 2020 President Trump announced that the Federal Government will be establishing a coronavirus hospital in Louisiana and Texas.

April 2, 2020 President Trump took an additional coronavirus test and tested negative.

April 2, 2020 President Trump ordered the Federal Government to cover the costs of all National Guard operations in states with recently approved disaster declarations.

April 2, 2020 President Trump sent Senator Chuck Schumer a letter debunking false claims made against the Trump Administration’s coronavirus response.

April 2, 2020 Secretary Mnuchin and Small Business Administrator Jovita Carranza announced that the Paycheck Protection Program, created by the CARES Act to provide $350 billion in loans to small businesses, will be launched tomorrow.

April 2, 2020 Secretary Mnuchin announced that the first relief payments will be dispersed within two weeks.

April 2, 2020 Vice President Pence announced that 1.3 million coronavirus tests have been completed.

April 2, 2020 Vice President Pence announced that all Blue Cross Blue Shield Members will be waiving out of pocket costs for coronavirus treatment.

April 2, 2020 Rear Adm. Polowczyk announced FEMA's Supply Chain Stabilization Task Force has delivered 27.1 million surgical masks, 19.5 N95 million respirator masks, 22.4 million surgical gloves, 5.2 million face shields, over 7,600 ventilators

April 2, 2020 The Federal Transit Administration (FTA) announced $25 billion in federal funding to support public transportation systems in response to the coronavirus.

April 2, 2020 The Department of Justice and HHS distributed 192,000 N95 respirator masks confiscated from price gougers to health care workers in New York and New Jersey.

April 2, 2020 The FDA approved the first coronavirus antibody test, developed by Cellex.

April 2, 2020 The FDA issued new guidance to increase the supply of blood donations, reducing the deferral period for gay men from 12 months to 3 months.

April 2, 2020 The Department of Education donated 5,760 N95 respirator masks discovered in storage to aid the fight against the coronavirus.

April 2, 2020 Secretary Pompeo announced that the State Department has now brought home 30,000 Americans stranded overseas as a result of coronavirus-related travel restrictions.

April 2, 2020 April 2, 2020 HHS announced it was relaxing enforcement of HIPAA violations to encourage health care providers to share coronavirus data and information with federal and state health care officials.

April 2, 2020 The Trump Administration issued recommendations to nursing homes to help mitigate the spread of coronavirus.

April 2, 2020 HUD announced it was immediately making $3 billion of CARES Act funding available to help America's low-income families and most vulnerable citizens across the nation.

April 2, 2020 The Energy Department announced it would immediately make 30 million barrels of the strategic petroleum reserve's (SPR's) oil storage capacity available to struggling U.S. oil producers.

April 3, 2020 President Trump announced new voluntary CDC guidelines that all Americans wear non-medical, fabric or cloth face masks to prevent asymptomatic spread of coronavirus.

April 3, 2020 The President met with energy execs from Phillips 66, Devon Energy, Continental Resources, Hilcorp Energy, Occidental Petroleum, The American Petroleum Institute, The Energy Transfer Partners, Chevron, & Exxon Mobil to discuss coronavirus' impact on the energy industry.

April 3, 2020 President Trump spoke with French President Emmanuel Macron to discuss convening the five permanent members of the UN Security Council in an effort to defeat the coronavirus and discuss its impact on the world.

April 3, 2020 President Trump approved major disaster declarations related to the coronavirus outbreak for: New Hampshire, West Virginia, Indiana, Arkansas, and Oregon

April 3, 2020 President Trump signed a Presidential Memorandum blocking the export of N95 and other respirator masks, surgical masks, PPE gloves, and surgical gloves to ensure they are available in the U.S. – designating them as "scarce" under the Defense Production Act.

April 3, 2020 President Trump announced that Anthem will waive co-pays for coronavirus treatment for 60 days.

April 3, 2020 President Trump announced that uninsured Americans will have their coronavirus treatment covered, using funding from the CARES Act.

April 3, 2020 Trump Administration officials spoke to the directors of the two largest health care providers in Louisiana, Ochsner and LCMC Health, to discuss their need for medical supplies.

April 3, 2020 President Trump directed FEMA to send Ochsner Surgical Gowns.

April 3, 2020 President Trump announced that 9,000 retired Army medical personnel have volunteered and are assisting the federal response to the coronavirus.

April 3, 2020 President Trump announced that the DOJ and HHS have together secured 200,000 N95 masks, 130,000 surgical masks, 600,000 gloves, from hoarders and have distributed the supplies to health care workers.

April 3, 2020 Vice President Pence announced that 1.4 million coronavirus tests have been completed to date.

April 3, 2020 Vice President Pence announced that 18,000 machines are already available across the country to administer Abbott 15 Minute Coronavirus Tests, with another 1,200 soon to be distributed to states.

April 3, 2020 Vice President Pence announced that a Project Airbridge flight landed in Columbus, Ohio with medical supplies.

April 3, 2020 Secretary Azar announced a public-private partnership with Oracle to collect crowd-sourced data on coronavirus therapeutic treatments.

April 3, 2020 The SBA launched the Paycheck Protection Program for small businesses impacted by the coronavirus pandemic, issuing more than 17,500 loans valued at $5.4 billion.

April 3, 2020 The Army Corps of Engineers is working with states to assess 750 requests for temporary hospital facilities, having completed 673 already.

April 3, 2020 The FDA announced it would coordinate the national effort to develop blood-related therapies for COVID-19.

April 3, 2020 The Defense Department's Joint Acquisition Task Force launched a new portal giving the private sector the ability to submit information and solutions to the DoD.

April 3, 2020 The State Department announced that they have awarded contracts for 8 new medical facilities, totaling 9,693 new beds.

April 3, 2020 The Department of Labor issued guidance to help employers reduce their use of N95 respirators, freeing up supply for the coronavirus response.

April 3, 2020 HUD announced it is making $200 million in Indian housing block grants for Indian Tribes under the CARES Act.

April 3, 2020 EPA Administrator Wheeler held a call with retailers and marketplace platforms to discuss ways to protect consumers from fake disinfectants.

April 3, 2020 First Lady Melania Trump held a phone call with Mrs. Brigitte Macron of France to discuss the coronavirus response.

April 4, 2020 President Trump announced that 1,000 members of the Defense Department's Medical Corps will be deployed to New York to assist in the fight against coronavirus.

April 4, 2020 President Trump spoke to commissioners of major league sports organizations including the MLB, NFL, & NBA, recognizing what the leagues, teams, and players are doing in their communities to combat coronavirus.

April 4, 2020 President Trump tweeted encouragement to American children unable to start their Little League baseball season on time due to coronavirus.

April 4, 2020 President Trump approved major disaster declarations related to the coronavirus outbreak for Nebraska, Wisconsin, Maine and Nevada.

April 4, 2020 President Trump announced that he was considering a second coronavirus task force focused on the economy.

April 4, 2020 President Trump urged PM Modi of India to allow Hydroxychloroquine to be shipped to the United States.

April 4, 2020 President Trump announced that the U.S. government has repatriated over 40,000 Americans from 75 countries.

April 4, 2020 Vice President Pence spoke to Governors of New York, New Jersey, Louisiana, Massachusetts, Michigan, and Maryland.

April 4, 2020 FEMA obligated $44 million to Iowa under the state's major disaster declaration to combat the coronavirus.

April 5, 2020 President Trump approved major disaster declarations related to the coronavirus outbreak for: South Dakota, New Mexico, Oklahoma, Mississippi

April 5, 2020 President Trump announced that by Tuesday, 3,000 military and medical personnel will have deployed to New York, New Jersey, and Connecticut to assist in the coronavirus response effort.

April 5, 2020 President Trump announced that the Trump Administration will be sending New York 600,000 N95 masks tomorrow, including 200,000 to Suffolk County alone.

April 5, 2020 President Trump announced that the Administration will soon send 300 ventilators to Michigan, 200 ventilators to Louisiana, 600 ventilators to Illinois, 100 ventilators to Massachusetts, 500 ventilators to New Jersey

April 5, 2020 President Trump announced the establishment of a federal coronavirus medical station in Washington D.C.

April 5, 2020 President Trump announced that Washington has returned 400 ventilators to the strategic national stockpile.

April 5, 2020 President Trump announced that 1.67 million coronavirus tests have been completed.

April 5, 2020 President Trump announced that the government has stockpiled 29 million doses of Hydroxychloroquine

April 5, 2020 Dr. Birx announced that testing in the New York metro area, New Jersey, Louisiana, and Washington has exceeded the testing rate of Spain and Italy

April 5, 2020 Adm. Polowczyk announced that three Project Airbridge flights of medical supplies landed across the US today carrying 1 million gowns, 2.8 million surgical masks, 11.8 million gloves

April 5, 2020 Adm. Polowczyk spoke to top health officials from states severely impacted by the coronavirus to discuss the supply chain.

April 5, 2020 Secretary Wilkie announced that the VA is making 1,500 beds available at VA hospitals to help states and localities across the country.

April 5, 2020 Vice President Pence spoke to governors from states severely impacted by the coronavirus, including Michigan, Louisiana, and Illinois.

April 5, 2020 FEMA and The Army Corps of Engineers completed renovations at the McCormick Place Pavilion in Chicago, providing an additional 500 hospital beds for the city

April 6, 2020 President Trump announced an agreement with 3M to produce and import 55.5 million N95 masks each month for the next three months.

April 6, 2020 President Trump held a call with CEOs from pharmaceutical and bio-tech companies to discuss potential coronavirus therapeutics.

April 6, 2020 President Trump had a "very friendly" phone call with former Vice President Joe Biden to discuss the coronavirus.

April 6, 2020 President Trump announced that 1.79 million coronavirus tests have been completed.

April 6, 2020 President Trump approved Governor Murphy's request to allow New Jersey patients aboard the USNS Comfort.

April 6, 2020 President Trump approved Governor Cuomo's request to allow the treatment of coronavirus patients on the USNS Comfort.

April 6, 2020 President Trump announced that CVS will open two new drive-thru coronavirus testing sites in Georgia and Rhode Island. Both will use Abbott's rapid coronavirus test.

April 6, 2020 President Trump announced that the FDA authorized Inovio's potential coronavirus vaccine for a clinical trial, wile 10 potential coronavirus therapeutic agents are in "active trials" with another 15 potential therapeutics in plans for clinical trials.

April 6, 2020 President Trump praised the work of the private sector, including Apple and Salesforce, who have agreed to donate personal protective equipment to help defeat the coronavirus.

April 6, 2020 President Trump announced that The Army Corps of Engineers is building 22 field hospitals and alternative care sites in 18 states.

April 6, 2020 President Trump announced that 8,450 hospital beds and 8,000 ventilators have been deployed across the country from federal stockpiles.

April 6, 2020 Vice President Pence announced that to date $4.1 billion has been allocated to states under federal disaster declarations.

April 6, 2020 Vice President Pence announced that 21,000 National Guard Servicemen have been activated across the country to assist in the fight against coronavirus.

April 6, 2020 VP Pence announced that thanks to California's donation of 500 ventilators, the federal government will send 200 ventilators to Maryland, 100 ventilators to Delaware, 100 ventilators to Nevada, 50 ventilators to Washington D.C., and 50 ventilators to Guam & the Northern Mariana Islands

April 6, 2020 The CDC began publishing a new, data-centered coronavirus surveillance report on coronavirus.gov.

April 6, 2020 HHS announced an additional $186 million in CDC funding for state and local jurisdictions combatting the coronavirus.

April 6, 2020 HHS announced it will be purchasing 15 minute coronavirus tests from Abbott for state, territorial, and tribal labs and for the Strategic National Stockpile.

April 6, 2020 The Department of Education announced a streamlined process making it easier for states to use federal education funding for distance learning during the coronavirus outbreak.

April 7, 2020 President Trump participated in a conference call with banking executives to discuss how to best deliver financial aid and technical assistance to small businesses.

April 7, 2020 President Trump announced the SBA has processed "more than $70 billion" in loans to help small businesses as part of the Paycheck Protection Program.

April 7, 2020 President Trump approved a major disaster declaration for Minnesota related to the coronavirus outbreak.

April 7, 2020 President Trump announced that in addition to the 8,675 ventilators in the strategic national stockpile, the federal government will be acquiring 110,000 ventilators in the next three months to be distributed to states in need.

April 7, 2020 President Trump announced that 1.87 million coronavirus tests have been completed.

April 7, 2020 President Trump announced his intent to ask Congress for an additional $250 billion for the Paycheck Protection Program to loan to small businesses.

April 7, 2020 Vice President Pence participated in a conference call with over 500 business owners to discuss their needs amid the coronavirus response effort.

April 7, 2020 CMS Administrator Verma announced that CMS will make available an additional $30 billion in grants this week for health care organizations with increased operating costs due to the coronavirus.

April 7, 2020 The State Department announced an additional $225 million in health, humanitarian, and economic assistance to reduce the transmission of the coronavirus around the world.

April 7, 2020 As part of Project Airbridge, UPS and FEMA began shipments of 25 flights with more than three million pounds of medical supplies.

April 7, 2020 The Department of Transportation finalized a requirement that airlines who receive assistance under the CARES Act continue flights to destinations they were serving before the outbreak, ensuring commercial flights are available.

April 7, 2020 The EPA distributed over 1,100 N95 masks to the California Office of Emergency Services.

April 8, 2020 President Trump spoke to over 10,000 faith leaders & more than 3,000 state, local, and tribal officials to discuss the coronavirus response effort.

April 8, 2020 Secretary Pompeo announced that since January, over 50,000 Americans have been repatriated by 90 countries in over 480 flights.

April 8, 2020 Under the DPA, HHS announced a $646.7M contract with Philips to produce 2,500 ventilators for the Strategic National Stockpile by the end of May, and a total of 43,000 by December.

April 8, 2020 President Trump approved a major disaster declaration for Vermont related to the coronavirus outbreak.

April 8, 2020 President Trump announced that a Project Airbridge shipment of protective gowns landed in Dallas, Texas.

April 8, 2020 President Trump announced that 10 drugs to potentially be used against the coronavirus are currently in clinical trial.

April 8, 2020 President Trump thanked Indian PM Modi for allowing a shipment of the life-saving drug hydroxychloroquine to be released to the U.S.

April 8, 2020 Vice President Pence announced $98B in forgivable loans were disbursed through the Paycheck Protection Program, 27,000 National Guard service members were activated across the country to assist in the coronavirus response

April 8, 2020 The CDC issued new guidance for how essential and critical workers who have been exposed to the coronavirus can return to work, with precautions.

April 8, 2020 Four additional flights as part of Project Airbridge landed across the country, delivering PPE and other medical supplies.

April 8, 2020 Customs and Borders Protection announced with FEMA that it will detain shipments of PPE in order to keep critical medical supplies within the U.S. for domestic use.

April 8, 2020 HHS announced an agreement with DuPont and FedEx to rapidly manufacture and deliver 2.25M new Tyvek Protective Suits to the Strategic National Stockpile over the next five weeks.

April 8, 2020 HHS expanded telehealth services for Native Americans through The Indian Health Service.

April 8, 2020 HHS authorized pharmacists to order and administer coronavirus tests, further expanding the availability of testing.

April 8, 2020 HHS awarded $1.3B from the CARES Act to 1,387 health centers in all 50 states, 8 territories, and the District of Columbia to fight coronavirus.

April 8, 2020 CMS issued updated guidance based on CDC guidelines to protect patients and health care workers in hospitals from the coronavirus.

April 8, 2020 The USDA announced its approval of Arizona's & California's request for food stamp recipients to purchase food online, allowing these recipients to purchase groceries for delivery.

April 8, 2020 The VA announced that it has begun using funding from the CARES Act to pay overtime, hire new staff, and purchase supplies including PPE, beds, and pharmaceuticals.

April 9, 2020 President Trump spoke with mental health advocates from across the country to discuss their work amid the coronavirus outbreak.

April 9, 2020 President Trump approved major disaster declarations related to the coronavirus outbreak for: Alaska and Idaho

April 9, 2020 President Trump announced that 24 Project Airbridge flights have been completed to date, with an additional 49 flights scheduled.

April 9, 2020 President Trump announced that there are currently 19 potential coronavirus therapies being tested and another 26 potential therapies in active planning for clinical trials.

April 9, 2020 President Trump announced that, to date, over 2 million coronavirus tests have been completed.

April 9, 2020 Vice President Pence announced that $125B in Paycheck Protection Program forgivable loans has been approved to date.

April 9, 2020 Vice President Pence announced that a total of 29,000 National Guard service members have been activated across the country to assist in the coronavirus response.

April 9, 2020 Vice President Pence announced that to date 4,100 military medical personnel have been deployed to New York, New Jersey, and Connecticut.

April 9, 2020 The Treasury Department announced that it extended over 300 tax filing, payment, and administrative deadlines to give relief to taxpayers.

April 9, 2020 Working with the Treasury Department, the Federal Reserve announced new lending programs providing up to $2.3T in loans to businesses and state & local governments.

April 9, 2020 HHS announced it would relax enforcement of HIPPAA for pharmacies and other organizations that are working at coronavirus testing sites, helping these groups focus on testing.

April 9, 2020 Secretary of Education DeVos announced that $6.3B in CARES Act funding will be immediately distributed to colleges and universities to provide cash grants to students affected by the coronavirus.

April 9, 2020 Secretary of Education DeVos announced that $6.3B in CARES Act funding will be immediately distributed to colleges and universities to provide cash grants to students affected by the coronavirus

April 9, 2020 The EPA announced that more than 11,500 pieces of PPE have been transferred to FEMA, which will be later transferred to state and local agencies across New England combating the coronavirus.

April 9, 2020 The USDA launched the Pandemic Electronic Benefit Transfer (EBT) Program in Michigan, which will help feed children eligible for USDA school lunch programs who are now home during the coronavirus outbreak.

April 9, 2020 The USDA announced relief for farmers across the country by giving borrowers 12 months to repay marketing assistance loans (MAL), helping protect farmers from being forced to sell crops to make loan payments.

April 9, 2020 CMS temporarily suspended a number of regulations so that hospitals, clinics, and other health care providers can book the number of staff to confront the coronavirus

April 10, 2020 President Trump announced that 60 mask sterilization systems, with the ability to clean over 80,000 masks approximately 20 times, will be sent to 10 cities.

April 10, 2020 President Trump spoke with Russian President Vladimir Putin to discuss the global coronavirus response and the global energy market.

April 10, 2020 President Trump announced that a field hospital in Seattle will be leaving, as Washington State's coronavirus outbreak becomes more manageable.

April 10, 2020 President Trump announced that his administration is working to bring blood-based serology tests to market "as quickly as possible" so Americans can determine if they have had the coronavirus.

April 10, 2020 President Trump announced that he will be establishing an "Opening Our Country Council" with more details coming early next week.

April 10, 2020 President Trump signed a Presidential Memorandum to facilitate the supply of medical equipment and other humanitarian relief to Italy.

April 10, 2020 Dr. Fauci spoke to Arkansas Governor Asa Hutchinson and Wyoming Governor Mark Gordon to discuss coronavirus mitigation in those states.

April 10, 2020 Vice President Pence, CDC Director Redfield, & Surgeon General Adams spoke to over 400 leaders of the African American community, including Jesse Jackson, NAACP representatives, & the National Black Nurses Association to discuss the impact of the coronavirus.

April 10, 2020 Vice President Pence spoke to Colorado Governor Jared Polis about the specific needs of his state's battle against the coronavirus.

April 10, 2020 Vice President Pence announced that more than 2.1M coronavirus tests have been completed to date.

April 10, 2020 Vice President Pence announced that 29,600 National Guard Troops have been activated and 4,700 active duty medical personnel have been deployed to nine states

April 10, 2020 Vice President Pence announced that to date, 26 Project Airbridge flights have landed in the U.S. with PPE, with four flights scheduled to land today with 250,000 gowns and 25M pairs of gloves.

April 10, 2020 HHS began delivering $30B in relief funding to health care providers, part of the $100B allocated to health care providers by the CARES Act.

April 10, 2020 The FDA approved an emergency authorization for a blood purification device to treat coronavirus patients.

April 10, 2020 Transportation Secretary Elaine Chao announced $1B for Amtrak to continue rail service and respond to the spread of the coronavirus.

April 10, 2020 The Treasury Department launched a web portal to help Americans who did not file tax returns receive their coronavirus relief payments under the CARES Act.

April 10, 2020 The Treasury Department announced it will launch a new "get my payment" app where Americans can enter their direct deposit information to get coronavirus relief payments quicker.

April 10, 2020 The VA deployed medical staffers to New Orleans to help "surge" personnel in the area, which is currently being heavily impacted by the coronavirus.

April 11, 2020 President Trump approved a major disaster declaration for Wyoming related to the coronavirus outbreak, marking the first time in U.S. history a President has declared that a major disaster exists in all 50 states.

April 11, 2020 The DoD announced it is using The Defense Production Act to get the private sector to produce 39 million N95 masks within 90 days, a $133M investment.

April 11, 2020 Three Project Airbridge flights landed in Chicago, Illinois, delivering over 62 million gloves.

April 11, 2020 The Department of Justice announced it is monitoring state and local social distancing regulations to ensure religious organizations are not unfairly targeted.

April 11, 2020 The USDA added Florida & Idaho to the food stamp online pilot program, allowing food stamp recipients to purchase food online.

April 11, 2020 CMS expanded the requirements that private health insurers provide free coronavirus testing, saying that this includes anti-body testing and costs related to coronavirus testing, like emergency room or urgent care visits.

April 12, 2020 A deal brokered by President Trump was announced between The OPEC countries, Russia, and the U.S. to cut production and stabilize the oil market amid dual disruptions from coronavirus and the price war between Saudi Arabia & Russia.

April 12, 2020 The FDA issued an emergency authorization to devices from Advanced Sterilization Products, which can decontaminate approximately 4 million N95 respirators each day.

April 12, 2020 The FBI uncovered an international fraud scheme related to the attempted purchase of 39 million N95 masks by a Service Employees International Union Affiliate.

April 13, 2020 President Trump announced that new coronavirus infection rates remained “flat” over the weekend across the country.

April 13, 2020 President Trump announced that HHS is signing five new contracts for ventilators with GE, Hillrom, Medtronic, ResMed, & Vyaire, which will be added to the Strategic National Stockpile.

April 13, 2020 President Trump announced that nearly 3 million coronavirus tests have been completed, with roughly 150,000 new tests each day.

April 13, 2020 President Trump announced that multiple advisory committees, including a “faith leaders committee” will be formed to consult on the reopening of the country.

April 13, 2020 President Trump and Vice President Pence met with representatives from Abbott to discuss increasing the production of cartridges for Abbott’s rapid coronavirus test machines.

April 13, 2020 Vice President Pence and members of the Coronavirus Task Force led a conference call with 48 governors.

April 13, 2020 Vice President Pence announced that there are currently just under 7,000 ventilators in the Strategic National Stockpile, and that no one has been denied a ventilator who needed one.

April 13, 2020 Dr. Fauci participated in a meeting with members of the Congressional Black Caucus to discuss the impact of the coronavirus on the African American community.

April 13, 2020 Adm. Polowczyk announced that 37 Project Airbridge flights have been completed, with another 43 scheduled.

April 13, 2020 5 flights landed across the country carrying shipments of PPE as part of Project Airbridge.

April 13, 2020 The U.S. government now has 28 million doses of hydroxychloroquine stockpiled.

April 13, 2020 The Treasury Department announced that 80 million Americans will receive economic impact payments in their bank accounts within the week.

April 13, 2020 The Treasury Department launched a new web portal which will quickly deliver CARES Act funding to state, local, and tribal governments.

April 13, 2020 The Defense Department announced it was buying 60 Battelle decontamination systems which can sanitize 80,000 N95 respirators per day.

April 13, 2020 HUD announced new guidelines clarifying that borrowers of multifamily mortgages insured by HUD and FHA and renters have certain protections from eviction and foreclosure.

April 13, 2020 The Department of Justice and Federal Trade Commission announced that they will be enforcing antitrust laws against businesses that try to exploit the coronavirus outbreak to harm American workers.

April 13, 2020 The USDA released a “one-stop-shop” resource guide to help farmers, rural communities, and others know what resources and assistance are available to them as a response to the coronavirus.

April 13, 2020 The USDA approved Rhode Island’s request to join the Pandemic Electronic Benefit Transfer (EBT) Program, which will help feed children eligible for USDA school lunch programs who are now at home during the coronavirus outbreak.

April 13, 2020 The Department of Commerce and Census Bureau announced adjustments to the 2020 Census operational schedule to protect census workers and the American people during the coronavirus outbreak.

April 13, 2020 The VA announced a “dramatic” increase in virtual and tele-mental health appointments, a sign that veterans are still able to access care remotely during the coronavirus.

April 13, 2020 The DHS announced it had processed more than 271,000 travelers through enhanced screenings at airports as of April 12, referring nearly 1,500 to the CDC for further evaluation.

April 14, 2020 President Trump announced a halt in funding to the WHO while a review is conducted to assess its mistakes and mismanagement of the coronavirus outbreak.

April 14, 2020 President Trump announced the Dynamic Ventilator Reserve, a public-private partnership to help hospitals with surplus loan them to hospitals in need.

April 14, 2020 President Trump met with health care executives to discuss the supply of ventilators.

April 14, 2020 President Trump announced the members of the Great American Economic Revival Industry Groups, who will advise the President on how to re-open the economy.

April 14, 2020 President Trump met with coronavirus survivors at the White House to discuss their treatment and condition.

April 14, 2020 President Trump spoke with French President Emmanuel Macron to discuss the global coronavirus response and the re-opening of the global economy.

April 14, 2020 President Trump extended an order for the federal government to cover the costs of all National Guard operations to states with recently approved disaster declarations.

April 14, 2020 HHS announced it was distributing the $3.5 billion in child care and development block grant funding included in the CARES act.

April 14, 2020 FEMA confirmed it send out 19.1 million doses of hydroxychloroquine to cities across the country.

April 14, 2020 More than 30,000 National Guard troops total have been activated to assist in the coronavirus response.

April 14, 2020 Two flights landed carrying 16 million gloves, 698,590 gowns, and 690 thermometers as part of Project Airbridge.

April 14, 2020 The Treasury Department announced that many of the nation's major airlines, including American Airlines, Delta, JetBlue, and Southwest intend to participate in the Payroll Support Program, helping pay airline workers' salaries and benefits.

April 14, 2020 The Transportation Department announced $10 billion in relief for America's airports from the Trump Administration's newly created CARES Act airport grant program.

April 14, 2020 The Department of Energy announced it is negotiating crude oil storage contracts totaling 23 million barrels to help US energy producers affected by lower demand.

April 14, 2020 The EPA announced that it has temporarily waived certain approvals for manufacturers producing disinfectants for use against the coronavirus.

April 14, 2020 The Department of Education Announced $3 billion in education block grants for states to help schools, students, and educators at all levels.

April 14, 2020 The VA announced it has made a total of 1,500 hospital beds around the country available to FEMA.

April 14, 2020 GM began mass production on an order of 30,000 Ventec ventilators, 600 ventilators are expected to be shipped this month and the full order will be completed by August.

April 15, 2020 President Trump announced that new guidelines for re-opening the country will be announced tomorrow, in consultation with governors and lawmakers.

April 15, 2020 President Trump announced that more than 3.3 million coronavirus tests have been completed.

April 15, 2020 President Trump announced that 44 Project Airbridge flights have delivered supplies to date.

April 15, 2020 HHS awarded $90 million to Ryan White HIV/AID Program recipients to combat coronavirus.

April 15, 2020 The Treasury Department launched the "Get My Payment" web app, allowing taxpayers to submit their direct deposit information online for their Coronavirus Economic Impact Payments.

April 15, 2020 The Treasury Department announced that supplemental security income recipients will receive their coronavirus relief payments as they would their SSI benefits, directly into their bank accounts or by debit cards or by check.

April 15, 2020 CMS announced Medicare will nearly double payments for "high-throughput" coronavirus tests, incentivizing health care providers to increase the supply and speed of testing.

April 15, 2020 The Department of Labor awarded more than $131 million in dislocated worker grants to help workers impacted by the coronavirus outbreak.

April 16, 2020 President Trump announced new, phased "opening up America again" guidelines.

April 16, 2020 President Trump participated in a video conference with leaders of the G7 to discuss a coordinated response to coronavirus, including pooling data and research, preparations to re-open their economies, and the WHO's response to the coronavirus.

April 16, 2020 President Trump spoke with Republican and Democrat members of the Opening Up America Again Congressional Group on the coronavirus response and efforts to re-open the economy.

April 16, 2020 President Trump held a "Thank God For Truckers" ceremony on the South Lawn to thank truckers for moving goods and ensuring a stable supply of food, medical equipment, and other supplies during the pandemic.

April 16, 2020 President Trump participated in a video conference with governors on opening up America again.

April 16, 2020 President Trump announced that 3.5 million coronavirus tests have been completed to date, the most of any country worldwide.

April 16, 2020 President Trump reiterated his request for an additional $250 billion to replenish the paycheck protection program to help struggling small businesses.

April 16, 2020 President Trump announced that 4,000 community banks have participated in the paycheck protection program.

April 16, 2020 Under the DPA, HHS announced a $336 million contract with GE for 50,000 ventilators to be produced by July 13; in total, HHS has signed contracts for 41,000 ventilators by May and over 187,000 ventilators by the end of the year.

April 16, 2020 Secretary Mnuchin and Administrator Carranza urged Congress to provide additional funds to the paycheck protection program to help small businesses.

April 16, 2020 USAID announced that it committed nearly $508 million in emergency health, humanitarian, and economic aid around the world to help respond to the coronavirus pandemic.

April 16, 2020 The FDA encouraged Americans who have recovered from coronavirus to donate their plasma for the development of new treatments and therapies.

April 16, 2020 OSHA issued an alert listing safety tips employers can follow to help keep manufacturing workers safe during the coronavirus pandemic.

April 17, 2020 President Trump and Secretary Perdue announced a $19 billion relief package for ranchers and farmers impacted by the coronavirus.

April 17, 2020 President Trump approved a major disaster declaration for American Samoa related to the coronavirus outbreak, meaning major disaster declarations have been approved in all 50 states and in all US territories for the first time in history.

April 17, 2020 President Trump participated in a conversation with faith leaders to discuss the coronavirus response and “express his eagerness to get” houses of worship reopened as soon as possible.

April 17, 2020 President Trump spoke to President Andrés Manuel López Obrador of Mexico to discuss Mexico’s need for additional ventilators.

April 17, 2020 President Trump announced that 3.7 million coronavirus tests have been completed to date.

April 17, 2020 Vice President Pence announced that a total of 33,000 National Guard troops and 5,500 active duty servicemembers have been activated to date to assist in the coronavirus response.

April 17, 2020 Dr. Fauci participated in a call with the Senate Democrat Caucus to discuss the US coronavirus testing capacity.

April 17, 2020 CDC Director Redfield announced that 500 CDC staff are now embedded in state, local, and tribal health agencies across the country.

April 17, 2020 Dr. Birx announced that 47 states have the ability to perform at least 30 tests per month per 1,000 residents.

April 17, 2020 The NIH announced a new public-private partnership with over a dozen leading biopharmaceutical companies to speed up the development of coronavirus vaccines and therapies.

April 17, 2020 At the director of FEMA, GM announced that they delivered the first GM-Ventec ventilators to Chicagoland hospitals.

April 17, 2020 To support FEMA's Project Airbridge, UPS announced it would add over 200 flights in April.

April 17, 2020 The Treasury Department and VA announced that veterans who had not filed tax returns would automatically receive economic impact payments without additional paperwork.

April 17, 2020 The DOJ filed an injunction to halt the online sale of a supposed "miracle" treatment for the coronavirus which is "unapproved, unproven, and potentially dangerous".

April 17, 2020 The DOI announced it will continue to allow public access to parks.

April 17, 2020 The USDA added Washington, DC and North Carolina to the SNAP online pilot program, allowing food stamp recipients to purchase food online and for delivery.

April 17, 2020 The USDA approved the Pandemic Electronic Benefit Transfer for North Carolina and Massachusetts, which will help feed children eligible for USDA school lunch programs who are now at home during the coronavirus outbreak.

April 18, 2020 President Trump announced that over 4 million coronavirus tests have been completed to date, double the number of tests done by any other country.

April 18, 2020 President Trump announced that 1.6 million small businesses have participated in the paycheck protection program and reiterated his request that Congress replenish funding for the program.

April 18, 2020 President Trump offered to send ventilators to Iran, if the Iranian government accepted the assistance.

April 18, 2020 President Trump consulted with FEMA and military officials about the coronavirus response.

April 18, 2020 President Trump spoke to the leaders of Poland, South Korea, and Bahrain about the global response to the coronavirus.

April 18, 2020 The USDA added West Virginia to the SNAP online pilot program, allowing food stamp recipients to purchase food online and for delivery.

April 19, 2020 President Trump announced that 4.18 million coronavirus tests have been completed to date – more tests than France, The U.K., South Korea, Japan, Singapore, India, Austria, Australia, Sweden, and Canada combined.

April 19, 2020 President Trump announced his administration is working on using the DPA to increase the production of testing swabs.

April 19, 2020 President Trump participated in a call with Republican senators on opening up America again.

April 19, 2020 64 Project Airbridge flights have been completed to date carrying over 600 million pieces of gloves, gowns, and other PPE, with 50 additional flights scheduled in the future.

April 19, 2020 CMS Administrator Verma announced new requirements for nursing homes to report outbreaks of coronavirus to patients, patients' families, and the CDC.

April 19, 2020 President Trump held calls with the head of the Eastern Orthodox Church Archbishop Bartholomew I, Turkish President Erdogan, and President of the Philippines Rodrigo Duterte about the response to the coronavirus pandemic.

April 20, 2020 President Trump announced that HHS has distributed the $30 billion in relief funding to health care providers under the CARES act.

April 20, 2020 President Trump announced that there are currently 72 active trials for coronavirus therapies, with 211 additional therapies in the planning stages for active trials.

April 20, 2020 Vice President Pence and members of the coronavirus task force spoke to all 50 state governors and provided each with a list of labs with additional testing capacity in their respective states.

April 20: Chief of the Army Corps of Engineers Gen. Todd Semonite announced that USACE has, to date, executed the construction of 32 facilities across the country, creating approximately 16,000 more beds.

April 20, 2020 The Trump Administration announced its helping increase testing swab production by 30M per month - assisting an Ohio manufacturer to convert production lines to produce 10M swabs a month & using the DPA to help Puritan Medical Products produce 20M testing swabs a month.

April 20, 2020 CMS Deputy Administrator and CMMI Director Brad Smith announced that 650,000 infrared thermometers have been secured by the federal government in anticipation of future demand for these devices as states re-open.

April 20, 2020 Vice President Pence and Dr. Birx visited FEMA HQ and thanked FEMA staff for their hard work.

April 20, 2020 Vice President Pence announced that all DoD and federal labs will be made available for states to use in order to increase testing capacity.

April 20, 2020 Vice President Pence and Adm. Giroir announced that current testing capacity means that all 50 states are "ready right now to enter phase one" if they meet other criteria of the President's opening up America guidelines.

April 20, 2020 HHS announced a partnership with Oracle and their donation of a therapeutic learning system, an online platform designed for collecting crowd-sourced data on potential coronavirus therapies.

April 20, 2020 Vice President Pence announced that the CDC is deploying teams of 10-12 experts to all states and territories to assist in contact tracing.

April 20, 2020 HHS' substance abuse and mental health services administration (SAMHSA) announced $110 million in emergency grants for those suffering from mental illness and substance abuse amid the coronavirus pandemic.

April 20, 2020 The Defense Department announced the hospital ship the USNS Comfort has started admitting patients from New Jersey.

April 20, 2020 The Defense Department announced the US will be providing humanitarian support and relief to Italy, including transportation, supplies, and telemedicine.

April 20, 2020 The EPA announced expanded research efforts into the coronavirus' impact on the environment and human health.

April 20, 2020 The VA announced it acquired a 470,000 sq. ft. facility in Texas to help provide overflow bed capacity to treat coronavirus cases, which will eventually serve as an outpatients and specialty care clinic for veterans.

April 20, 2020 Acting DHS Secretary Wolf announced that US, Canada, and Mexico had extended non-essential travel restrictions for an additional 30 days.

April 20, 2020 The Justice Department announced it cleared antitrust barriers which could have blocked the drug distribution company AmerisourceBergen from distributing medicine and supplies as part of the coronavirus response, including hydroxychloroquine.

April 20, 2020 The USDA approved Arizona and Illinois to join the pandemic EBT program, which will help feed children eligible for USDA school lunch programs in these states who are now at home during the coronavirus outbreak.

April 20, 2020 CMS announced it is incentivizing Medicare health care providers to report more coronavirus data to help treat and fight the spread of the disease.

April 21, 2020 After negotiations with the Trump Administration, the Senate passed the Paycheck Protection Program and Health Care Enhancement Act, which includes an additional $382B for the PPP, $75B for hospitals, and $25B for coronavirus testing efforts.

April 21, 2020 President Trump announced that 20 states announced plans to enter phase one of the opening up America again guidelines.

April 21, 2020 President Trump officially announced plans to suspend immigration, with certain exceptions, for 60 days.

April 21, 2020 President Trump met with Governor Cuomo at the White House to discuss coronavirus testing.

April 21, 2020 President Trump announced that the FDA has now authorized more than 50 coronavirus diagnostic tests and four antibody tests.

April 21, 2020 HHS announced $995 million in CARES Act grants for older adults and the disabled.

April 21, 2020 FEMA approved nearly $5 million for BiPAP breathing machines for Pennsylvania.

April 21, 2020 The FDA issued an emergency approval for the first coronavirus test where a sample can be collected at home.

April 21, 2020 The State Department announced it is coordinating international humanitarian assistance with pacific nations including Australia, New Zealand, Japan, and Taiwan.

April 21, 2020 The USDA announced that states of Kentucky, Missouri, and Texas have been added to the SNAP online program, allowing food stamp recipients to purchase food online.

April 21, 2020 Education Secretary DeVos announced an additional $6.2 billion in grants is available for universities to continue providing educational services during the outbreak, such as distance and remote learning programs.

April 22, 2020 President Trump signed a Presidential Proclamation suspending immigration in the U.S. for 60 days due to “the impact of foreign workers on the United States labor market, particularly in an environment of high domestic unemployment’.

April 22, 2020 President Trump urged the House of Representatives to pass the Senate-backed Paycheck Protection Program and Health Care Enhancement Act without delay.

April 22, 2020 President Trump directed the Opportunity & Revitalization Council to focus on supporting underserved communities impacted by the coronavirus, including Black and Hispanic communities.

April 22, 2020 President Trump announced the Administration has to date directed more than $7 billion in funding towards coronavirus treatments, diagnostics, and therapies.

April 22, 2020 President Trump spoke to Governor Newsom about increasing testing capacity.

April 22, 2020 President Trump held calls with Pakistan's PM Imran Khan and Amir Sheikh Tamim Bin Hamad Al Thani of Qatar about the global coronavirus response.

April 22, 2020 Vice President Pence held a call with over 340 state legislators from 43 states to discuss the response to coronavirus.

April 22, 2020 Vice President Pence announced that 5,500 active duty military personnel are currently deployed to assist in the coronavirus response, including 964 medical personnel in 17 hospitals in 7 states.

April 22, 2020 Vice President Pence announced that the VA has been deploying teams of VA personnel to assist nursing homes in some states.

April 22, 2020 HHS awarded nearly $165 million in funding to fight the coronavirus in rural communities, providing CARES Act funding to 1,779 small rural hospitals and 14 HRSA-Funded telehealth resource centers.

April 22, 2020 HHS announced an additional $20 billion in CARES Act funding for health care providers would be disbursed this week.

April 22, 2020 FEMA Announced $36.5 million in expedited funding to the city and county of Denver, Colorado in response to the coronavirus.

April 22, 2020 FEMA published a final rule defining certain PPE as "scarce" to combat hoarding and price gouging of these materials.

April 22, 2020 The Justice Department announced federal law enforcement officials had successfully disrupted hundreds of online coronavirus scam websites.

April 22, 2020 The USDA announced it has successfully increased monthly SNAP benefits by 40% during the coronavirus outbreak.

April 22, 2020 USDA approved Alabama for the Pandemic EBT Program, which will help feed children eligible for USDA school lunch programs who are now at home during the coronavirus outbreak.

April 22, 2020 Secretary DeVos called on wealthy universities to reject taxpayer coronavirus funds and on Congress to change the eligibility put forth by the CARES Act.

April 23, 2020 President Trump held calls with United Arab Emirates Crown Prince Mohammed Bin Zayed, South Africa President Cyril Ramaphosa, Kenyan President Uhuru Kenyatta, and Colombian President Ivan Duque about the response to the coronavirus pandemic.

April 23, 2020 President Trump announced that to date 750 million pieces of PPE have been delivered to the US through Project Airbridge.

April 23, 2020 Vice President Pence participated in a conference call with Secretary Carson to discuss refocusing the White House Opportunity and Revitalization Council on the needs of Hispanic and Black communities impacted by the coronavirus.

April 23, 2020 Vice President Pence announced that since the release of the Trump Administration's Opening Up America Again guidelines, 16 states have issued formal re-opening plans.

April 23, 2020 Acting DHS Undersecretary for Science & Technology William Bryan announced findings of a study indicating that heat, humidity, and UV rays can slow and kill the coronavirus.

April 23, 2020 HHS announced $631 million in CARES Act funding for public health departments across the country for testing, contact tracing, and containment of the coronavirus.

April 23, 2020 HHS awarded nearly $5 million to poison control centers across the country which are seeing increased calls during the coronavirus outbreak.

April 23, 2020 CMS released a new telehealth toolkit to accelerate state us of telehealth in Medicaid and CHIP during the coronavirus pandemic.

April 23, 2020 The USDA approved Wisconsin for the Pandemic EBT Program, which will help feed children eligible for USDA school lunch programs who are now at home during the coronavirus outbreak.

April 23, 2020 The EPA announced that it blocked the importation of "a significant number of shipments" of illegal and untested "virus shut out" products that were being shipped into California airports.

April 24, 2020 President Trump signed the Paycheck Protection Program and Health Care Enhancement Act into law, providing $321B in new funding for the PPP, $75B for health care providers, and $25B for coronavirus testing.

April 24, 2020 President Trump held calls with the Indonesian President, Ecuadorian President, El Salvadorian President, and Honduran President about the response to the coronavirus pandemic.

April 24, 2020 Vice President Pence announced to date 5.1 million coronavirus tests have been completed.

April 24, 2020 Vice President Pence announced that over 35,000 National Guard troops and 5,000 active duty military personnel in 10 states remain active to assist in the coronavirus response.

April 24, 2020 Vice President Pence & members of the coronavirus held a conference call with Governors to discuss increasing testing capacity.

April 24, 2020 FDA Administrator Dr. Hahn announced the FDA granted emergency approvals to 63 coronavirus diagnostic and serological tests to date.

April 24, 2020 Administrator Carranza & Secretary Mnuchin announced that the FBA will resume accepting PPP loans on Monday, April 27.

April 24, 2020 Secretary of Labor Scalia participated in a virtual G20 Labor & Employment Ministers meeting to discuss the response to the coronavirus pandemic.

April 24, 2020 The VA announced that hiring has increased 37% during the first 2 weeks of April, as the agency surges staff to fight the coronavirus.

April 24, 2020 The DOJ obtained an injunction prohibiting a Dallas health center from fraudulently promoting “ozone therapy” as a legitimate COVID-19 treatment.

April 24, 2020 USDA approved California & Connecticut for the Pandemic EBT Program, which will help feed children eligible for USDA school lunch programs who are now at home during the coronavirus outbreak.

April 24, 2020 The USDA announced Vermont was added to the SNAP online program, allowing food stamp recipients to purchase food online.

APPENDIX L. MY PERSONAL EXPERIENCE WITH A FRADS

In August 20, 18, I began to informally apprentice a young man using a fully remote apprenticeship delivery system model. The apprenticeship lasted eight (8) months. I brought John* into our web development team based on his stated experience. I did not give him any tests to determine his skillset. His expected role was to help our team manage the backend of a Magento e-Commerce website for a client in Kentucky. My hope was that once trained John would be able to assume the position of a key contributor.

What I learned:

What someone believes they know, and what they actually know may be very different. John's stated experience was based on a WYSIWYG e-Commerce with which he was proficient. I had gotten very out of touch with the level of overall our team. Some of us have been working together for over 20 years; and, our skillsets have grown over time. Our team is also extremely flexible and each person is highly independent. Other than one regularly scheduled weekly meeting, most interaction is ad hoc. John wanted flexibility, but, I now know that in a FRADS, you have to have a very solid structure, and plan of progression because the apprentice needs more guidance than more expert members of the team. I also believe that the related learning component is critical so that the burden of all of the learning does not fall on the mentor. Because I thought John had more prior knowledge, I did not include RTI.

I interviewed John at the end of his time with us and the following are important constructs that emerged:

1. An apprentice needs clear roles and accountability.
2. Timely feedback is critical.
3. Timely follow-up and follow-through on the part of other team members is essential.
4. It is difficult for a new apprentice to manage multiple projects at once.
5. John needed clearly defined objectives with an detailed outline of how the plan should be accomplished.
6. An apprentice needs a regular schedule, with ready access to the mentor.
7. JIT tech support is needed.
8. John felt there were multiple decision makers, and that was confusing.

9. John said the online communication was effective, and he was surprised. He didn't think it would be.
10. John felt daily check-ins would have been helpful, but, the way he scheduled himself precluded often precluded that.
11. When I phased back a bit after seven months to see how he would do, John felt no one else stepped up to help him.

As I evaluated John's feedback, I realized our team had learned to work with and around each other. A FRADS needs a much more structured environment. I also realized I did not have the whole team's buy-in. This meant that if John was working at a time when I was not, he was not getting the support he needed from other team members. In addition, the nature of our work is such that we have to wait for data from many suppliers. Thus, we work between a number of constantly changing projects, stopping and starting as data becomes available. This created confusion for John. As soon as I realized his skillset was not where he thought it was, I should have enrolled him in RTI. I also should have talked with the team to gain their buy-in and support; and, we should have selected one or two projects at most for John to work on. I should also have suggested that John work regular hours so that I could be available for him, at least until he became more proficient. While John learned a lot, he did not gain proficiency. I learned that a FRADS requires as much or more structure than a face-to-face apprenticeship experience, as well as vetting and training of the apprentice and members of the team.

*not his real name

APPENDIX M. CODEBOOK

Name		Nickname	Description
0 Auto-coded Responses		auto-coded responses	This section is auto coded by Question Number for cross comparisons of responses by question. Transcripts were formatted using Word Styles normal and Header 1; with Interviewer coded as T. and Respondents as XX-A. Stakeholder specific questions that were not asked of every respondent are coded at Q00. Stakeholder Specific
Q00. Stakeholder Specific		auto-coded—Q00 stakeholder specific	These are responses to questions that were asked based on the particular expertise of the stakeholder; and, not asked of every stakeholder. A. Purdue Global delivers personalized, online education, tailored to the unique needs of adults who have work and life experience beyond the classroom enabling them to develop essential academic and professional skills with the support and flexibility they need to achieve their career goals.
Q01. Title & Position		auto coded—title & position	A. So it's regional vice president of strategy and partnerships.
Q02. Main role and Areas of responsibility and focus		auto coded—role responsibilities	A. It's provision of educational solutions to corporate partners to meet their training and development needs.
Q03. Hold more than one position or perform more than one role		auto coded—more than one position or role	I also and I have to provide a qualification, I'm not allowed to speak on behalf of the agency or the secretary or represent the organization in these types of communications, but I do currently hold the position of Deputy Administrator at the U.S. Department of Labor's Office of Apprenticeship.
Q04. Prior Related Experience		auto coded—prior related experience	A. ...the last, I would say since 2002, I have worked specifically in the workforce development arena in a couple of ways. 7.5 years of that was working for the community college system in North Carolina doing customized training programs. And, then the rest of that time I've worked for the private sector for two Fortune 100 manufacturers as the Chief Learning Officer. That was Seimens and Merck..then I led three statewide teams at the Department of Commerce, one of which was the state apprenticeship team.

Q05. Partnerships Most Important		auto coded—partnerships	A. ...very important...employers that are actually using the apprentices and we are the ones that have voting rights in our consortium...we couldn't do it without having a strong relationship with our school system... our schools...both our K-12 school system...also our formal education provider which gives us the formal piece of the apprenticeship...our community colleges. The other...partnership role...very important...is our community partners...the community foundation and our chambers
Q06. Apprenticeship is...		auto coded—definition apprenticeship	A. Earning while you learn on the job is how I would end that sentence.
Q07. Envision fully remote apprenticeship		auto coded—envision FRADS	A. I think it would be a person, sitting at home, online, doing their related instruction remotely and working with a mentor, using some sort of technology like Skype or Zoom or something like that.
Q08. Run across any FRA models or Similar Models		auto coded—experience with FRADS	-A. No, in fact I don't even know that I had contemplated that idea until you had approached me about wanting to do this interview.
Q09. Do you see Apprenticeship as a Competitor		auto coded—competitor	A. I don't see it as competitive at all. I see it as really a great match of a traditional educational approach and one that is and has traditionally been very hands on in its approach to training an individual to a certain occupational outcome.
Q10. Reasons still F2F		auto coded—reasons f2f	A. ...Just habit. Many...are beginning to adopt things like robotics and human robotics integration and AI solutions, etc. But they still require people to show up to the office....build these massive campuses where they expect people to work...t when it can all be done remotely...just force of habit... this control mindset that requires a supervisor, a manager, a director, a vice president to see people in the seats... in order to understand or believe that they're producing quality outputs...
Q11. Need for alternative delivery system		auto coded—need for alternate DS	A. Yeah, I absolutely do. I think it's necessary. I think it will transform the way apprenticeships are done and I think it will proliferate more apprenticeships.
Q12. U.S. infrastructure and expertise		auto coded—infrastructure & expertise	A. I think so. It may not work for every single job or industry vertical, but, yeah I think the technology is certainly there.
Q13. Acceptance and use by business and industry		auto coded—acceptance use b&i	A. I think it would be a slow sell, but I think eventually employers would come to understand the value and I think you would have a much easier time targeting the small to medium size businesses that have no technical expertise and I look at it from the lens of cyber security. No cyber security talent that would be available or that they could afford on their own, so by offering remote stuff you'd be able to enhance that. So they would be an easier sell than say maybe a large company...

Q14. Acceptance and use by the apprentices		auto coded—acceptance & use apprentices	A. To be honest, I don't feel like an apprentice is going to care how they're getting their apprenticeship accomplished, they're interested in learning the skills, learning the career, and long-term career viability, so I don't think an option for that would be hard.
Q15. Include in the planning		auto coded—include in planning	A. I think to a certain extent there'd need to be university officials, learning scientists for sure, content specialists in the industry. I think an employer partner is critical so there has to be some industry representatives, regulatory folks I think to a certain extent, as this kind of goes back to the funding and accessing funding, making sure that folks from the Department of Labor were involved.
Q16. Barriers or challenges		auto coded—barriers challenges	A. I think one of our biggest challenges is the employer engagement, that's one. Two is the demand for the program and being able to fund and meet the demand of candidates, so I mean we have lots and lots of people that want to come in our program.
Q17. Advantages or disadvantages		auto coded—advantages or disadvantages	A. If I don't have to fly you in or drive you in and you don't have to take that hour to commute and I don't have to set up a space for you and provide you a desk and pay rent and light bills and the related such things for you to execute your training at my location, I've saved a significant amount of overhead and so in my mind it's a reduced cost. Now are there trade-offs? Absolutely. You have to have a trusting environment...
Q18. Industries Roles Personalities Most or Least Suited		auto coded—industries most least suitable	A. Well, I think any of the verticals, see you listed Liberty Mutual, I think that's a perfect example. I think in the legal area, in the investment finance, I mean a lot of those I think would be perfect opportunities. I think the areas, you mentioned manufacturing, I think that's doable but that's going to be a challenge. Some of those would be a challenge and frankly, I don't know if there's that many opportunities in that sector compared to some of the others.
Q19. Certifications		auto coded—certifications	A. So it just depends on the type of credential, so some programs have national recognition, some programs in the states create their own apprenticeship criteria or add to the federal criteria, and then certain occupations, a certification is not enough, they have to have a license and that means that that license is created at the state level or even at the county level, so it does depend on the occupation and it depends on how each region is interacting with that occupation.

Q20. Changes Required to Current System		auto coded—changes required current system	A. I mean there's the natural things that just have to, in terms of process I think it's again a little bit of practice with the tools...I think the other is just you would think people would adapt to the fact that digital kind of 7x24x365 capability of learning, sharing, whatever, could be an advantage. I think people get very time dependent.
Q20b. Paths to Change		auto coded—paths to change	A. I think that going through National Agencies is a really tough thing. Back then Dept of Labor was really. There was a lot more interest, and this was back in the '80's. And, DOL was a good partner....Maybe if somebody comes in there who heads it up. It's dicey to work with those big bureaucracies. It's really really tough. So, I think it's gotta be states.
Q21. Quality of Experience and Caliber of Outcomes		auto coded—quality and caliber	A. I absolutely believe both of those... When you take somebody out of their environment...many individuals aren't as comfortable here and you're going to a hotel, and you don't know where you're going to eat, you don't know all these other different things, you're in a room with different people that you may or may not want to express your opinion...because you don't know these people....I think the experience is definitely more one on one...I have not had anybody...say...I wish I had appeared in the class
Q22. What needed to ensure same quality and outcomes		auto coded—what ensures quality & outcomes	A. I don't think there's a way to supplement happy hours and I mean some people have value in that and some don't. To me, when I look at, for me personally if I look at a place that I want to go culture is important to me, even if I'm going to go be a cyber security analyst, I want to have some sort of, it's probably my military that comes out in me, mission, I love values, I mean I love that stuff. I kind of eat it up and I love corporate culture. I don't know how you'd replace that piece remotely.
Q23. Lave and Wenger integration into the community of practice		auto coded—CoP	A. I would think of a couple of examples. One is to the degree that the company has already made some conscious choices as to how they operate generally, meaning if a company uses a lot of Zoom and go-to-meeting and video conference and the mobile office, people work remotely from home, it's just an already existing part of their culture, then to add that into the apprenticeship model, I think is an easy transition. I've seen it happen.

Q24. Access limited populations		auto coded—access limited populations	A. I guess those would be populations that don't have the same kind of opportunities that others would just because of where they're located. It's kind of like a food desert in a big city....There's jobs in Lafayette at the local Subaru plant, but, someone that's spent their whole life in Indianapolis... can't imagine living in a smaller city... away from everything they know and understand....so how do we bring those opportunities...same can be said of rural areas.
Q25. FRADS as path of inclusion for access limited individuals		auto coded—path of inclusion	A. Well I certainly think that...we make judgements too many times about peoples' ability to do work, if they have a situation like what you just described and I think we unnecessarily marginalize a certain number of those people... there are all kinds of stories...where someone has had a particular level of benevolence and a particular level of resources and...motivation where they have succeeded in...helping those...populations be productive.
Q26. If FRADS, would participation increase		auto coded—increase participation	T. Do you believe if such a system existed it would do anything to increase participation by the access-limited populations. A. I absolutely do. Yes. Definitely.
Q26a. What needed to increase Participation		auto coded—needed to increase participation	A. I think and maybe a targeted marketing campaign specifically built around that particular population might have to be developed. I think probably more importantly, if such a system existed, getting employers that serve those populations or in proximity to those populations involved would be important.
Q27. Offer to everyone or target access limited populations		auto coded—offer to everyone or restrict	A. I mean that would be my thought, is that you offer it to the population overall and then you target those more access limited populations.
Q28. What groups most benefit		auto coded—groups most benefitted	A. I think again incarcerated individuals, handicapped individuals, folks whose mobility is limited, those populations come to mind.
Q29. Corporate environment's readiness		auto coded—readiness b&i	A. I think it would be a hard sell. I definitely. Again, the model would have to be there. There would have to be some really solid examples. I think that you would need a testbed, a company buying into it, and have some real examples to show as you utilize that for outreach.
Q30. Economic Considerations		auto coded—economic considerations	A. ...capacity equals cost, so if I have a major corporation with a training budget, I can deploy faster, I can create the partnerships faster, I can adopt a curriculum faster, I can analyze my occupational needs sooner because I have staff capacity or a consulting capacity that allows me to do that and then I can deploy these workers much faster and there's cost connected to that. If I'm a small employer, say 10-20 people, I may only be able to run 1-2 apprentices because I can't manage the payroll...

Q31. Readiness of the apprentice market		auto coded—readiness apprentices	A. Absolutely. Here's why I say absolutely with that. There's a pretty wide range of apprentices in terms of age. You know, most people think well this is just a different avenue for somebody who didn't go to college. So they think and apprentices you know 16 or 18 to 24. I'm here to tell you that in Most states, the data I have says the average age of an apprentice is about 32. So that means you got incumbent workers, you've got displaced workers, you've got previously incarcerated, you've got veterans.
Q32. Government readiness		auto coded—readiness government	A. I do think so. I've had several conversations with the folks at the Department of Labor in their apprenticeship office and some pretty high-level meetings where we discussed some of these concepts, some of these very concepts and they were very, very open to it, very excited about it... the struggle is always, okay what do we do with this because it's so new and out of the box and we don't have a structure set up to operationalize it,.. I have seen first-hand that that particular agency...
Q32b. Military Readiness		auto coded—readiness military	A. Yes, I think they're the most ready, because they do understand training. And, they do understand training at a distance. They have training everywhere in the world. And, they are using more and more online capabilities. So, yes, I think that they're probably, they're our prime target, and I think they would be yours for your study.
Q33. Overall readiness		auto coded—readiness overall US	You know I think that the Readiness on the part of the US to really expand apprenticeship in general is about a five or six...I think we've been building Readiness...And so you know maybe I'll even go a little higher than five or six, maybe it is a seven. For a fully remote, you know I think you have to kind of work your way back the scale and say "It's maybe a four, a 3 or a 4"...as the other becomes a 7...you might see the remote option move from 3 to 4 or 5.
Q34. Who to Involve		auto coded—who to involve	T. Who do you think would need to be involved if this system were to become a viable alternative. What groups, what partnerships? A. So, I think it would be important for the workforce boards across each state. They have money that must be spent on people who have been not so employable in the past to help them upskill, to get better jobs, to get them out of poverty. I think they could be a really critical partner. Maybe the community colleges. Places like Goodwill and the United Way who have money...
Q34b. Who Lead Initiative		who to lead	A. I would say probably Higher Ed and industry. Not government. I worked with the government for about 9 years. Three of that in a direct training capacity.

Q34c. Partner Groups		auto coded—partner groups	A. I would say there are a variety of partners, so we have the USDOL, we all work closely with them. We have Maher & Maher with the Federal contract. Some folks that are doing some work in competency based apprenticeship is the Urban Institute. Jobs for America... New America.. and you know the rest of us like the National Skills Coalition, the National Fund, Advanced CTE, the National Governor's Association.
Q34d. Oversee Quality Control		auto coded—who oversee quality	A. I mean it's traditionally been the Department of Labor and they certainly have developed, of any entity they've developed sort of the standards and the competencies to be able to say, okay this is what needs to comprise an apprenticeship and this is how you need to develop your standards and this is what needs to happen in order for the apprentice to come out of it with a workplace certification.
Q35. Quality and Evaluation		auto coded—quality & evaluation	A. The USDOL does a number of things to ensure Quality. ...I'm monthly coaching for Delaware, Pennsylvania, and Maryland. And, I'm doing it through a contract company that the USDOL hired. They are called Maher & Maher. I don't know if you've heard of them before. But, they have a very large DOL contract to do the monitoring for states that have received these expansion grants.
Q36. Requirements - Restrictions - Hindrances		auto coded—requirements restrictions hindrances	A. ...And that's part of the problem that we're facing right now is that decision makers, the people in leadership roles are focused on the small sphere of influence that they may have rather than the opportunity to capture global impact and really every business, whether you're a Mom and Pop shop or a big corporation you're now competing globally because of the internet.
Q36a. Federal Level		auto coded—hindrances federal	A. ...The federal regulation requires one to one but it's also based on safety criteria. So clearly if you have somebody operating a chop saw, you need direct supervision over that individual ...An environment where safety is not such a great issue, the department has typically granted waivers or has historically granted adjusted ratios for this type of training... depending on the occupation. They've already approved a variety of models where the ratio is greater than one...
Q36c. State Level		auto coded—hindrances state level	SA states have such a clamp on the state, like Wisconsin and Nevada. They can't get anything done. Anything. Because those SA states, they have been the state agencies for a long time and you have to do whatever they say or you can't have a registered apprenticeship program. And, that's a real problem. i can't tell you how many states call me and say, I can't get anything done.

Q37. Mentoring		auto coded—mentoring	A. Typically, they're working on projects. So, the mentor's not with them all the time. The mentor, gets them started and helps them connect to resources. And, then basically the apprentice does the work unsupervised for the most part.
Q38. Dewey Holistic View		auto coded—holistic	A. There's a difference between an electrician who understands the full scope of the occupation from pulling the wire, laying the pipe, connecting the conduit, installing the fixtures, connecting them to the panel, all that stuff, there's a difference between that person and a technician who just comes in and swaps out the guts of a light and makes it an energy efficiency light. There's a big difference in their ability to work and their ability to participate in an occupational space.
Q39. Existing partner group who might be negatively impacted or resistant		auto coded—group negatively impacted	A. What might be popping into my mind right now could be people like the skill trade unions or maybe the National Association of Manufacturers or the society of manufacturing engineers and some of their apprentice programs. Yet I can't help but think that this could actually be an opportunity for them in some cases. But the reason those came up is they have established apprenticeship/work experience programs in the manufacturing space.
Q40. Any strong reservations or challenges or barriers insurmountable		auto coded—strong reservations	A. I know it would be very challenging to deliver that hands-on instruction via video or skype and then monitoring what the apprentices are doing as far as output. Making sure that they're having quality. But, you know there's probably technology that can help overcome some of those challenges.
Q41. Anything else should take into consideration		auto coded—other considerations	A. You have to start at its core with the employer, you have to consider external resources and pool them in a way that creates the outcome that you're all looking for and you have to have the right partners at the table. There's nothing impeding you from deploying the types of models that you're focused on and have been describing during our conversation. The question is, can we line up all of those pieces in a way that make it the most powerful for the participant and the employer jointly?
Q42. Next steps		auto coded—next steps	A. I think one of the critical pieces is mapping how you place that content onto an LMS and customize that for the delivery of that training and those competencies in an apprenticeship situation so that you've got the ability to gauge and demonstrate hands-on mastery or whatever it might require.

Q43. Questions would want addressed		auto coded—questions want answered	A. No, I think that the question that needs to be asked is whether or not the employers in that particular sector will recognize that type of work experience and training and hire people based on it. So the fact that you create an apprenticeship program and train people to do X on your systems, that's great, and that person is a great and a valuable employee to you but will he or she be valuable to the employer down the street who competes against you?
Q44. Do you have any additional thoughts, suggestions, concerns, or insights you'd like to share		auto coded—additional thoughts	A. ...My work continues to demonstrate that employers once educated around the value of apprenticeship kind of go, where the heck has this been, and why didn't I know about it. And so when properly introduced apprenticeship can be a very valuable tool and the fact that remote apprenticeship can be created in a way that's meaningful and scaled rapidly just makes it that much stronger and so I think that we have a lot to learn and we're going to see some exciting stuff over the next few years.
1 Possible Quotes		possible quotes	Potential quotes were added as I went through each transcript. Quotes may be added to this Node as I begin to write to support the propositions I make.
2 Demographics		demographics—Stakeholders	This is demographic information snipped from the transcripts. In Case Classifications, I have also coded the demographic information for use in queries and descriptive statistics. Demographic information includes current position, relevant experience, partnerships and awareness of and sentiment toward the idea of a Fully Remote Apprenticeship Delivery System
0 Stakeholder Group		demographics—Stakeholder group	Stakeholder groups were originally based on the three categories set forth in the IEG Framework: Supporting, front-line, and ??? As the interviews progressed, these categories became sub-categories of service provision; including technology providers, manufacturing employer sponsors; HE broken down into 4 year, 2 year, and certificate programs, etc.
3rd Party Intermediary		demographics—stakeholder group—3rd Party	The Federal Government has designated 3rd Party Intermediaries as organizations that provide services to Citizen Beneficiaries as part of the supply chain. These may be groups like CyberUP (Tony Bryan) who helps match apprentices to employers, and helps with the related training of apprentices.
AAI Grantee		demographics—stakeholder group—AAIgrantee	The American Apprenticeship Initiative Grant is intended to help expand apprenticeship across the United States. Grantees may be Higher Ed or 3rd Party Intermediaries.

Business & Industry		demographics—stakeholder group—b&i	Business & Industry are the employer markets that hire labor. The focus areas of this study are mainly manufacturing and technology. Other markets include health care, insurance, food service, etc.
Manufacturing		demographics—stakeholder group—b&i manufacturing	Manufacturing is an industry that has special labor requirements, often traditionally involving hands-on skills and aptitudes, as well as special (and often large and expensive) equipment.
Technology		demographics—stakeholder group—b&i tech	Technology is a B&I that provides technological solutions such as software, hardware, and IT and networking services. This may include data centers, cyber security, web development, coding, help desk, instructional design, etc.
Consultant		demographics—stakeholder group—consultant	A consultant is someone who assists another organization or company in a capacity that is other than an employee, and for the purposes of assisting with a business need. In this case, consultants assist with the expansion and delivery of US Apprenticeships or with large systems change.
DOL		demographics—stakeholder group—consultant DOL	A Department of Labor Consultant helps states implement the policies and provisions of the US Federal Government. Lonnie Emard served as a DOL consultant.
Future of Work		demographics—stakeholder group—consultant future of work	Daniel Villao is a consultant who assist companies in transitioning as the workplace and workforce changes.
Large Systems Change		demographics—stakeholder group—consultant lg systems change	Large Systems Change consultants help organizations including government, businesses, non-profits, educational institutions, etc. adapt to market changes, and to implement changes in processes or systems that may be ineffective but have historical significance and use.
Government		demographics—stakeholder group—government	Federal or State governmental entities, in this case those involved directly with the apprenticeship initiative.
Higher Education		demographics—stakeholder group—HE	Higher Ed includes 2 year, 4 year and online colleges and universities.
4 Year College or University		demographics—stakeholder group—HE 4yr	A college or university that awards at least a four-year degree.
Community College		demographics—stakeholder group—HE CC	A college that awards 2 year degrees (Associates) and certifications.
Online University		demographics—stakeholder group—HE Online	A college or university that delivers instruction in a virtual format and that awards at least certificates, associates, and 4-year degrees.

1 Stakeholder Credentials		demographics—Stakeholder credentials	Stakeholder credentials are any knowledge, skill, competency, professional experience, credential, etc. that gives a person recognized expertise in a particular field. For example: Pat McLagan worked as a consultant for 10 years with the South African government and business and industry to help change the way labor was being educated. The sub-nodes were left to help separate out all of the data. At some point this might be interesting to look at by sentiments to see if there is a correlation...
Biographies		demographics—Stakeholder bios	These are either stakeholder provided biographical sketches of each participant, or if they requested it, were written by the author using information provided either in online sources or by the participants during the interviews or in response to follow-up emails.
Experience Types		demographics—Stakeholder Types of Experience	What areas have they worked in or interacted with giving them a level of knowledge and expertise in that area?
Business and Industry Experience		demographics—Stakeholder experience B&I	Any non-governmental for-profit entity in the United States. This will include manufacturing and tech companies for purposes of this study; but, could include many others such as health care, insurance, financial services, etc.
Collaboration		demographics—Stakeholder experience collaboration	Experience in collaborative environments; particularly online collaborations; also experience leading teams as that requires collaboration
Contract Work & Consulting		demographics—Stakeholder experience contract or consultant	Self-employment work supporting B&I such as a SME for the Department of Labor (Lonnie Emard) or a Large Systems Change Consultant such as Pat McLagan.
Education		demographics—Stakeholder experience education	education at any level k-20; corporate including Administrator, CLO, Competency based Education; corporate training; creating instructional programs; developing curriculum; grant administration; learning science; remote training or online instruction; and teacher or instructor
Government		demographics—Stakeholder experience government	Experience at any level of government or policy making
Government Industry Collaboration		demographics—Stakeholder experience govt industry collaboration	Experience in government / industry collaborations
Large Systems Change		demographics—Stakeholder experience large systems change	Experience with large systems change
Military		demographics—Stakeholder experience military	Any type of military experience
Policy		demographics—Stakeholder experience policy	Government policy; SME; Workforce Design Strategies; Writing and administering grants

Technology		demographics—Stakeholder experience technology	Experience in any form of tech including software, hardware, coding, cyber, supply chain, internet, etc.
Work-based Learning		demographics—Stakeholder experience work-based learning	Any type of work-based learning including apprenticeship(s) and internships. This includes participating in one as a citizen beneficiary and/or offering/administering work based learning opportunities
Experience Years		demographics—Stakeholder years experience	Length of time in the sector or in an area related to the topic of apprenticeship. This may include educational level, years of experience, areas of expertise, related experience(s), and even experience with factors that might impact their understanding of the topic such as use of collaborative tools or exposure to online learning.
2 Stakeholder Titles Roles Responsibilities		demographics—SG titles roles & responsibilities	Because of the length of time taken to complete this study, several stakeholders have changed positions. Two in particular were affiliated with the government in policy positions and no longer are. This node includes info on the company the stakeholder is employed by, their title(s), role(s), and responsibilities
3 Partnerships Important in Current Role(s)		demographics—SG partnerships	What partnerships are important to them currently? This is so that if they are involved in apprenticeship, it can be determined whether partnerships will need to be added/changed if begin FRADS. As consultants, customers, vendors/suppliers, for research, decisions makers (not HR); Association partners, educational partners, government partners, internal partners ***important, military partners, non-profit partnerships, stakeholder partners in consortium (i.e., GAP Tammy Simmons)
4 Awareness Exposure to FRADS		demographics—SG FRADS awareness	Has the stakeholder ever heard of a fully remote apprenticeship before, or do they know of anyone conducting them? AHIMA, exposure as result of this study, health care, higher ed, insurance & financial services, ISHPI, IT sector, manufacturing, military, OR NO Exposure
5 Sentiments in re FRADS		demographics—SG personal_feelings	Positive or negative feelings personally about the construct and viability; see also Sentiment under Codes
3 Current System		apprenticeship—current	This section describes the state and components of the current face-to-face apprenticeship system
1 Definition of Apprenticeship		apprenticeship—definition	Stakeholders were asked to define apprenticeship. The sub-cats to this category embody the lens(es) through which they view apprenticeship.
A Win Win		apprenticeship—definition—win-win	Stakeholders who define apprenticeship by its benefits.
Business and Hiring Strategy		apprenticeship—definition—business strategy	Stakeholders who see apprenticeship from mainly a business perspective.
Defined in terms of Components		apprenticeship—definition—components	Components or requirements of registered apprenticeship

Pathway to Employment		apprenticeship—definition—path to employment	The View of apprenticeship from the apprentice's perspective
Policy (Governmental) Structure or View		apprenticeship—definition—policy perspective	Stakeholders who viewed apprenticeship from a policy perspective
Proven Model of Learning		apprenticeship—definition—model of learning	Stakeholders who viewed apprenticeship as a model of learning / training
2 Components of the System		apprenticeship—system components	Components of the current apprenticeship system. Used as a basis of viability. If one of these components is deemed critical and cannot be replicated in a FRADS, then a FRADS may not be viable.
A Job		system—job	A job is the starting place of any apprenticeship
Decision Makers		system—decision makers	These are the people who will make the decisions to have or not have an apprenticeship and how it will be carried out
Evaluation		system—evalutation	How is the current system evaluated
Industry Related		system—industry	Industry specific components
Job Related Instruction		system—related instruction	The RTI which is often offered online
Learning Management System (LMS)		system—LMS	There may or may not be an LMS; and currently it is usually offered by the partner offering the related instruction
Mentors		system—mentors	Mentor relationships and responsibilities
Models		system—models	A look at a few models currently in use
Partnerships		system—partnerships	Partnerships critical to successful apprenticeships
Software Used		software_current	If an apprenticeship provider, what software are they using? If they are not a provider but are familiar software that could work or is being used, list that here
Stakeholder Group Roles		system—SG—roles	What stakeholder groups do within the current system: What roles they play
3rd Party Intermediary Current Roles		system—SG—roles—3rd party	These are organizations like RCBI, Tony Bryan's CyberUp, Community Colleges like Harper (Rebecca Lake)
AAI Grantee Role		system—SG—roles—aai grantees	AAI Grantees received a DOL Grant for expanding apprenticeship. Not all 3rd Party Intermediaries are necessarily AAI Grantees.
Educational Researcher Role		system—SG—roles—ed researcher	Educational institutions studying the apprenticeship movement
Employer Sponsor Role		system—SG—roles—employer	Employers willing to sponsor apprentices
Governmental Liaison Role		system—SG—roles—governmental liaison	These are the SME's and Consultants for the DOL to the States (like Lonnie Emard)
Technology Providers		system—SG—roles—tech providers	These are companies all along the supply chain that would make a fully remote apprenticeship possible; from bandwidth, to hardware, software, expertise, hosting, etc.

State of the system		state of the system	What things are important in the current system that either would be addressed by FRADS or perhaps a potential barrier, or just should be considered as a model is constructed?
Technologies		system—tech	Technologies currently in use in apprenticeships
3 Benefits of Apprenticeship		apprenticeship—benefits	A look at the benefits of apprenticeship. Once these are assessed, the benefits of a FRADS will also be assessed and compared. If benefits increase as a result of a change in the delivery system, the case will be stronger for the change.
Certification		benefits—certification	One of the benefits of US Apprenticeships is that most apprentices receive certifications that are recognized in the industry
Full Integration into a Company Culture		benefits—integration—culture	A benefit of apprenticeship is integration into the company culture because the apprentice works on projects with the rest of the team while they are learning.
Transformative		benefits—transformation	Apprenticeships can transform businesses and families for generations coming after
4 Challenges		apprenticeship—challenges	This looks at the challenges and their possible causes associated with apprenticeship.
Barriers Diversity and Inclusion		apprenticeship—barriers	Barriers to work that are therefore present in apprenticeship. Diversity/Inclusion, economics, transportation, family obligations, etc.
Complexity		apprenticeship—complexity	The complexity of offering modern apprenticeships
Cost of Apprenticeship		apprenticeship—cost	Costs associated with apprenticeship
Economics		apprenticeship—economics	The economy's impact on apprenticeship.
Evaluation		apprenticeship—evaluation	How is the current system evaluated?
Gaps		apprenticeship—gaps	Where are there gaps in the current system that need to be addressed and might be with FRADS?
Recruiting Apprentices		apprenticeship—Recruitment	Recruitment, assessment, matching of employer sponsors, workplace mentors and apprentices
5 Other Models		apprenticeship—other models	The US is not the only country using an apprenticeship model. Other countries such as Germany and the UK have been employing a variety of models much longer.
4 Change		change	FRADS would constitute a large systems change. This section looks at key components of such change, such as readiness, receptivity, valance, and efficacy.

0 Why Still F2F		change—reasons f2f	Perceptions of reasons still F2F. Consider and address: Communication would break down; current paradigm isn't conducive; not financially feasible; generational mindset; govt bureaucracy; habit; HE; historical perception of Apprenticeship; lack of communication between stakeholders; lack of understanding of possibility/capabilities; need to integrate into culture; need to SEE it successfully implemented; not enough pain; tech not there; teams prefer presence; jobs where work with hands not conducive to FRADS
1 Valance of FRADS		change—valance	Valance is a term used by Weiner in his discussion of change. He says that valance is the value someone sees in the change being presented. If an individual can see the value, they are more likely to embrace the change. Node includes: Evidence of desire to change; flexibility; Employer Employment alignment; increased labor pool; lower cost; increased productivity; may increase apprenticeship opportunities; Place work where employees are; positive ROI; Potential for 1 to many; proactive vs reactive; value that is added
2 Efficacy of FRADS		change—efficacy	Efficacy is a term used by Weiner meaning the belief someone has that a change is possible, or that a person is capable of accomplishing a particular change. The greater the belief in the capability, the greater likelihood one is to embrace change. This node includes building or creating efficacy; contingencies; the efficacy of the current system; and, the responses to whether the US infrastructure and expertise is able to support a FRADS.
3 Preparation for Change		change—prep	Factors that play into preparing for change.
Apprentices		change—prep—apprentices	What factors should be considered in preparing apprentices to change to a FRADS? Benefits; selling points; solid program
Apprentice Benefits		change—prep—apprentice—benefits	Need to clarify and articulate the benefits to the apprentices
Apprentice Characteristics		change—prep—apprentice characteristics	This node is broken down into verbal descriptions and statistical data.
Descriptives		change—considerations—apprentice characteristics—descriptives	Descriptive Phrases about Apprentices, including the Company view of youth, contract workers, the need to be disciplined to work remotely; differences between workers who are new to an industry and those who are transferring within an industry; and the youth as more tech savvy.
Statistics		change—considerations—apprentice characteristics—stats	Statistical descriptions of the apprentice populations
Apprentice Solid Program		change—prep—apprentice—solid program	The programming must be solid so that the apprentice doesn't feel lost or isolated. Curriculum, technology, support, and resources must be carefully planned and implemented.

What is the Selling Point		change—prep—apprentice—selling points	What sells this to the apprentices? What makes it a viable alternative?
Business & Industry & Other Stakeholders		change—prep—B & I	What is needed to prepare business & industry to use FRADS? Clear benefits; clear communication; excellent programming; education of stakeholders including unions, business owners, employers, HR, etc. Look at the things that are motivators and work off of them.
1 Understand Stakeholder Motives		change—prep—B & I—motives	Knowing what motivates the various stakeholder groups will help prepare us to address those areas that are important to stakeholders.
2 Communicate Clear Benefits (Stakeholder Education)		change—prep—B & I—educate stakeholders	Educating stakeholders includes communicating the process and benefits to business owners, employers, HR, unions, etc. It is educating or imparting the vision to aid in their understanding
3 Build Solid Program		change—prep—B&I—solid program	The programming must be solid so that the business can meet their objectives as efficiently and effectively as possible and realize the same outcomes (or better) than with a F2F apprenticeship. Curriculum, technology, mentor support, and resources must be carefully planned and implemented.
Critical Considerations		change—prep—considerations	The critical considerations related to all large systems change in general and to a change in the apprenticeship delivery system in particular
Learning and Instructional Elements		change—prep—considerations—learning	Things related to the learning component of apprenticeships. These include curriculum; e-learning; LMS; online vs f2f learning, etc.
Need for Change		change—prep—considerations—need for change	This node includes things like the current labor environment and their need for human capital; the idea that we need multiple ways to address the labor shortage; and that the needs of business and employees is changing.
Need Alternate Solutions to Address Labor Shortage		change—prep—considerations—need for change—alternate solutions	This includes looking for ways to leverage technology.
Need for Human Capital		change—prep—considerations—need for change—human capital	This includes the reasons why there is a need: competing for same talent; have been looking to Silicon Valley (Google/Facebook); Currently have to import talent; an Overview of the Problem Space; some proposed solutions; Current Environment; political, employers, apprentices, etc.
Need of Business and Employees is Changing		change—prep—considerations—need for change—Bus & Emp changing	Formerly skilled positions are now IT jobs; need solutions for access-limited individuals; need to build a workforce; need to develop the talent pipeline; need way to match the needs of particular groups; need to develop new skillsets; need to place non-traditional workers; urgently need to be able to scale; target populations are not benefitting from current apprenticeship program

Potential Impact of Change		change—prep—considerations—need for change—potential impact	Reskilling and upskilling to replace jobs that are lost due to technologies; possible tax incentives; economic impact; could increase apprenticeship opportunities; and strengthen the network; and, increase the effectiveness of the funding (not currently used efficiently according to Lonnie Emard)
System Components		change—prep—considerations—need for change—system components	This includes things like steps of preparation, costs associated with change in some cases, structure, partnerships, purposeful mindset, possible incentives, time tracking, etc.
4 Readiness for Change		change—readiness	Perceptions of the various delivery system components (stakeholder groups) readiness for change.
Perception of Receptivity		change—readiness—receptivity	Stakeholders perceptions as to the receptivity of potential apprentices, higher ed, and B&I including different sectors such as manufacturing, tech, and health care. This is based on experience within the marketplace or as participants have interacted with various groups. This seems to be impacted by the individual stakeholder's experience with collaborative software and online learning (future study?).
Receptivity by Apprentices		change—readiness—receptivity—apprentices	If offered, stakeholder perception of attitudes of apprentices
Receptivity by Higher Ed		change—readiness—receptivity—higher ed	Perception of receptivity by higher education
Receptivity of Business and Industry		receptivity B&I	If offered, perception of Business and Industry to it.
SG—3rd Party Intermediaries		change—readiness—SG 3rd Party Intermediaries	These are perceptions of receptivity of 3rd party intermediaries for FRADS. EX: TB-A. Yeah I think we could be deliverers of it because the advantage I'm going to have over a university or two year college is I can be fast,...unless they start to regulate intermediaries...as long as I'm not changing up the deliverables of my apprenticeship standards of my hours I can tweak and adjust my curriculum as needed and be much faster and nimble...I think intermediaries like us have a big role in doing it...
SG—Apprentices		change—readiness—SG-apprentices	Readiness of apprentice to accept a fully remote apprenticeship. This node includes perceptions of stakeholders as to the readiness of potential apprentices and includes negative responses based on age, inability to reach potential apprentices; many positive responses without qualification and positive responses with contingencies such as age and having a proven/tested model.

SG—Business and Industry		change—readiness—SG B&I	This node captures stakeholders perceptions of the readiness of business and industry to embrace a FRADS. This question looks at all of B&I and therefore some of the responses are specific to manufacturing and some to tech, etc. Most stakeholders distinguish between the sectors they are referring to.
1 Not Very Ready		chage—readiness—SG B&I—not very ready	Manufacturing is not seen as being very ready at all. This node gives reasons why that is.
2 Somewhat Ready		change—readiness—SG B&I—somewhat ready	These are responses that are neither fully positive or fully negative; but, lean toward potential for FRADS as an alternative. EX: So first of all, its acceptance and use by business and industry, would they be receptive? NH-A. I think they might be at least intrigued to borderline receptive. I think if we could get over some of the logistical concerns in a cost effective manner, I think they would be interested, yes.
3 Ready & Why		change—readiness—SG B&I—ready & why	Perceptions that these sectors are ready and why that may be
4 Ready with Contingencies		change—readiness—SG B&I—ready with contingencies	This group is separated into How, Who and Why as respondents seemed to consider those three areas of viability. They set parameters on how the implementation is done (decent program, successful pilot), which sectors would be most likely to embrace it (IT vs manufacturing), and reasons companies would or would not do it (cost savings, increased labor pool).
How		change—readiness—SG B&I—contingencies—how	They set parameters on how the implementation is done (decent program, successful pilot.
Who		change—readiness—SG B&I—contingencies—who	Sector and role dependent: which sectors would be most likely to embrace it (IT vs manufacturing) and/or find it easiest to implement.
Why		change—readiness—SG B&I—contingencies—why	Reasons companies would or would not do it (cost savings, increased labor pool)
SG—Governmental Readiness		change—readiness—SG Government	No one said no.
1 Federal Ready & Why		change—readiness—SG Governmental—federal	Stakeholders perceptions of the federal government as ready and their reasons for that such as the monies appropriated, the new rules allowing 3rd party providers and industry recognized apprenticeships, etc.
2 States Considerations		change—readiness—SG Governmental—states	States experience differences as a result of their autonomy. Some are OA states and some SA. OA partner with the Federal Government and have uniform reporting. SA's do not.
3 Potential Hinderances		change—readiness—SG Governmental—hinderances	Bureaucracy and states autonomy are mentioned as examples of areas where FRADS could get held up or not be implemented fully.

SG—Higher Education		change—readiness—SG higher ed	This node includes perceptions of and by Higher Ed as well as the question of what motivation would they have to participate and embrace FRADS.
SG—Military		change—readiness—SG military	This node highlights perceptions of military readiness based on stakeholders who are working directly with the military or who served in the military.
SG—Outside Consultants		change—readiness—SG consultants	These are not really 3rd party providers. They serve as SME's to the DOL and States, etc.
SG—Technology Companies		change—readiness—SG Tech Companies	This node contains responses by stakeholders in the tech industry or familiar with tech and their perceptions of whether we have the technology to implement and support FRADS.
US Overall Readiness FRADS		change—readiness—SG US overall	No "NO"s. This looks at whether the US has the expertise and infrastructure to implement and support a FRADS. EX: NH-A. Expertise, yes; infrastructure, maybe. PM-A. I honestly think we don't have the mechanism to do these kind of things that require cross-collaboration which is really what something like this does (referring to organizations, industry and government collaboration).
1 US is Ready		change—readiness—SG US overall—ready	Stakeholder perceptions that the US is ready overall for a FRADS.
2 US is Somewhat Ready		change—readiness—SG US overall—somewhat ready	Stakeholder perceptions that the US is somewhat ready; but, there is a need for a mechanism for cross-collaborations and our infrastructure is not complete in rural areas.
3 Contingencies to US Readiness		change—readiness—SG US overall—contingencies	These are the contingencies stakeholders gave as to their beliefs concerning the overall readiness of the US to implement a FRADs.
5 Resistance to Change		change—resistance	Indications of resistance to change; and, or perceptions of groups who may be resistant to an alternate apprenticeship delivery system: Legacy companies vs new start-ups; generational issues; misunderstandings of what FRADS is; seeing FRADS as competition; and other.
Mitigation of Resistance		change—resistance—mitigation	Ways to mitigate some of the potential resistance to offering FRADS as an alternative delivery system.
Types of Resistance		change—resistance—types of resistance	Some of the reasons companies and organizations or government might resist a change to the apprenticeship system.
6 Stories of Experience with Change		change—anecdotes	Anecdotal stories of stakeholders experience with change
5 Access-Limited Populations		access limited populations	For purposes of this study, we will define Access Limited Populations as individuals who encounter impairments, barriers, or constraints that impede their ability to participate fully in common opportunities.

0 Definition of Access-limited Populations		access-limited—definition	Stakeholders were asked to define access-limited populations. Responses ranged from disability, to the lens of the employers access to labor; to home or location bound individuals; to lack of access to mentors or technology or certain careers or transportation; to issues of poverty, imprisonment; to a general under-representation of a particular group.
1 FRADS as Path of Inclusion		access-limited—path of inclusion	Stakeholder views of a FRADS as a path of inclusion for access-limited individuals and potentially increasing participation
Logistically Limited		access-limited—path of inclusion—logistic limitations	These responses focus on military personnel, those who physically are unable to get to work, incarcerated individuals, and Native Americans living on reservations.
Opportunities		access-limited—path of inclusion—opportunities	Opportunities to work with these populations
Social or Emotional Issues		access-limited—path of inclusion—social emotional	Discussion of individuals who may be socially or emotionally unable to work in a face-to-face environment; but, may excel online.
2 Recruitment		access-limited—recruitment	This node contains stakeholder thoughts on recruitment of apprentices from access-limited populations.
Increasing Participation		access-limited—recruitment—increase participation	No one said NO and no one listed contingencies for their YES responses. This node captures thoughts on whether FRADS might increase participation and what is needed to involve access-limited populations?
Marketing Campaign Targeting Population		access-limited—recruitment—apprentices	Recruitment aimed at potential apprentices
Recruiting Employers Serving Population(s)		access-limited—recruitment—employers	Considerations recruiting employers specifically to target access-limited populations
3 Most or Least Benefitted		access-limited—most-least benefitted	Groups that stakeholders believe would be most and least benefitted by a FRADS. Groups include handicapped; incarcerated; lacking transportation; limited mobility; rural; and under-represented. Manufacturing was seen as not benefitting due to a perceived "need" to be "on the shop floor" and "reaction time" (maybe thinking of disabled(?).
Benefits		access-limited—most-least benefitted—benefits	These are the perceived benefits access-limited individuals might receive from a FRADS.
Not Seen as Helpful in Manufacturing		access-limited—most-least benefitted—not manufacturing	Manufacturing was seen as not benefitting due to a perceived "need" to be "on the shop floor" and "reaction time" (maybe thinking of disabled(?).
4 Other Considerations		access-limited—other considerations	Things stakeholders believe must be taken into account when planning a service delivery system for access-limited individuals. Articles are included addressing the digital divide and possible solutions. EX:

Corporate Considerations		access-limited—other considerations—corporations	Considerations specific to corporations thinking of FRADS as a path of inclusion for access-limited individuals and the contention that market realities remain the driver for companies in the US
Matthew Effect		access-limited—other considerations—Matthew Effect	Should a FRADS be offered to only target access-limited populations or everyone? Participants nearly all thought it should be offered to everyone.
Possible Solutions		access-limited—other considerations—possible solutions	Potential solutions to barriers to FRADS for access-limited individuals
Potential Barriers		access-limited—other considerations—potential barriers	Things that might prevent benefits for FRADS
The Digital Divide		access-limited—other considerations—digital divide	Articles on possible solutions to digital divide
6 FRADS		FRADS	Fully Remote Apprenticeship™ Delivery System
0 Defining or Envisioning FRADS		FRADS—definition or envision	Stakeholders are asked to tell what they believe a FRADS would be envision it might look. Responses range from can't envision & not good to structural and instructional components
Able to Envision		FRADS—definition—envision	How ds stakeholders envision the system? For example: Collaboration and communication, structure including technologies required, ,logistics (never on site), components, workflow, instructional components, outcomes, critical requirements such as behavioral qualities and mentoring relationship; and, who might benefit and what factors play into benefits.
Cannot Envision		FRADS—definition—envision—cannot envision	This node captures stakeholder responses that indicate an inability or unwillingness to entertain the construct in a creative way.
Overview with Examples		FRADS—definition—envision—overview & examples	This node captures responses that focus on specific examples given as the stakeholder attempts to envision a FRADS such as connectivity, types of workers such as knowledge workers vs hands-on, skills required, locations of workers vs jobs, engaging the population, and sectors most appropriate and in demand such as cyber security.
Technology		FRADS—definition—envision—technology	This node captures responses focusing on technology(ies) such as gathering appropriate data, importance of connectivity by sector, cost, finding a way to facilitate presence and hands-on demos such as simulations, VR and AR, and robots, safety concerns, the model or network architecture, and the movement toward CoBots (integrating human & robotics).
1 Critical Components of FRADS		FRADS—critical components	Critical comparisons between f2f and potential FRADS

A Holistic Apprenticeship (Dewey)		FRADS—holistic	Thoughts on what would be required to create a holistic apprenticeship in a virtual environment
Assessing for Broader Skills		FRADS-holistic— broader skillsets	A holistic apprenticeship is dependent on an assessment that goes beyond the simple job related skills such as personal and social skills, life skills, etc.
Full Competence		FRADS-holistic—full competence	Perceptions on facilitating and measuring life skills as well as job skills
Functional Equivalence		FRADS-holistic—functional equivalence	Perceptions of the potential of a FRADS to be functionally equivalent to a f2f experience in quality and caliber of employee produced.
Caliber of Employee		FRADS-holistic—functional equivalence—caliber of employee	Perceptions of the ability to produce as effective an employee as f2g
Some Doubt		FRADS—holistic—functional equivalence—caliber of employee—doubt	Some doubt whether Employers can get the same caliber of employee
Yes		FRADS—holistic—functional equivalence—caliber of employee—yes	Employers can get the same caliber of employee
Yes with Contingencies		FRADS—holistic—functional equivalence—caliber employee—yes w con	Employers can get the same caliber of employee with some continencies
Quality of Experience		FRADS-holistic—functional equivalence—quality of experience	Quality of experience compared to traditional Face to Face
No		FRADS—holistic—functional equivalence—no	Apprentices cannot get the same quality of experience
Some Doubt		FRADS—holistic—functional equivalence—some doubt	Some Doubt that Apprentices can get the same quality of experience
Yes		FRADS—holistic—functional equivalence—yes	Apprentices can get the same quality of experience
Yes with Contingencies		FRADS—holistic—functional equivalence—quality—yes w contingency	Contingencies include things like company buy-in, the instructional environment, mentoring, recruitment, tech skills, personal characteristics such as being a self-starter or self-motivated, not needing human contact, having specific needs, and a well developed, well managed system.
German System		FRADS-holistic—Germany	When discussing a holistic apprenticeship, Germany is held by many to be the exemplar. This node captures comments on the German system.
Goodness of Fit		FRADS-holistic—goodness of fit	Perceptions on suitability or fit of a sector or an apprentice
Good Fit		FRADS—holistic—good fit	Suitable sectors for a FRADS
Poor Fit		FRADS—holistic—poor fit	Sectors that would not be a good fit for a FRADS
Partnerships		FRADS—partnerships	What partners would be needed to ensure a viable FRADS

Education		FRADS—partnerships—education	Education is seen as a potential partner to provide instruction; but, also as a managed service provider and to provide the learning science behind the skills-based FRADS. EX: The role of the university would be in addition to providing the technical platform, there's a certain amount of learning science that goes into putting learning into an online environment...making it functional for an adult learner.
Governmental		FRADS—partnerships—government	Partners mentioned within various levels of government. EX: I would say there are a variety of partners, so we have the USDOL,
Non-Profit Organizations		FRADS—partnerships—non-profits	Partnerships with non-profit organizations. EX: I think they could be a really critical partner. Maybe the community colleges. Places like Goodwill and the United Way who have money to help people get skills and help them to get a career sustaining job.
Workforce Boards		FRADS—partnerships—workforce boards	Partnerships with local and state workforce boards. EX: o, I think it would be important for the workforce boards across each state. They have money that must be spent on people who have been not so employable in the past to help them upskill, to get better jobs, to get them out of poverty.
Structure and Infrastructure		FRADS—structure & infrastructure	Infrastructural and structural considerations if FRADS is to be offered
Apprentice Centered		FRADS—components—structure—apprentice centered	The shift to an apprentice-centered system includes: clear picture of instructional expectations, a CoP specific to FRADS, conducive environment for success, curriculum/related instruction, evidence, portability of skills (holistic view), recruitment and vetting, reliable broadband, socio-cultural aspects of work, structure of the program, and a synchronous connection with mentor
Community of Practice (CoP)		FRADS—components—structure—CoP	Considerations with integration of the apprentice into the community of practice. EX: CM-A. I think it's critically important again, that's part of what learning is all about generally, but certainly an apprenticeship is sort of immersing them in the field and it can be done. It can be done through online learning just as it can in a traditional classroom.
Challenges		FRADS—components—structure—CoP—challenges	Challenges in integration into the CoP include building the trust and dealing with spontaneous meetings.
Yes to CoP		FRADS—components—structure—CoP—yes	Thoughts include ways to build the community, co-teaching, using social media, and also give examples of ways online schools have addressed this issue.
Yes with Contingencies		FRADS—components—structure—CoP—yes with contingencies	Contingencies may be industry dependent, or may relate to the technologies available, as well as to the nature of the apprentice.

Competency		FRADS—components—structure—competency	Because of the need to gauge competency, stakeholders looked at how to define and measure it as well as sources of instruction and measurement.
Infrastructure to Manage Wages		FRADS—components—structure—managing wages	This node emerged from the data and has been listed as an issue; but, it is unclear why it might be an issue. This needs to be researched to determine if it is indeed a concern in all cases, some cases, or no cases.
Learning Science		FRADS—components—structure—learning science	The science behind remote learning emerged as a structural concern. EX: I think you would want, and particularly for an apprenticeship...some of the industry folks to be involved in the delivery of the content but the role of the university... in addition to providing the technical platform, there's a certain amount of learning science that goes into putting learning into an online environment, one; and two, making it functional for an adult learner.
Mentoring Component		FRADS—components—structure—mentoring	The mentoring component includes qualities of a mentor suitable to FRADS as well as training and other concerns and thoughts related to the mentoring component of the FRADS
Monitoring & Tracking		FRADS—components—structure—monitoring & tracking	This node captures thoughts on monitoring and tracking the apprentice and their OJT as well as the mentor's time and interaction with the apprentices. Evaluation and Quality Control are considered as well as the financial aspects and practicality.
Security		FRADS—components—structure—security	Thoughts on potential changes or security measures that may need to be implemented if fully remote. EX: ...whatever technology we develop, secure or otherwise, if somebody really has nefarious intentions to get at what's in there, they'll likely find a way... it's a matter of how sensitive is one's tolerance to having this information get into the hands...a lot of that will depend on the nature of the organization...envision cases ...multiple levels of security...collaborate...others, dial ...up SKYPE
System Mindset Critical		FRADS—components—structure—systems mindset	Thoughts on viewing this as a system. Ex: [Note from Pat via email after the interview fits here: I think interventions must be designed with all groups involved. Too often they are designed with and for managers, but often the whole system needs support of some kind. It's good to map out how the whole system would work/support the change both before and after it is launched and begins to take root.]
Technology		FRADS—components—structure—technology	Thoughts on tech changes may include: BYOD, communications tools, a large LMS, versus Packages, monitoring, securing the connection and device, the degree of IT literacy required, the current tech environment, as well as future trends.

Types of Tasks		FRADS—components—structure—type_of_tasks	What types of tasks are most conducive to a FRADS
Target Industries and Populations		FRADS—target industries & populations	This node captures thoughts on target company types, industries and populations such as: engineering and additive manufacturing. it also captures industries thought not suitable.
2 Benefits of a FRADS		FRADS—benefits or advantages	Advantages of a FRADS; for example range of availability, transportation solution, disabilities, mentor capacity may increase, greater reach, costs related to on-site reduced; flexibility; increased opportunity; perceived benefits and ROI.
3 Disadvantages of a FRADS		FRADS—disadvantages	Stakeholders perceived disadvantages such as possible cost of mentors, dealing with day to day ad hoc meetings; monitoring the system; and, instances where the tech is limited then limiting the implementation or success of the delivery
4 Challenges or Barriers		FRADS—challenges or barriers	Things that would prevent a FRADS from being successful
1 Age or Generational Issue		FRADS—challenges—age or generational	Thoughts on the generational differences as well as age related skills and mindsets.
2 Cultural (personal & corporate)		FRADS—challenges—cultural	Cultural challenges are both personal and corporate in nature and include such things as building trust, creating a supportive environment, cultural backgrounds, expected importance of proximity, integration into a group environment, mentoring remotely, forming relationships, and the personality necessary to interject remotely into a conversation.
3 Industry Buy-In		FRADS—challenges—industry buy-in	Thoughts on Industry buy-in may range from: "A want to problem" to an existing mindset of what an apprenticeship "is", to possible resistance to the model itself.
4 Hands-On Work Considerations		FRADS—challenges—hands-on work	Issues related to hands-on work (also covered in additional concerns)
6 Possible Solutions		FRADS—challenges—possible solutions	Possible solutions may include: cross corporations, integration of apprenticeship into the educational system, intentional integration techniques conducted by mentors, the use of retirees, pools of mentors, and technologies to better facilitate the process.
7 Additional Concerns		FRADS—challenges—additional concerns	Additional concerns may include costs of a systems change; curriculum constraints; expectations of apprentices; portability of credentials; possible regulation later; scaling; silo'ing among providers; and where the work resides.

5 Technologies		FRADS—challenges—technologies	Thoughts on technology include both at home and centralized training facility and includes concerns about equipment, materials, and quality checks (in manufacturing), on-site equipment support, quality checks (how they would be conducted), secure keypad entry for secure training centers, technology access, and including a time clock if using a training facility.
5 Changes required to current System		FRADS—changes required current system	These are things that may need to be changed in a fully remote environment: 3rd party intermediaries including system and process for wrap around services; application process; systems for communicating and building trust; planning; performance evaluation; controls and measures; waiver of 1:1 ratio; mentor reviews in manufacturing; application of learning science; system for pay increases; and fully using 21st century apprentice capabilities
6 Sectors Most & Least Likely		FRADS—sectors most or least likely	Captures thoughts on most likely and least likely places, sectors, positions, people to offer a successful FRADS
Setting that Lends Itself to FRADS		FRADS—Sectors most likely—lend self to FRADS	Captures settings that lend to FRADS. For example: Additive manufacturing; automation Robotics & AI; business analyst; customer service; cyber security; finance; data analytics; health care; help desk; insurance; jobs already remote; personality types; prison; programmers/coders; specific roles; tech companies; positions that utilize technology. Also looks at the nature of the position, work, year, and specific roles.
Setting where Difficult or Impossible		FRADS—Sectors leastt likely—difficult or impossible	Settings, industries or locations where FRADS is less likely or impossible; such as carpenters; some manufacturing; medical and dental; physical or hands-on services; instances where decisions are made on the fly or where there is a lack of internet.
7 Trends that Support FRADS		FRADS—trends that support FRADS	Stakeholder thoughts on trends that support FRADS, such as the tech skills based on age (digital natives); broadband access; community college efforts; e-Learning; funding for apprenticeships; policy changes; tech trends; future of work; and changes in manufacturing such as 3D printing, automation, AI, digitalization of information and democratization of information; self-diagnosing, self-correcting robots and programs; and changes in the design function.
8 Stakeholder Sentiment		FRADS—stakeholder sentiment	Statements by stakeholders with language that offers insight into their attitudes and opinions of FRADS
7 Next Steps		next steps	Stakeholder perspectives on what should be done next

1 Starting Point		next steps—starting point	Stakeholder perceptions of who should be involved; may include apprentice provider if not employer sponsor; apprentices; content specialists; DOL, Education providers; employers
Lead Initiative		Next steps—start—who should lead	Suggestions of who should lead a FRADS initiative may include parties such as 3rd Party Intermediaries; business & industry; Connected Nation; VA; Government; Not Government; Online universities; Workforce Development; Community Initiatives; education; and collaborations
Partnerships		Next steps—start—partnerships	Suggestions of partnerships that might be needed to implement and support FRADS. This includes employer sponsors and non-employer partnerships. Also considerations concerning potential partnerships should be captured.
Employer Sponsors		Next steps—start—partnerships—employer sponsor	Within Employer Sponsors, numerous positions might be suggested including: HR Managers, Leadership Team; Production Managers; Program Administrators; and Tech Leaders
Non-employer Participants		Next steps—start—non-employer participants	Non-employer participants might include apprentice provider (3rd party intermediary); apprentices; content specialists; DOL; education providers and University officials; learning scientists; tech companies; support or infrastructure organizations and regulatory officials and possibly even the Urban Institute
Partner Considerations		Next steps—start—partnerships—considerations	These may include partner groups that may be negatively impacted by FRADS; and, on the other hand include things such as proper preparation of onsite peers to view FRAs as equals
2 Planning		Next steps—planning	Thoughts on things that need to be considered going forward toward design and implementation of a FRADS
1 General Strategy		Next steps—planning—strategy	Examples of strategy: I think one of the critical pieces is mapping how you place that content onto an LMS and customize that for the delivery of that training and those competencies in an apprenticeship situation so that you've got the ability to gauge and demonstrate hands-on mastery or whatever it might require. You want to make it as easy as possible for the employer to provide or participate.. I keep going to rural communities....
2 Issues to Address		Next Steps—planning—issues to address	Issues might reside at the Federal or state level; include things such as the Industry Recognized versus Registered Apprenticeships; a lack of awareness of opportunities; social aspects of FRADS; and the inner-focus of some companies

3 Process to Mitigate Challenges		Next Steps—planning—mitigating challenges	What suggestions do stakeholders have to mitigate the challenges? EX: And I think as those challenges are encountered, what would be helpful is if there were some standards, some guides to say, here's the challenges that you might encounter, here's the ways that we have solved those, that we recommend to solve those.
4 Pilot		Next steps—planning—pilot	Emerging from the data was multiple stakeholders suggestion of a pilot as the next step. Example: What do you see as a possible next step in the examination of fully remote apprenticeships as an alternative to the current face-to-face delivery system? "Maybe a pilot test. If you find willing partners, maybe a pilot test."
5 Structure		Next steps—planning—structure	Various thoughts on structure of the apprenticeship; structure of the partnerships, etc. EX: "You know, if I were going to build some sort of remote delivery system for apprenticeship, I think it would have to be a combination of some sort of great tele-presence, collaboration platform, not necessarily as dramatic as the self-balancing, tele-presence robot; but, something that is going to be really key is that collaboration platform."
6 Tech Infrastructure		Next steps—planning—tech infrastructure	The discussion of the technology includes things such as networking architecture;— reference architecture; software implementations; user interfaces; and the overall quality of the experience
7 Oversight, Quality & Evaluation		Next steps—planning—oversight evaluation and quality	Issues of oversight and quality control and evaluation including who, how, when including certifying body; the employer and education provider in partnership; team leads or production supervisors; the free market; 3rd party intermediaries; and the DOL.
8 IEG Framework		IEG Framework	Items that are included in the IEG Service Delivery Framework as 1) Enabling Conditions; 2) Inputs; 3) Service Delivery Implementation; 4) Service Outputs; 5) Service Outcomes And, then the feedback loop with Lessons Learned
1 Enabling Conditions		IEG Framework—enabling conditions	Includes Political Economy | Leadership | Policy Development | Capacity Development | Budgeting | Regulatory & Legal | Data Systems | Supply Chain | Country Procurement Systems (N/A for now) | Public Financial Management

Barriers or Challenges		IEG Framework—enabling conditions—challenges or barriers	A. ...the culture barriers, internally... people embracing that concept. We've even looked at that from our own perspective as far as we're having a hard time finding the right types of engineering talent ...one of the things we're really seriously considering is actually hiring remote workers... maybe... they only come in a couple of times a month....But, truly fostering that environment...embracing that as a culture...probably the right thing...especially given...don't want to move to South Bend
Economy		IEG Framework—enabling conditions—economy	T. Economic impact on FRADS A. Yes, there are probably a lot of ways. The availability of funds, the tightness of the labor market, dollars for workforce development, all of those things can be mitigated through a remote apprenticeship application, I would think.
Infrastructure & Expertise		IEG Framework—enabling conditions—infrastructure & expertise	A. I think we have the capacity for it, we may not necessarily have it all today but with expansion of 4G and 5G capacity in our infrastructure, there's companies currently deploying hardline communication and wireless communication that can manage those types of pipelines. I think that it's available to us, the question is, are businesses ready to deploy that way? I think that young emerging companies are really in the best position to take advantage cause they're open to it.
Mindset		IEG Framework—enabling conditions—mindset	I think it's nothing short of tradition and a lack of understanding of the capability of online delivery systems and how engaging and really hands on, it can be with the right system and the right approach to instructional design.
Partnerships		IEG Framework—enabling conditions—partnershps	A. Certainly, corporate partnerships primarily, that's a primary channel that Purdue Global has identified for student acquisition, so different from a traditional institution of higher education. The students that come to Purdue Global ideally are going to be working adults, folks that are already in the workforce and so rather than try and market to a 18-24 year old student...market directly to students who are in the workplace... that's where those corporate partnerships become really essential...
Perception of Acceptance		IEG Framework—enabling conditions—receptivity	A. I think it would be very accepted. Again, I've been a part of some conversations around apprenticeships with business and industry and I've been surprised at how interested and excited businesses get when you talk to them about, look this isn't just traditional book learning, this involves an apprenticeship, we can apprentice what you need to create people for the jobs that you need.

Proof of Concept		IEG Framework—enabling conditions—proof of concept	T. Any questions you would want addressed before you could feel comfortable that a FRADS is viable. A. What is your proof that you can teach what's typically a hands-on approach and how are you going to monitor what the apprentices are doing?... There are AAI grantees for IT, for transportation...different AAI grantees. T. ...maybe we start in an industry that's non-manufacturing and get proof of concept at that level...work out the process...A. I think that's probably a good idea.
Readiness		IEG Framework—enabling conditions—readiness	A. I do think so. I’ve had several conversations with the folks at the Department of Labor in their apprenticeship office and some pretty high-level meetings where we discussed...some of these very concepts and they were very, very open to it, very excited about it. I think the struggle is...what do we do with this because it’s so new and out of the box and we don’t have a structure set up to operationalize it...I have seen first-hand that that particular agency is very open to it.
Trends		IEG Framework—enabling conditions—trends	...there are several bills going before Congress to support apprenticeship programs, so I think there's a lot of policy change that's happening
2 Inputs		IEG Framework—inputs	Includes: Funding (e.g., Capital, operation, and maintenance) | Human Capital (e.g., service providers and managers) | Service Delivery Design: a. identification of citizen beneficiaries; b) Needs analysis (beneficiaries, providers, managers, existing SD model); c) End to end implementation plan; d) Establishment of service standards; e) Plans for operation and maintenance; f) Development of monitoring and improvement system; g) Design of feedback loops (accountability)
Access-Limited Populations		IEG Framework—access limited populations	A. Maybe people who are disabled or don't have reliable transportation. It could be in school youth who are living in poverty. I think that can be a very broad definition.
Partnerships		IEG Framework—inputs—partnerships	A. The primary relationship that’s important is the employer. Apprenticeship is fully reliant on the ability to put people to work. If there’s no employer there is no apprenticeship.
Planning & Design		IEG Framework—inputs—planning & design	This section includes aspects of planning; the who, what, when, why, system components, economic considerations, and so on.
A Holistic Approach		IEG Framework—inputs—planning & design—holistic approach	I'm doing much more than giving a person a job and a skill in my company through this apprenticeship. You're teaching them and mentoring them on all aspects of life and community and leadership and organization.

Additional Considerations		IEG Framework—inputs—planning & design—additional considerations	A. ...you have to start at its core with the employer, you have to consider external resources and pool them in a way that creates the outcome that you're all looking for and you have to have the right partners at the table. There's nothing impeding you from deploying the types of models that you're focused on and have been describing during our conversation. The question is, can we line up all of those pieces in a way that make it the most powerful for the participant and the employer jointly?
Certifications		IEG Framework—inputs—planning & design—certifications	A. So it just depends on the type of credential, so some programs have national recognition, some programs in the states create their own apprenticeship criteria or add to the federal criteria, and then certain occupations, a certification is not enough, they have to have a license and that means that that license is created at the state level or even at the county level, so it does depend on the occupation and it depends on how each region is interacting with that occupation.
Community of Practice Plan		IEG Framework—inputs—planning & design—CoP	A. I don't think that would be hard. Like the defense contractor who helped us start, they've done those communities of practice and they do a good job of when they have community of practice meetings, they televised it and put them on social media for those who can't come so they could feel like they're there and in person and participate, so that part doesn't bother me as bad, there's a level of relationship though that happens prior to that, but I think they're still able to facilitate that aspect of it
Competencies		IEG Framework—inputs—planning & design—competencies	T. Are you creating your own curriculum then, your own competencies. Explain UK. Jackie. We've created our own as part of this grant. We're up to 20 different occupations /now. And, all of them have been vetted by industry. T. Do you put your curriculum then into a central depository? JA-A. Once they go to the department of labor for approval, then they become public through the DOL?
Economic Considerations		IEG Framework—inputs—planning & design—economic considerations	A. So, I would have to go back and look for that number. One of the things that we've done in North Carolina to offset the cost, is we now offer a state tuition waiver for any high school student that goes into a registered apprenticeship program. For the life of their apprenticeship, their college tuition is waived and paid by the state.

Matthew Effect		IEG Framework—inputs—planning & design—matthew effect	A. Iif you want to reach disadvantaged communities, you have to do it on purpose. And people get upset with it, especially minority leaders because it's not about creating another disparate environment, it's about leveling the playing field. And so you can't swing the pendulum entirely to the disparate community side, it has to be a balanced approach. But you do have to purposely focus on ensuring that those folks that are disadvantaged get a fair opportunity to participate.
Next Steps		IEG Framework—inputs—planning & design—next steps	A. I think a pilot test. Doing some sort of...obviously you've got to do some program development around it before you even do a pilot test. But, that certainly is a good way to get your toes in the water and test it out.
Pilot		IEG Framework—inputs—planning & design—pilot	A. ..two things, I think someone or some group to almost pilot this and say, okay based on our research...here's the reference architecture saying what we need to do and here's a list of early adopters that have said, okay we've raised our hands, we're interested in this...somebody has passion. Some companies that have said, okay you give us at least some sort of what you feel that this needs... we're going to jump in and...embrace this...and then somebody would walk alongside them...check in with them...
Plan to Increase Participation		IEG Framework—inputs—planning & design—participation	A. I think and maybe a targeted marketing campaign specifically built around that particular population might have to be developed. I think probably more importantly, if such a system existed, getting employers that serve those populations or in proximity to those populations involved would be important.
Quality		IEG Framework—inputs—planning & design—quality	A. I think people have focused on the quality aspect of traditional classroom delivery versus online and I think slowly but surely what has happened is that qualitative studies of student outcomes have shown that there's very little difference if any and in fact there are some studies that would show that the educational outcomes across the board as well as student engagement is higher with online delivered coursework than face to face.
Who to Involve		IEG Framework—inputs—planning & design—who	A. I think all of those certainly but I think ultimately where it's going to get traction will be from industry, from the places where the positions are critically needed and they need an innovative solution, a new approach, and I think it's going to start with the employer, it's going to involve certainly the government, it's going to involve higher education, it's going to involve third parties.

Target Industries		IEG Framework—inputs—target industries	A. We've had a lot of conversations with healthcare systems, and I think the occupations around healthcare delivery, patient service, all of that particular industry, I think has risen to the top in my mind, I mean technology was there, cyber security was there, but healthcare recently I think is an area that would, an industry that would be very open to participating in apprenticeships.
3 Funding		IEG Framework—funding	Lessons learned and Changes Made
4 Service Delivery Implementation		IEG Framework—implementation	Service Delivery Model: a) Central Government Provision or Contracting; b) Decentral Govt Provision or Contracting; c) Hybrid between Central and DeCentral Govt Proviision or Contracting; d) Public Private Provision; e) Private Sector Provision; f) Citizen-directed Providsion (e.g., CDD, voucher); g) Other innovative provision | Other Implementation Processes
Communication & Collaboration System		IEG Framework—implementation—communication & collaboration	A. I would say one would certainly be, can we make the communications infrastructure work as seamlessly as possible and I would want to know how did we replicate the phenomenon of presence or physical proximity in that fully remote internship. I know it almost seems like an oxymoron to try to talk about fully remote yet replicating presence, but I do believe that's an important thing.
Components		IEG Framework—implementation—components	A. I would think that you would have to have software in place for certain occupations...like record learning and test scores and transcripts...When I was at Seimens I used something calling tooling-u which is a completely fine university for technical skills... to supplement my youth apprentices related instruction...I really liked about that was on any day, I could pull up a report and see exactly what they did, what their test scores were, how long they were in the system, those sorts of things.
Integration into Community of Practice		IEG Framework—implementation—integration into CoP	A. I think it's critically important again, that's part of what learning is all about generally, but certainly an apprenticeship is sort of immersing them in the field and it can be done. It can be done through online learning just as it can in a traditional classroom. I think of our law school (Purdue Global...online)...one of the ways we've integrated...into the field of practice is through...a mentor a the law school...actually do pro bono work...it's physically in Orange County, CA...

Mentoring		IEG Framework—implementation—mentoring	T. Do you think that one workplace mentor would be able to mentor multiple apprentices in this kind of a system? A. I do. T. Does that happen now? PH-A. Yes, mostly in one on one instruction, but, I do know of an organization in Boulder, CO that is doing an IT coding model apprenticeship in which they do bring the apprentices in to learn coding and one mentor mentors multiple apprentices. T. Kind of like having a bench. PH-A. Yes, that's exactly right.
Possible Hinderances		IEG Framework—implementation—possible hindrances	A. People that don't want oversight are always going to challenge these models, eople that would rather have the race to the bottom, where they believe that only the company goal is what's valuable. It's not important to them that people have the dignity of an occupation and a career path that actually allows them to purchase the products that they make.
Training & Support of Apprentices		IEG Framework—implementation—training support apprentices	maybe how the employer would support that person, that would be my only initial question and how would they treat that person if they were a remote?
Training & Support of Sponsors		IEG Framework—implementation—training support employers	T. Any questions you would want addressed before you could feel confident a fully remote apprenticeship delivery system is a viable alternative? A. Well, it depends on how the questions are posed...if you are trying to sell me on a solution, for a fully remote delivery system for apprenticeship...then I would have a lot more questions than if we were doing it ourselves...If you were coming in...to make a sales pitch....trying to sell me these self-balancing tele-presence robots...a lot more questions.
Who Responsible within Company		IEG Framework—implementation—responsible parties	Who is responsible within the company? A. You'd have somebody that would sort of wear that hat or take on that function. T. I'm assuming that kind of support would phase out overtime... A.Yeah, for the most part. I mean, you're still going to want to have some oversight to the program of some type.
5 Serivce Outputs		IEG Framework—outputs	Related to Service Delivery Activity: a) Service Provider Performance; b) Service Monitoring; c) Service Quality Control; d) Mechanism for Accountability (e.g., report cards or complaint resolution)

Alternative & Path of Inclusion		IEG Framework—outputs—alternative path of inclusion	I think we unnecessarily marginalize a certain number of those people. Obviously some probably would not do very well in a working scenario as most people conceive of it. However, there are all kinds of stories across the country where someone has had a particular level of benevolence and a particular level of resources and a particular level of motivation where they have succeeded at reaching out and engaging and helping those kinds of populations be productive.
Credentials		IEG Framework—outputs—credentialing	...we have standard competencies for every single one, no matter if it's a time-based, hybrid-based, or competency-based...and. they're these kind of large standard, 10,000 feet level competencies, so that all of the companies can use them. And... I know they're adaptable for every company. So, I assume you would try to say these larger 10,000 ft level competencies work for a remote vs a hybrid or face to face...very reluctant without having somebody see what they can really do.
Increase participation		IEG Framework—outputs—increase participation	What I'm doing right now is aligning speaking engagements in corporate environments where leaders find themselves to bring these ideas to place....conferences and panels and entities, public sector entities that are facilitating these kinds of conversations but... until companies see somebody doing it and actually making money at it, you won't have to hold a conference. As soon as...one client demonstrates that it's a valuable a approach, I have three more clients...hey can you help me?
What Need to Ensure Outcomes		IEG Framework—outputs—needed to ensure outcomes	What is needed to ensure outcomes?
6 Feedback Loop		IEG Framework—feedback loop	Related to Service Use: a) Coverage of Service; b) Quality of Service; c) Affordability of service; e) Reliability of service; f) Satisfaction of Citizen Beneficiaries; g) Sector-Specific beneficiaries outcomes; h) Sustainability of the service beyond the initial project period
Evaluation		IEG Framework—feedback loop—evaluation	How should FRADS be evaluated and by whom?
Portability of Credentials		IEG Framework—feedback loop—portability of credentials	How to ensure portability of credentials?
Who Oversee Quality Control		IEG Framework—feedback loop—oversee quality	Who should oversee quality control?

APPENDIX N. KCBM INCLUSIVE HYBRID CLASSROOM TECHNOLOGY SCHEMATIC