AN EXPLORATION OF EMERGENETICS® TRAINING IN THE FEDERAL
WORKPLACE

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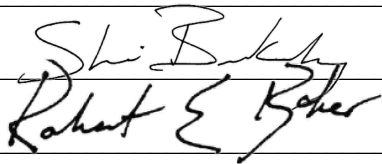of
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An Exploration of Emergenetics® Training in the Federal Workplace

A Dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at George Mason University

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Dedication

This is dedicated to my loving husband Andrew, my two wonderful children Norah and Nathan, my cat Lewsie and my dogs Bo and Diesel.

Acknowledgements

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List of Abbreviations and Symbols

Human Performance Technology ....HPT
Human Resources ....HR
Learning Management System .... LMS
Information Technology ....IT
Unregistered Trademark ....™
Registered Trademark with U.S. Patent Office .... ®

Abstract

AN EXPLORATION OF EMERGENETICS® TRAINING IN THE FEDERAL WORKPLACE

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George Mason University, 2021

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Performance based training interventions are often solutions in improving organizational performance in federal organizations. The purpose of this study was to explore the application of Emergenetics® training concepts and the use of the mobile application in relation to supervisors, employees and their teams. The goal was to identify how individuals collaborated before and after training in effort to increase employee and workplace performance. Following a one-year mixed methods study, results found that the Emergenetics® training program and mobile application proved valuable to team collaboration efforts as described by supervisors and employees. This study is slated to be a resource in implementing and effectively measuring performance-based training interventions in the federal workplace.

Chapter One: Introduction

As workplaces become more engaged in people-centric practices, new possibilities emerge for employees to thrive. In modern society, knowledge workers comprise most of the workforce and have become the major creators of wealth and jobs (Askar, 2018). Researchers conclude that many aspects of the workplace affect business performance. Business success relies on the actions of the organization's people and, particularly, their ability to engage in the kinds of activities and behaviors necessary to carry out organizational goals (Karanges et al., 2014). People-centric workplaces emphasize the human element of communication, leadership, and business interactions. Exploring individual performers' knowledge-sharing dynamics is critical to the human performance technology (HPT) field (Morelli et al., 2017).

In many cases, organizations use training to close human resource gaps as a performance improvement strategy, and these strategies are grounded in performance improvement methodology. One methodology stems from the field of HPT, which is related to performance improvement and incorporates theories from various disciplines, including behavioral engineering, instructional systems design, design, research, design thinking, lean management, and organization development (International Society of Performance Improvement [ISPI], 2020).

HPT's focus on human performance implies attention to improving employee performance, and its focus on technology describes a set of methods and procedures for improving the work, worker, workplace, and environment (Van Tiem et al., 2012). Two

main drivers of HPT are evaluation and change. At each stage in the process, outputs are evaluated to ensure that certain objectives are met. HPT cross-pollinates with instructional technology principles in appropriately designing learning interventions for organizational needs (Kang, 2017). The difference is that in HPT, the path ahead requires a more extensive, elaborate analysis process using front end analysis (FEA) techniques targeted at investigating the root cause of performance issues and appropriate interventions as solutions (Harless, 1982).

Linear, systematic approaches to solving learning problems are becoming less effective, with organizations increasingly turning to other methods to improve their workplace performance. In recent years, methods have emerged that utilize Agile-based processes and design thinking (Czeropski & Pembrook, 2017). In 2006, Roger Martin introduced design thinking to the management lexicon as an abductive approach to solving complex problems (as cited in Joachim et al., 2020). Tim Brown, CEO of the design consultancy IDEO, then centered design thinking principles around human end users, bringing the concept into popular management discourse for non-designers (Brown & Katz, 2011). According to Plattner et al. (2012), "A human-centered approach to innovation draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success" (p. 2). Brown promoted design-thinking concepts to the business world, showing how this collaborative approach helps to solve business problems and elucidates the interactions between the worker and technology—as well as the customer and product—in innovative, creative ways (Brown & Katz, 2011). This human centered approach is also evident in design

research which supports the strategic design and development of systems and services to generate value to the end user (Bannan, 2003).

Design research practices are foundational to creating systems that respond to human needs often by analyzing complex problems. Jonassen (2010) stated that prior experience in problem-solving is the most common metric for identifying expertise on the subject of focus. Such collaborative efforts are important in organizational development and promote a high-quality work product through abductive logic. That is, jumping ahead in reasoning and then testing a hypothesis rather than merely analyzing history to inform the next step of reasoning (Joachim et al., 2020). In the federal sector, the culture of the workplace may impede these design research processes including iterative-based practices, as federal budgeting processes impose strict time constraints on providing work products. However, there is little research on collaboration for improved performance in the federal sector.

Organizational Context

The federal organization that is the subject of this study provides oversight of fraud, waste, and abuse through auditing and investigative practices employed against potential criminal and malicious cyber practices across the larger agency. One key element of this mission is carried out by teams of auditors and inspectors, who produce objective reports in response to congressional inquiry. According to senior leadership, due to the emphasis on teamwork when producing the final reports, applying problem-solving and critical-thinking skills is imperative for achieving optimal results.

Audit and inspection teams are formed based on project scope, with geographically dispersed employees traveling frequently to field sites. The teams' reliance on various technologies is important for the communication, sharing, and documentation of findings throughout this process. After data are collected, the team writes a report collaboratively across various field offices nationwide. According to senior leadership, the final reports have not been satisfactorily cohesive and lack a logical flow. This is because the reports are currently written non-collaboratively by multiple team members. Leadership, therefore, has advised that mandatory training using the Emergenetics® model be undertaken by all employees to increase these skills for improved team performance. This study explores the extent to which the Emergenetics® training impacted collaborative team performance. After more than a year of conducting training workshops, the results were assessed, taking into account the effects of technology use through the Emergenetics® mobile application.

Emergenetics® and Performance Improvement

The use of psychometrics has grown in popularity in the US Federal Government as part of an effort to increase work quality and boost organizations' morale. Emergenetics® International is a private consulting organization headquartered in Centennial, Colorado that has developed a psychometrics tool designed to increase workforce performance. Dr. Geil Browning is the chief executive officer (CEO) and owner of Emergenetics®, LLC, and of the Browning Group International Inc., which provides training development and consulting services to organizations worldwide. She, along with her business partner, Dr. Wendell Williams, developed a proprietary cognitive

model based on neuroscience that functions as a measurable, proven method of recognizing and applying thinking and behavior patterns that people can use regularly (Browning, 2018). Browning and Williams developed the Emergenetics® tool to combine the core principles of effective learning, communication styles, and team interaction into a usable model provided by certified facilitators (Emergenetics® International, 2021). As stated on Emergenetics® International's (2021) website, "From hiring candidates to developing individuals and facilitating teamwork, everything is built on robust psychometric research to maximize human performance" (Our DNA.).

The Emergenetics® model introduces concepts of personal thought and behavior preferences, which focus on employees' strengths regardless of personal demographics. Utilizing these strengths when collaborating with others is vital to employee success in the large federal government oversight office that was used as a subject in the study, in Washington, DC. This model uses a psychometric tool for gathering personalized data and is a form of diversity and self-awareness training, transparently highlighting each individual's cognitive and behavioral preferences in group training.

The Emergenetics® model is rooted in Roger Sperry's *split brain* research from the 1970s, which debunked the *left brain* and *right brain* concepts using the lateralization of waves across lobes and applied it to the field of educational psychology (Sperry, 1982). Sperry (1965) believed that genetics, life experiences, personality traits, and environment play into one's identity as an adult. Understanding teams in relation to individual behavioral and thinking preferences with a view toward improving human performance is a key objective in the Emergenetics® model (Barrick & Mount, 1991).

According to Emergenetics® International (2021), the model is designed to describe

people in terms of psychometrics, using four thinking attributes and three behavioral

attributes. These are compiled into a complete user profile and explain how people

behave, with reference to their individualized thought processes. Because thought

processes, unlike behaviors, are not visible to observers, the tool provides useful ways to

manage and leverage a diverse workforce through transparency (Browning, 2006). The

Emergenetics® International (2021) website states that at a practical level, the profile

represents a clear framework of seven easily recognizable and useful factors that apply to

work, communication, and interpersonal relationships. The framework is depicted in

Figure 1.

Figure 1

Emergenetics® Profile: Seven Factors

Note. Reprinted from *Our Science*, by Emergenetics® International, 2021., https://en-gb.emergenetics.com/apac/our-science/. Copyright 2021 by Emergenetics® International. Reprinted with permission.

An individual's Emergenetics® profile illustrates seven attributes and represents a unique combination of individual thought and behavioral preferences. The profile is derived from an online survey with 100 questions about daily work and life activities. The survey is accessed through a link unique to the participant, sent by email weeks or months before their participation in the workshop. The generated results are sent to the training coordinator or person who requested the individual's profile and are not seen by the individual. The results are represented in a personalized pie chart with thinking preference percentages and behavioral scales. After the initial workshop, this profile is given to the individual, who is encouraged to share it with their team to promote a transparent and inclusive culture.

Emergenetics® International developed a proprietary mobile application (see Figure 2) to allow those with a personal profile to connect with co-workers, family, and friends who also have Emergenetics® profiles. According to Emergenetics® International (2021), this virtual connection "facilitates effective communication and interaction by providing clear-cut personalized tips based on the unique attributes of any person's profile" (How We Help). The application includes various tip sheets, including how to run meetings with people of various preferences and how to approach difficult conversations, and allows members to view group summaries of the mean profile preferences of their entire team. This information about group means is useful to supervisors and managers who can then develop engagement strategies unique to their teams' preferences.
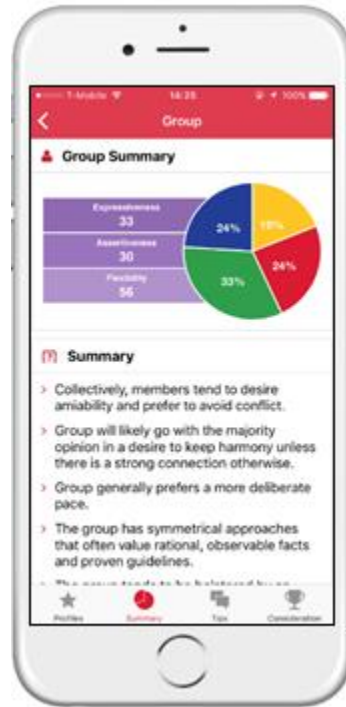
Figure 2

Emergenetics® + Mobile Application

Note. Reprinted from *Tools*, by Emergenetics® International, 2021

https://www.Emergenetics.com/products-services/tools/emegenetics-mobile-app.

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According to the Emergenetics® International (2020) website, the Emergenetics®+ application allows those with existing profiles to:

- Connect with co-workers and friends who have Emergenetics® profiles.

- Compare profiles for similarities, differences, and interaction recommendations.

- Access practical communication tips to improve collaboration.

- Create and save groupings of multiple profiles.

- Share profiles and customized group reports.

- Access Emergenetics® guides and work templates to apply Emergenetics® in daily interactions with colleagues.

Security concerns surrounding the application's personal information-sharing features are addressed in several ways. When a member seeks a connection with another member in the Emergenetics® profile database, a request is initiated, sent though the application, and must be confirmed by the requested member before any personal profile information becomes available. This process serves as a member's consent to share personal information. Emergenetics® does not share profile information but keeps it for statistical reference only.

Emergenetics® training is administered in two parts. First, an online Emergenetics® profile assessment is sent to individuals by email to analyze their profile. After completing the assessment, participants are invited to attend a three-hour Meeting of the Minds™ (MOTM) workshop and are prompted to download the application on their mobile devices. All workshop materials are available through the application, including the participant's personal and team profile information. The workshop takes place in a classroom environment at the organization with fellow employees on hand to interpret their profiles and determine the usefulness of the information as a self-

awareness tool. Currently, no scientific research has evaluated the effectiveness of the Emergenetics® model in the federal arena.

Purpose and Research Questions

The purpose of this study was to explore aspects of the Emergenetics® training program on individual performance and how it impacts collaborative team performance in the federal workplace. Performance in this study was measured in two ways. First, perceptions of improved communication, sharing, engagement, and overall attitudes of employees after the training were explored from a sample of those who took the training. According to Kahn (1990), employee engagement encompasses psychological wellbeing and an overall feeling of belonging to an organization. These elements help contribute to achieving organizational goals. This variable (employee engagement) was unpacked in the present study by obtaining primary data through a combination of survey questions, focus group questions, and individual interviews. In addition, organizational data illustrating employee pre- and post-workshop performance appraisal scores were obtained. This objective data source was aggregated and used to validate the study findings, as discussed in Chapter 4. The research questions that guided this study are as follows:

1) What are the perceptions of the value of Emergenetics® training?

2) How do participants use the mobile application after training (if at all)?

3) How has Emergenetics® training influenced supervisor attitudes toward their teams' collaborative efforts?

This study investigated the use of the Emergenetics® tool and mobile application as a performance improvement solution in a federal organization, with the goal of understanding the tool's impact on employees' work performance and attitudes to technology. This study contributes to HPT literature and practice in many ways. The investigation of the use of psychometrics in federal organizations provides a guide for future researchers to measure performance and overall engagement in organizations.

These results will help organizations gain understanding of potential effects of training programs like Emergenetics® in providing improved collaboration among geographically dispersed teams. This is important currently during the global pandemic, wherein many teams are being forced to collaborate from various geographic locations. This study adds to the literature of HPT by improving collaborative team efforts in the workplace, which is paramount for team success in achieving organizational goals.

Chapter Two: Review of the Literature

Introduction

  This chapter reviews the literature related to HPT and workplace technologies used to increase employee performance in the federal sector. The first section describes the search strategy used to explore the extant literature, while the second section discusses the field of HPT for background theory. The third section addresses HPT's use of learning and development (L&D) technology in the workplace, and the fourth section considers the role of the supervisor in a direct report's performance rating. The last section summarizes the gaps in the literature that the present study seeks to fill.

Search Strategy

  A systematic search was conducted utilizing Rowley and Slack's (2004) building blocks approach that "takes the concepts in search statements and extends them by using synonyms and related terms" (p. 35). The search was carried out according to the steps below.

Step 1: Planning

  The first action taken was to determine which databases and keywords to use. The researcher initiated several meetings with librarians across multiple disciplines, including education, business, and psychology at George Mason University (GMU). During these meetings, the librarians advised the researcher as to which databases were most relevant to the topic and which inclusion and exclusion criteria to employ.

Step 2: Search Criteria

As shown in Table 1, the inclusion criteria were that the journal article be peer-reviewed and in the English language and that it have full-text availability in the databases listed in Table 1. Articles related to HPT and employee performance in academic settings, such as higher education and teacher education, were excluded, as were dissertations After this systematic search strategy, 1,398 references were uploaded into the bibliographical software EndNote and analyzed for duplicates, as described in Step 3.

Table 1

Search Criteria by Database

Keywords	Total Results (*n*) Meeting All Inclusion Criteria	Database (With Search Criteria Locations for Each Criterion)
"Performance technology" AND "Employee performance"	*n* = 22	ERIC • "Peer review" box checked under "Limit search results" • "Journal articles only" chosen in "Document" dialog box • "English only" chosen in "Language" drop-down box
"Performance technology" AND "Employee performance"	*n* = 1,211	Business Direct within EBSCO • "Full text" and "peer reviewed" checked under search bar *n* = 74,338 • "Scholarly articles" checked *n* = 3546 • English language filter *n* = 3542 • "Scholarly journals" box checked • Location "United States—US"
"Performance Technology" AND "Employee Performance"	*n* = 3	EBSCOhost: Psychology and Behavioral Sciences Collection • Advanced search options included "PDF full text" box checked • "Peer reviewed" box checked • "English language" box checked • In "document type" drop-down box, "Articles only" selected.

Keywords	Total Results (*n*) Meeting All Inclusion Criteria	Database (With Search Criteria Locations for Each Criterion)
"Performance technology" AND "Employee performance"	*n* = 141	EBSCOhost: Business Source Complete, Education Research Complete, Academic Search Complete, Computers and Applied Sciences Complete, Regional Business News, Public Administration Abstracts, Military and Government Collection, Human Resource Abstracts • Advanced search options included "peer reviewed" • "PDF full text" box checked • "English language" box checked • "Academic journal" selected for "publication type"

Keywords	Total Results (*n*) Meeting All Inclusion Criteria	Database (With Search Criteria Locations for Each Criterion)
"Performance technology" AND "Employee performance" AND North American industry classification system (NAICS) codes "6114-Business schools and computer and management training" OR "54161-Management consulting services*" OR "5416-Management, scientific, and technical consulting services*" OR "541618-Other Management consulting services*" OR "61143- Professional and management development training*" OR "611430-Professional and management development training*"	*n* = 21	ProQuest • Advanced search options included "peer reviewed" • "PDF full text" box checked, • "English language" box checked • "Academic journal" selected as "document type" • "Exclude duplicates" box checked • The search results excluded the following databases: Canadian Business, Asian & European Business Collection, Accounting, Tax & Banking Collection, and Indian Database Business. • Locations checked included "US," "United States," or "United States—US"

Note. Total number of sources from all database: 1,398.

Step 3: Selection

A folder was first created in Endnote titled "HPT" and 1,398 unfiltered articles were imported from each database according to author, title, and source. The export function was then used to list each reference and manually scan for duplicates. The total number of references after duplicates was 609, with 789 articles purged because of duplication and/or irrelevance, according to inclusion and exclusion criteria listed in the relevant database in Table 1. The total of 609 articles was then filtered by reading abstracts/titles for relevancy, which filtered out 312 more. Of the 297 articles retained, 213 were eliminated after a two-page cursory read for relevancy. Of the 84 total sources used for this review, 48 were theoretical, 4 were empirical, and 32 were practitioner case studies. The funnel chart in Figure 3 illustrates how the total number of $n = 84$ sources emerged as a result of a January 2019 search.

Total unfiltered sources- number of duplicates in EndNote

(1,389 – 789) = 609 sources

Total number of duplicates found in manual scan

(609 – 312) = 297 sources

Total number eliminated after reading abstracts/ titles

(297 – 176) = 121

Total number eliminated after 2 page cursory reading

(121 – 37) = 84

n = 84 sources used for this review
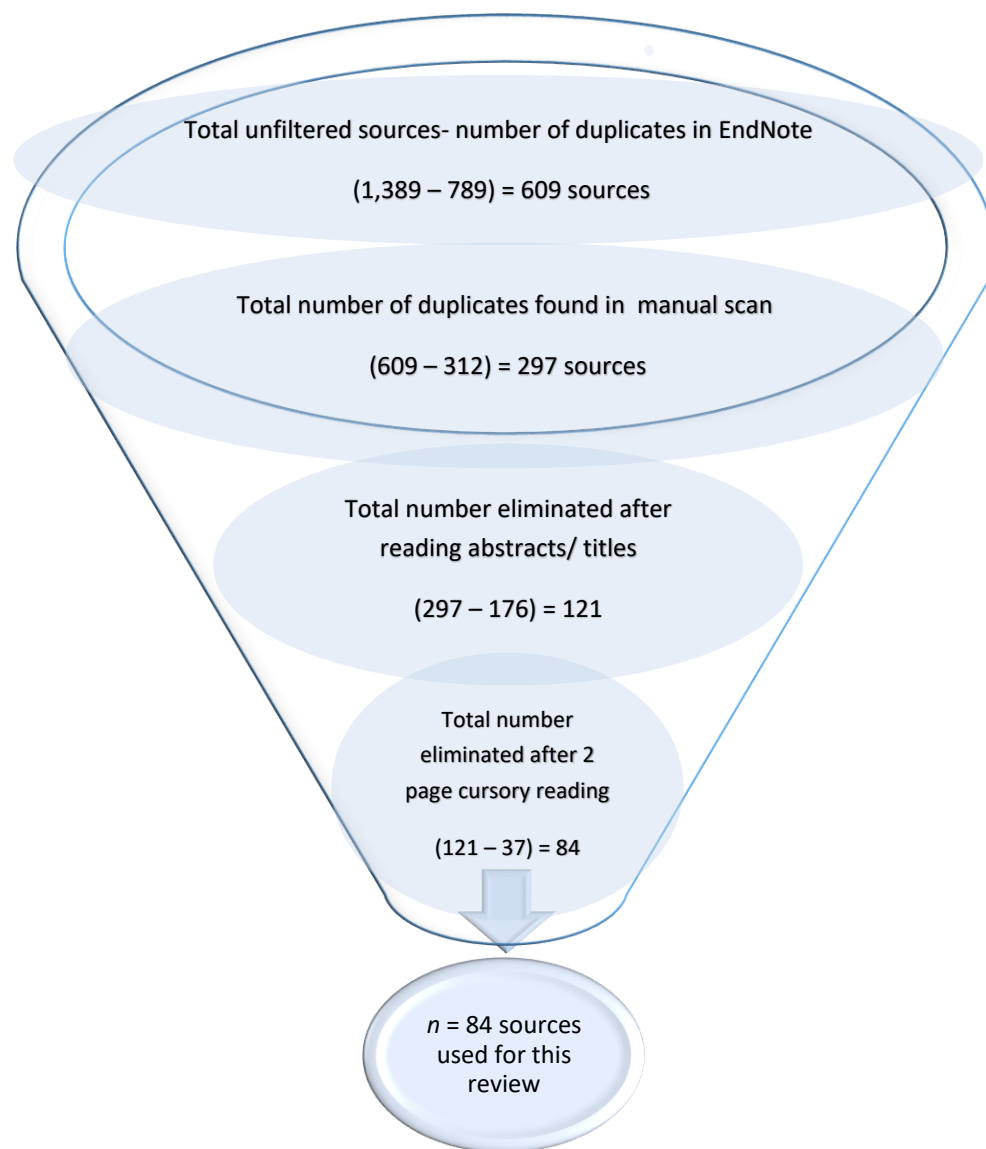
Figure 3

Literature Sources

History of the HPT Field

Pershing (2006) states that "Human performance technology is the study and ethical practice of improving productivity in organizations by designing and developing effective interventions that are results-oriented, comprehensive, and systemic" (p. 6). HPT uses three fundamental processes: performance analysis, cause analysis, and intervention selection. These processes can be applied to individuals, small groups, and large organizations (ISPI, 2020). Solving problems by improving the work, worker, and workplace enables the change that will result (Van Tiem et al., 2012).

Both academics and practitioners of HPT characterize the field as broad and holistic (Kang, 2017), covering an array of ideas, models, practical applications, and approaches. A variety of models have appeared over the last 50 years, a fact which illustrates the field's constantly evolving nature. Taking a historical perspective in identifying major contributors to the field, this review discusses process models and HPT methods related to technologies used by practitioners in the workplace that provide them with tools to analyze performance problems effectively. The field is heavily practitioner-based, and its history draws together various fields, including behavioral and cognitive psychology, communications theory, information processing, and general systems theory (Chow & Gong, 2010). In particular, general systems theory provides basic concepts to integrate ideas from many disciplines and subdisciplines relevant to HPT, including economics, sociology, accounting, management, and compensation practice (Brethower, 1999). Understanding the historical context of the field is key to understanding how HPT

functions in the context of the present study in making the connections between the intervention and measurements of performance.

1911–1979

Chevalier (2008) described Fredrick Taylor as the father of workplace improvement and human performance improvement. Taylor wrote *The Principles of Scientific Management* in 1911, in which he described a scientific approach to finding the "one best way" to complete a job (as cited in Chevalier, 2008). From 1911–1939, before the ramp-up of World War II, there was no economic need to develop workers through large-scale training efforts led by the federal government. During World War II (1939–1945), materials for learning were developed to change soldiers' behavior on the battlefield (Reiser & Dempsey, 2012). The overwhelming need for such training led psychologists to view training as a system and thus the field of instructional design, or instructional systems design (ISD), emerged. Some conceptual models in ISD are also grounded in HPT practice, as discussed in a later section of this review.

The field of ISD morphed into instructional design and technology in the late 1920s to 1940s as advances in media, such as sound recordings, radio broadcasting, and motion pictures, were used to develop instructional delivery methods (Reiser & Dempsey, 2012). In the late 1950s, HPT also began to formalize as a field and area of practice, as it was increasingly found that ISD had limited scope in focusing only on training and learning interventions in the workplace. In response to performance issues, practitioners found that environmental or systemic interventions were sometimes more appropriate than training alone (King et al., 2012). Openness to new ideas during the

Industrial Revolution in the 1960s helped to promote HPT principles as a way to streamline how work was done.

Behaviorism forms the baseline of HPT work, which operates with the goal of changing behaviors through performance-improvement initiatives. B. F. Skinner, a prominent twentieth-century psychologist, developed the theory of behaviorism, which explains behavior as a set of responses to external factors. He published his first work, *Walden Two*, in 1948 and conducted psychology studies with programmed instructions that operated on the principle of rewards for the demonstration of comprehension (Skinner, 1974).

In 1970, Joe Harless published *An Ounce of Analysis (Is Worth a Pound of Objectives)* and later developed a front-end analysis model using accomplishments to provide a diagnostic framework for gathering data before a solution was suggested (Harless, 1982). Chris Argyris, another leading contributor to the field of HPT, developed the concept of double-loop learning and feedback systems (Argyris, 1976). He also pioneered team building with upper management, illustrating the importance of feedback in organizations.

1980–2020

Economic theorists, including Edward Deming, Joe Harless, Peter Drucker, and Chris Argyris, entered the field, integrating engineering-based principles into learning and performance. Deming emphasized quality in his 14-point model, which was used in the industrial era of a production-driven society and helped turn the Japanese economy around after World War II (Van Tiem et al., 2012). Drucker's book, *Managing for*

Results, was originally published in 1964 and described management concepts in organizations in terms of objectives, focusing on the social meaning behind businesses and productivity (Drucker, 2008). Drucker's theory of decentralized organizations highlighted the knowledge worker as being key to workplace improvement initiatives (Howard et al., 2017).

In the 1980s, psychological theorists of HPT continued to focus on feedback to the learner. Feedback is a vital part of the HPT process and is, therefore, a major part of the theoretical background of the research. Gagne (1985) highlighted feedback as a key learning condition, stating, "Learners need to receive feedback on individualized tasks in order to correct an isolated problem" (p. 32). Similarly, Geis (1986) stated, "Establishing the fact that there is indeed a problem permits the technologist to take the second step: determining the value of the problem, that is, asking how much a solution is worth" (p. 6). Since the emergence of the field, various theorists and practitioners have had access to models for employing interventions to improve performance.

HPT's attention to human performance implies a focus on improving people/worker performance, and its attention to technology implies a focus on using a set of methods and procedures to improve the work, worker, workplace, and environment (Van Tiem et al., 2012). Two main drivers of HPT are evaluation and change. At each stage in the process, outputs are evaluated to ensure that certain objectives are met. Solving problems and improving work, worker, and workplace implies the change that will result (Van Tiem et al., 2012). This can be done on various levels, such as leadership making organizational decisions based on employee feedback.

According to Van Tiem et al. (2012), evaluation in learning and performance is the act of judging the value of a problem and its proposed solution. The purpose of using methodology to measure the effectiveness of a program depends on the stakeholder needs and expectations that affect decision-making. Donald Kirkpatrick is a proponent of evaluation, using the widely known four-step model described in terms of levels to evaluate a performance intervention's effectiveness (Kirkpatrick, 1998). The model is applicable to various types of interventions. Level one is widely used in education as a survey to rate students' satisfaction with the content (Kirkpatrick, 1998). The second and third levels are also important tools for gathering data on how learning is transferred to an individual's work performance. This transfer is measured by evaluating the learning and behavior of the individual before and after the intervention (Kirkpatrick, 1998). The fourth level focuses on measuring the overall results of the program or learning event.

The evolution of the HPT model includes extensive research and powerful theories from thinkers in various fields, including psychology, engineering, and education. HPT's detailed front-end performance analysis process illustrates the various considerations from each field in applying interventions aimed at changing behavior. This is also reflected in the field's 10 professional standards, which form the backbone of the International Society of Performance Improvement (ISPI), a professional that manages the CPT credentialing program (Kang, 2017). These standards are: focus on results or outcomes, take a systemic view, add value, work in partnership with clients and stakeholders, determine need or opportunity, determine cause, design solutions including

implementation and evaluation, ensure solutions' conformity and feasibility, implement

solutions, and evaluate results and impact (ISPI, 2020).

HPT and ISD Models

HPT cross-pollinates with various fields, especially instructional technology

(Kang, 2017). HPT models are categorized as diagnostic and process, depending on how

HPT is applied (Chow & Gong, 2010). The diagnostic models suggest areas where

interventions can be made, and the process models focus on how interventions can be

applied to address a performance issue (Kang, 2017). The ISPI model of HPT is one of

the most frequently used and referenced models in the fields of HR, organizational

development, and training design (Van Tiem et al., 2012).

The HPT model guides designers in a systematic, comprehensive analysis that

determines how training and non-training interventions may be effective solutions for a

given project or performance (Czeropski & Pembrook, 2017). It prompts questions that

lead to analysis of the gap between desired and actual performance, which may require

learning interventions. The ISPI model is based on the analysis, design, development, and

implementation (ADDIE) process, a linear model commonly used by instructional

designers. It forms the backbone of many HPT models.

According to Kang (2017), a key difference of the ADDIE and ISPI HPT models in

comparison to other models is the "expanded and elaborated analysis stage in the HPT

model with the separate systematic analyses of organizational and environmental issues,

gaps, and root causes affecting the actual performance" (p. 53). Unlike other models, the

HPT model compartmentalizes change management within the implementation stage. Van

Tiem et al. (2012) recognized that change is an integral process and incorporated change

management throughout the HPT process, as depicted in Figure 4.

HUMAN PERFORMANCE TECHNOLOGY (HPT) MODEL
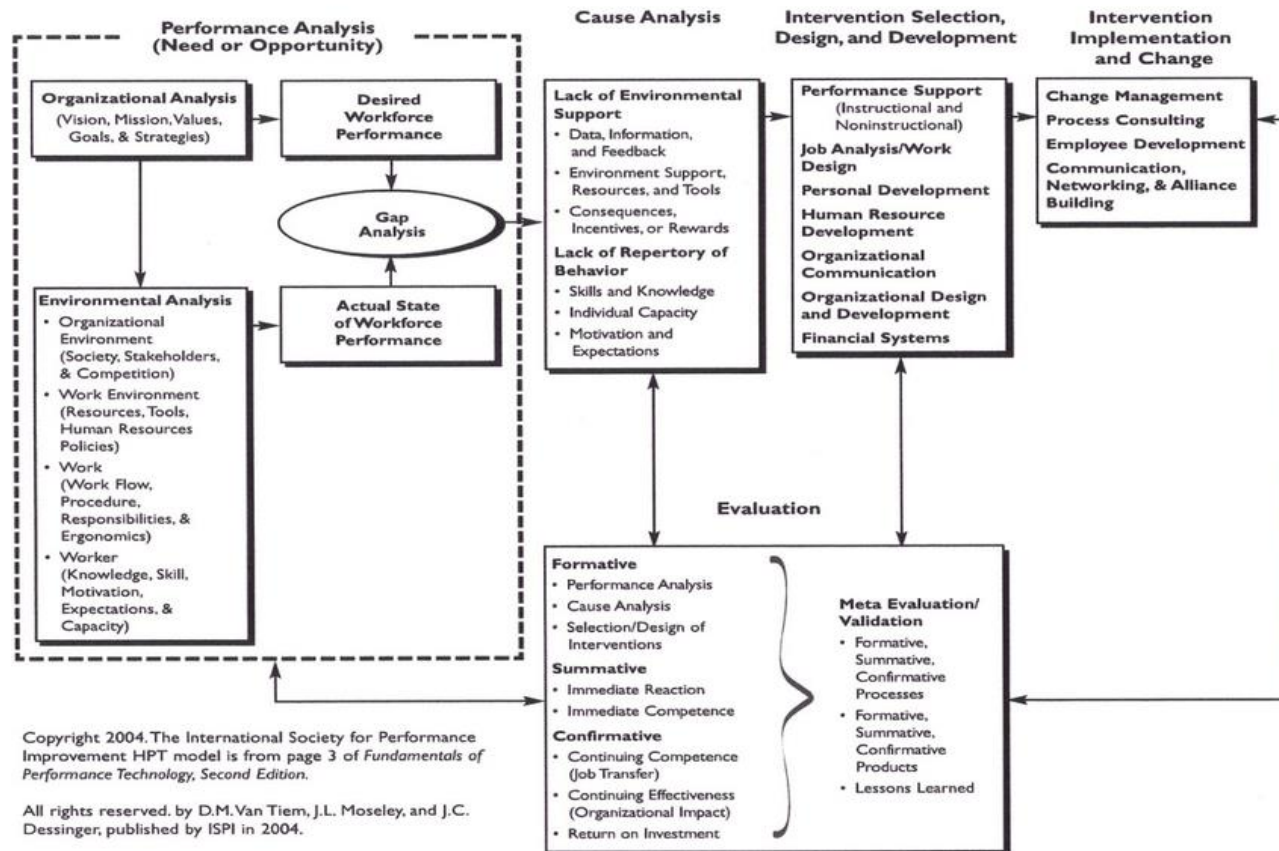
Figure 4

Human Performance Technology Model

Note. Reprinted from *Fundamental of Performance Technology* (2nd ed., p. 3), by D. M. Van Tiem, J. L. Moseley, and J. C. Dessinger, 2004, ISPI. Copyright 2004 by ISPI. Reprinted with permission.

Design Thinking and HPT

Other companies (e.g., Toyota and IBM) have adopted various training strategies to increase sales and improve customer experience (Liedtka et al., 2013). Pniewska (2014) found that engineering students become problem solvers when presented with a delivery model that prompts them to collaborate to address a challenge. Brereton and McGarry's (2000) observational study showed that design thinking also helped engineers think through design problems and communicate design ideas at the product development stage. Vetterli et al. (2013) demonstrated that design thinking improved team performance when assessed in relation to service and business model innovations, as more prototypes were produced when design-thinking processes were used. The collaborative effort of the design-thinking process can also add value to the HPT and ISD fields since design teams tend to work in silos rather than in neutral, open-minded groups that include stakeholders. HPT processes incorporated from human-centered interactions through exploring how people use systems are an important aspect of designing training interventions, since the efficacy of technology in learning relies on the learner's experience (Kitsantas & Dabbagh, 2010).

Technology in the Workplace

There are a variety of workplace technologies associated with employee performance. These include learning management systems (LMS) and performance tracking systems, among other technologies related to learning and development. Administrative and mission-support professionals use technology to store and report personnel data for performance tracking purposes. These systems are referred to by

various names, and the data are used by all employees to access their own payroll data or skills profiles, while supervisors can also access employees' performance data (Grant & Newell, 2013). Electronic human resource management systems (e-HRMs) are IT systems that enable organizations to gather, store, and analyze workforce data to increase the availability and flow of information (Grant & Newell, 2013). Human resource information systems (HRIS) and e-HRMs differ in that HRISs are geared toward the human resources (HR) function itself. For example, HR personnel are the users of the system who gather data and manage storage. An LMS can track and report users' learning and performance data, depending on how the system allows user access. An organization's focus should not necessarily be on the nature of the IT system but on how the system influences and is influenced by its specific functions, as well as how management and employee behavior are affected by use of the technology (Grant & Newell, 2013).

Previous research has shown that technology can influence decisions in organizations when properly implemented (Grant & Newell, 2013). However, findings also suggest that the successful implementation and use of technology by training practitioners can be difficult to achieve (Marler & Fisher, 2013). The development of learning and development platforms enables organizations to reach various goals related to attracting, motivating, and retaining employees that affect organizational performance. Electronic performance management and tracking systems are methods that organizations can use to easily track and store data while doing business (Askar, 2018).

However, learning and development platforms often involve a hefty investment for development or purchase, so their value creation is an important output. Hussein et al. (2007) state that to be strategic, the system needs to go beyond automation or increased service efficiency and enable new forms of value, which will lead to competitive advantage. As it touches all members of the organization, the system is uniquely able to enable innovation and analyze the information it stores. Allowing workplace technology to aid in performance is a means by which value can be created by localizing and implementing sound practices. The effect of technology in providing visibility and allowing training professionals to engage proactively with organizational management enables performance improvement within the organization through better communication and monitoring (Stone et al., 2015).

Nevertheless, further research by practitioners is needed to ascertain whether the technology to monitor and manage performance is cost-effective and beneficial for organizations. Aral et al. (2012) tested for three-way complementarities among IT, performance pay, and HR analytics practices. They concluded that without explicit policies to gather data from various systems, the information produced by the technology would be less useful. Having data analytics policies without adequate technology to monitor them or provide feedback on how to improve them would be similarly ineffective. The study concluded that the user could reduce variance most effectively by processing both the appropriate IT and data analytic practices (Aral et al., 2012). The authors further observed that if the system allowed monitoring of work performance, or if

it allowed the worker to deliver results more accurately, the expectation was that the business would improve its profitability (Aral et al., 2012).

LMS systems can also help organizations with the effective management of employee performance, which foregrounds the common thread of LMS systems. A critical goal for organizations is the effective management of employee performance, which, as Stone et al. (2015) explain, "includes assessing current performance, identifying high and low performers, and providing feedback to employees" (p. 34). In 2015, 93% of US organizations surveyed used electronic performance management systems (Stone et al., 2015). Organizations place importance on collecting and tracking employee performance throughout the annual performance appraisal cycle and on the ability to record formal and informal evaluation activities on an ongoing basis. Elements of a performance management system typically include feedback and transparency in sharing the results with leadership and managers, which prompt managers to meet with employees to discuss current and future goals and necessary improvements (Meyer & Dunphy, 2016). An LMS may have performance tracing functions built in, allowing the user to monitor, track, and perform learning tasks. Brumback (2011) argues that effective LMS and performance management systems should be designed around the user, who should be held responsible for data input for accurate results. The system's function is to fulfill the purpose of a performance management program to aid the organization in meeting its goals.

While these technological systems can provide substantial data, research indicates that they can also present challenges in terms of employee feedback. Kluger and Adler

(1993) uncovered a desire for personal feedback through employees' reactions to

computerized versus in-person feedback from supervisors. Study results suggest that

employees may be less likely to change their behavior when given electronic feedback, as

opposed to in-person (Kluger & Adler, 1993). E-HRMs may lead to lower quality and

decreased accuracy of ratings compared to traditional systems (Sulsky & Keown, 1998).

As with any L&D technology, data and processes need to provide a means for capturing

relevant and accurate indicators of employee performance, from both objective and

subjective perspectives (Meyer & Dunphy, 2016). However, empirical evidence from

practitioners in the federal government is minimal due to agency privacy practices

regarding personnel records. The lack of available literature demonstrates that more

research is necessary to examine the linkages between employee performance and

electronic feedback. The present study seeks to fill this gap in the literature by measuring

performance data following the use of a technology-based performance intervention.

Effects of Technology on Performance

Knowledge Management

Most data-centric organizations are heavily involved in the management of

knowledge and realize the complexity of the relationship between knowledge assets and

organizational performance (Askar, 2018). Knowledge can be defined as information

that is relevant, actionable, and based at least partially on experience (Massey et al.,

2005). Managing knowledge is important for organizations who want to better leverage

information as assets for value creation (Meyer & Dunphy, 2016). The field of

knowledge management (KM) concerns issues of creating, capturing, transferring, and

applying knowledge-based assets (Massey et al., 2005). An effective KM strategy also helps people share and put knowledge into action by creating access to it, and it can be enabled through IT. Massey et al. (2005) proposed that HPT provided a framework to help guide KM initiatives in increasing human performance. The challenge that organizations face is how to develop and implement systems and tools that provide performance support to knowledge workers and then integrate KM into business processes. Harnessing HPT, Massey et al. (2005) state that if the KM system's purpose is to enhance organizational performance, the environment surrounding the knowledge needs to be understood for the system to be successful (Howard et al., 2017).

HPT practitioners use front-end analysis (FEA), developed by Joe Harless (1982), as a tool for diagnosing organizational health concerns and exploring environmental factors contributing to issues in the workplace. This rigorous analysis process involves investigating the resources, skills, and knowledge needed to complete tasks and linking them to performance. This work is needed before closing gaps with an intervention and can be done with various approaches. One example from the federal government is the General Services Agency (GSA), which used a methodological approach similar to an FEA to gather essential data before exploring an intervention to address a performance issue.

In March 2000, GSA's Office of Real Property, which manages all federal government leases, as well as telecom and IT capabilities, began looking at the relationships between productivity, the workplace, employee satisfaction, recruitment, and retention. GSA's Innovative Workplaces Division developed the conceptual

Workplace Performance Model, which outlines the workplace as broadly subdivided into three major components: people, places, and tools (Kaczmarczyk, 2004). The model defines a high-performing workplace by three measures: employee satisfaction, productivity, and employee retention (Kaczmarczyk, 2004). These variables are highly influenced by environmental factors, including supervisor relationships, leadership roles, and political landscapes. In organizations, decisions are most likely made at the top tier rather than by employee input, considering fiscal resources and federal government guidelines on industry standards. Without an accurate system for measuring performance of individual contributors, the data will not be relevant for making decisions for the organization.

Measurement

Performance tracking measures are mandated by organizations to provide both supervisors and employees accountability. Implementing these measures is a necessary and time-consuming task. Automating these tasks allows supervisors more time to focus on essential work functions but may have downfalls for employees. This system-only engagement lacks human connection with limited options of measurement with a numerical rating system, sometimes without narrative justifications. While many organizations recognize the value of sound employee performance measures, some have effective measurement systems in place, while others do not. Companies may combine such measurements with incentive plans or bonus structures that may be objective or subjective. Matrices and scorecards—tools used by managers to measure and track

employee performance—are popular ways to manage data and organizational performance (Burnett & Lisk, 2019).

One common approach in the field of organizational behavior management (OBM) to promote success and overcome organizational challenges (e.g., employee retention and satisfaction) is the use of incentive plans (i.e., pay-for-performance systems; Hunt, 2011). Rooted in OBM, performance management can be used to prevent a wide variety of work-related problems. Howard et al. (2017) showed that incentive plans were useful but required meaningful managerial feedback, goals for direction, relevant incentives delivered in a timely manner, and contingency upon a specified behavior. Morelli et al. (2017) suggested that an objective measure of productivity, whether it be paper-and-pencil or electronic, must be in place to ensure a fair and effective system. In many organizations, employees become less engaged in the workforce due to low, possibly inaccurate ratings or because feedback on productivity improvement is often not delivered (Felix & Riggs, 1983).

Role of the Employee

A number of studies suggest a positive relationship between employee engagement and performance across industries, as rated by employees, supervisors, and peers. Engagement has also been described as key to an organization's success and competitiveness. While the importance of employee engagement for performance has been well studied, researchers are only beginning to consider how it is affected by technology.

Employee engagement has been researched under many labels. Massey et al. (2005) defined engagement in relation to vigor and dedication, giving it similar conceptual meaning to active performance. Kahn (1990) defined it as "the harnessing of organizational members' selves to their work roles; in engagement, people employ and express themselves physically, cognitively, and emotionally during role performances" (p. 694). Engagement has also been associated with meaningful work, feelings of being valued, and having the resources to motivate and empower (Karanges et al., 2014). Research has indicated that employee engagement concerns employees' connection and commitment to their organization and their work (Hatry, 2013). Kahn (1990) explains that engagement is commonly related to the environment and work itself, including employees' opinions and behaviors and how employees view supervisors and their colleagues in the organization. Despite the usefulness of these definitions, many questions about engagement remain unanswered (Mishra et al., 2014).

Recently, organizations have focused on the importance of engagement in business outcomes (Karanges et al., 2014). Research has found that engagement is important for individual and organizational success, sometimes even driving organizational change (Saks & Gruman, 2011). The employee benefits of engagement in organizations include promotions, salary increases, and a positive career experience. Yet, employees may become disconnected and disengaged due to changes in workplace priorities that leave them unaware of new expectations and goals (Mishra et al., 2014). Saks and Gruman (2011) found that performance management and learning were

important factors in facilitating engagement; employees become engaged when their supervisors set clear expectations for development.

Due to an increasingly mobile workforce, more research is necessary on how the virtual work environment affects engagement. Engagement through technology should be explored further through empirical studies on how it changes performance of remote employees. Research has shown a discrepancy between academic and practitioner experience, as research conducted in consulting firms has set the practice rather than theory in the available literature (Karanges et al., 2014). Compared to practitioners in the field of organizational development (OD), researchers have failed to recognize the phenomenon of engagement in relation to performance.

Models in the early 1990s focused on traditional methods of performance assessment, which assumed that employees should follow instructions, tasks, and orders, concluding that the better they did so, the better they performed, as judged by their supervisors (Kahn, 1990). Kahn (1990) suggested that engagement was a combination of employing and expressing oneself in work roles and that both should occur together. He explained that when employees became physically involved in their work, they applied cognitive effort to complete it and developed emotional ties with others at work as a result, since they were expressing how they thought and felt about their roles in the organization (Kahn, 1990). However, remote employees may not benefit from these in-person, physical interactions when technology assists in meeting with peers and management in the organization.

Howard et al. (2017) suggested that faster-paced workplaces, which were elastic in allowing people to work outside of the office, resulted in lower supervision and increased technology usage for communication. More communication between workers and more teamwork are crucial as employees are forced to take charge of their own self-development, potentially leaving them ill-prepared for the next level of work (Hunt, 2011).

Role of the Supervisor

An organizational shift in focus to managing employee engagement rather than only performance management (PM) puts pressure on managers to create the conditions necessary for employees to choose to engage in their work and roles (Stone et al., 2015). The manager-employee relationship will then be the focal point of communication, as employee needs are addressed by helping them experience meaningfulness, reflection, and feelings of safety (Stone et al., 2015).

O'Leary and Pulakos (2011) searched for a formula for effective performance management in organizations, which they stated remained elusive. Rather than the development of L&D systems, which they found rarely worked well despite the cost and time invested in them, their focus was on the relationship between supervisor and employee. The authors also found significant problems when performance management was reduced to steps and instructions within systems that were not related to day-to-day performance engagement activities essential to accomplishing work with others. Essential engagement activities include communicating clear objectives, providing timelines, and

using continual feedback, which are activities performed through interpersonal exchange and important for effective task completion (Morelli et al., 2017).

Proponents of learning and performance management systems note the systems' consistency in promoting the fairness and equity of organizational performance. At the same time, some systems can act as safety nets for those who do not engage in any performance tracking outside the minimal requirements mandated by the organization (Meyer & Dunphy, 2016). However, those supervisors who engage in more ongoing, informal processes use the system effectively and improve performance by contributing to the employee's continuous professional development (Hatry, 2013). These processes include holding face-to-face meetings midway through the performance year, monitoring development, and discussing potential opportunities for professional growth.

Although their data are now outdated in modern workplaces, Hunt (2011) and O'Leary and Pulakos (2011) described best practices within organizations to improve managers' and employees' abilities to engage in effective ongoing performance management behaviors as part of their daily work. Howard et al. (2017) suggested new systems based on industrial psychology that take into account an employee's habits that contribute to engagement. However, because supervisors have various data-tracking methodologies, it may be difficult to interpret valid results. The authors make generalizations in the study, showing that systems may not accurately address employee performance solely through a supervisor relationship, suggesting individualized plans are necessary to rate employees against their own competencies and strengths.

Accountability is also effective in monitoring performance, as discussed by Marrelli and Tsugawa (2010). Research has shown that supervisors in the federal government are often not held accountable for managing the performance of their employees, resulting in employees' low morale and an erosion of trust in their supervisors. Stone et al. (2015) discuss the role of executives in driving the emphasis on accountability in learning and performance tracking systems. Leadership's communication of expectations regarding performance tracking and reinforcement of them through the leaders' own behavior, while holding others accountable for those expectations, sets the stage for good practices. Both in research and practice, the demonstration of leadership support for the importance of sound management practice has been identified as important in any organization (Hatry, 2013).

Competencies are skills required of supervisors to engage in the daily activities that performance management requires to effectively achieve work goals (O'Leary & Pulakos, 2011). Often, employees are promoted to supervisory roles based on their technical skills, and they do not understand the managerial role or the expectations of employee development attached to it (Marrelli & Tsugawa, 2010). To help the organization achieve its goals, managers should be selected based on their competencies in getting work done through their employees rather than on their ability to do the work themselves. The Merit Service Protection Board, a governing entity under the Office of Personnel Management (OPM), which manages human resource policies for the entire federal workforce, defines the competency of "developing employees" in various

statements (Marrelli & Tsugawa, 2010). These statements specify that an effective

employer:

- Works with the employee to identify their strengths and development needs

- Ensures that each staff member creates and implements a professional

  development plan

- Identifies development opportunities for employees

- Continuously encourages employees to learn and grow

    Managerial competency is also defined by behavior examples that supervisors can

model to achieve excellent performance in a particular skill. Leadership can support

supervisors by explicitly outlining the organization's specific expectations of them and

integrating the performance elements into the electronic rating system for transparency. A

behavioral example is illustrated in Figure 5.

Figure 5

Example of a Supervisory Competency

Excellent Performance
- Works with each employee to identify their unique strengths and development needs.
- Provides employees with specific examples of their performance in areas that need improvement and in areas of strength.
- Discusses with employees their long- and short-term career goals and suggests options.

Satisfactory Performance
- Works with each employee to identify their unique strengths and development needs.
- Discusses with employees their long- and short-term career goals.

Unsatisfactory Performance
- Occasionally meets with the team as a group to identify common development needs.

Note.

Adapted from *A Call to Action: Improving First-Line Supervision of Federal Employees* (p. 91), by A. Marrelli and J. Tsugawa, 2010, Merit Systems Protection Board. Reprinted with permission.

Even if individuals with the right skills and competencies are selected, training is still necessary to help supervisors build trust and supportive relationships with their employees by engaging in continuous performance conversations and addressing issues through feedback (Stone et al., 2015). Outlining the expectations of performance, as shown in Figure 5, enables supervisors to see the difference in standards and helps leadership hold supervisors accountable for employee development (Hatry, 2013). Since data from performance technology systems are utilized by leadership to identify the needs and goals of the organization, accurate data collection plays an important role in the development of an intervention or program as a performance solution (Giacumo & Bremen, 2016). All users of the system can benefit from the effectiveness of workplace technology in meeting the organization's goals. A system can mimic good processes and deliver data, but when the system is built on broken procedures and a lack of clear policy, the results will be ineffective usage and inaccurate data (Grant & Newell, 2013). Clear expectations and goals cause employees to take professional development into their own hands and become autonomous decision-makers in the organization, improving overall organizational performance (Hatry, 2013).

Summary

This chapter outlined the search strategy used to conduct the literature review in three steps. Step 1: planning, Step 2: search criteria, and Step 3: source selection. The funnel chart (Figure 3) depicted the number of sources used for the review after analysis. A history of the HPT field was outlined in a timeline highlighting the major contributors to the field from 1911–2020. Then, an explanation of the HPT model was given, followed

by a discussion of design thinking and uses in the modern workplace. The chapter also outlined the role of the employee and supervisor with regard to HR software used to rate employee performance in the workplace.

HPT methods in the workplace are effective in providing performance interventions if the organization is open to feedback and opportunities to improve. Existing literature shows that using HPT in the workplace requires the knowledge and application of various related subjects; therefore, the roles of the employee and supervisor are crucial for the performance of the organization. As workplaces become more people-centric and aim to solve larger and more complex performance problems, the use of HPT is imperative. More research in evaluating the effectiveness of technological interventions in federal workplaces is necessary, and the present study seeks to address this need. The importance of continual professional development propelled by supervisors is important for retaining talent and promoting engagement between supervisors and their direct reports, and should be evaluated for organizational effectiveness.

Addressing these gaps in the literature will help establish relationships between performance factors and technology in the federal sector. By providing appropriate metrics for measuring individual self-perceived performance and aligning with organizational mission-critical needs, this study can help address these gaps. This could help federal leaders by providing insight into critical steps in addressing large-scale performance issues and providing pertinent interventions to improve employee engagement and overall productivity.

Chapter Three: Methodology

Introduction

This study focused on the nature of performance in relation to individuals, the use of the Emergenetics® mobile application, and potential effects on supervisors after the workshop. Understanding how Emergenetics® and the mobile application affected employee performance was important in exploring the effectiveness of the model as a training intervention for organizational performance. This chapter details the research design and methodology for the present study. The research questions that guided the study were:

1) What are the perceptions of the value of Emergenetics® training?

2) How do participants use the mobile application after training (if at all)?

3) How does Emergenetics® training influence supervisor attitudes toward their teams' collaborative efforts?

This research builds on the recommendation made by O'Leary and Pulakos (2011) to focus on the employer-supervisor relationship through engagement opportunities rather than relying on outdated performance management processes. Kahn (1990) noted in his research on employee engagement that when employees were engaged, they expressed themselves physically, cognitively, and emotionally in performance, such as in the workplace. The potential relationship between workplace interventions and employee engagement deserves more attention in the academic

community, and more research is needed to solidify understanding of these potential relationships.

Research Setting

The present study was conducted in a large federal oversight organization in the National Capital Region with a specific population that completed the Emergenetics® Meeting of the Minds™ workshop. The setting included federal employees and their supervisors in various professional disciplines. The training workshops each had approximately 20 adult employees of mixed gender, ethnicity, and job function. The supervisors had varying years of experience in managerial federal workplace roles. The workshops took place in person in a classroom setting from January 15, 2020 to February 11, 2020, and virtually from March 23, 2020 to September 2, 2020 due to the COVID-19 global pandemic.

Study Design

To address the research questions, an exploratory design using mixed method techniques was used for this research. Quantitative data was collected first, followed by qualitative data to help explain the quantitative results (Creswell, 2007). This technique is described as a quantitative (QUAN)-qualitative (QUAL) or equal-status sequential mixed methods design, which uses follow-up interest to further explain the survey instrument data (Teddlie & Tashakkori, 2009). Given the COVID-19-related stresses in the workplace, it was not certain what the level of participation in the study would be. For this reason, a third objective data source provided by the organization's HR department was included as a context variable to measure performance changes after the training

intervention. Performance appraisal scores of those who participated in the

Emergenetics® training were analyzed before and after the training intervention to

further inform the study. This design sought to capture the best of the qualitative and

qualitative data in two phases, with an additional objective validation phase.

Participant Recruitment

The population targeted for this study was the 343 federal employees who

participated in the Emergenetics® training from January 2020 to January 2021. The

employees consisted of supervisors and professional staff working in various professional

disciplines. Supervisors had varying years of experience in managerial roles, from senior

audit managers to entry level investigators. Due to the nature of the organization's

mission in providing oversight to a larger agency, the 343 employees were located

throughout the U.S. in 13 field office locations, with the majority located in the

headquarters in Washington D.C. During the time of this study, from January 2020 to

January 2021, the global pandemic meant employees were working from home and

training was shifted from the classroom to a virtual mode of delivery.

Given the well-defined and relatively small population size ($N = 343$), the entire

population was targeted for participation in this study. Potential participants were

identified through their enrollment in the training program by the training division at the

organization. Employees were invited to participate in the study through a personal

recruitment message (Appendix A). Participants were given three consent forms for the

survey, focus group, and individual interview participation (Appendix B, C, D), with an

explanation of the study's purpose. Once signed consent forms were returned, copies were made available to all participants.

Instruments

Quantitative Phase

The quantitative phase utilized a web-based survey questionnaire administered via the Qualtrics software package. The survey consisted of 10 closed-ended questions (one more than the pilot survey instrument, which had nine questions) designed by the researcher utilizing the Question Appraisal System checklist (Centers for Disease Control and Prevention National Asthma Control Program, 2013) to ensure non-leading question development and overall flow based on the objectives of the research questions. A comprehensive instrument specific to the Emergenetics® application had not been developed for use. The survey was designed specifically for the research and included demographic and behavioral questions intended to capture descriptive data from the participants in regard to the mode of delivery of training, supervisor status, and application use. The strategy for good question construction included using clear language, making sure that answer options did not overlap, and posing questions applicable to all participants (Creswell, 2015). The survey content was validated by 17 subject matter experts in the organization including certified Emergenetics® facilitators, training specialists, and program and data analysts who provided insight on logic, flow, question structure, and presence of bias before launch of the pilot study. These individuals confirmed that no bias was present after content validity was completed.

The instrument was tested in June 2019 at the same workplace in which the research was conducted. The purpose of the pilot was to test the instrument for scale reliability and validity before potential use for the full study on remaining workshop participants. The pilot consisted of 34 participants, all of whom took the training in a classroom setting and were not included in the total study population of 343 participants.

The pilot survey consisted of nine questions and was sent to participants via a link in an email using blind carbon copy (BCC) to protect the participants' anonymity. Two weeks after the initial email, the link was sent again to the same group, worded as a friendly reminder to complete the survey. This follow-up resulted in a significant increase in responses, thus reducing non-response errors (Creswell, 2015). The type of survey questions and measurements are outlined below.

One question sought demographics of employees and their program office and was intended to solicit personal characteristics of the participants. It was intended for RQ1 analysis and is shown in Table 2.

Table 2

Pilot Participants

Supervisor	Years at Organization	Office	Pay Grade GS Scale (Starting Annual Rate)
Yes	2	Audits	12 ($86,335)
No	12	Human Resources	14 ($121,316)
No	5	Investigations	12 ($86,335)

Supervisor	Years at Organization	Office	Pay Grade GS Scale (Starting Annual Rate)
Yes	6	Audits	09 ($59,534)
Yes	3	Audits	14 ($121,316)
Yes	2	Human Resources	12 ($86,335)
Yes	12	Human Resources	14 ($121,316)
No	5	Investigations	12 ($86,335)
No	6	Investigations	09 ($59,534)
No	3	Audits	14 ($121,316)
No	2	Audits	12 ($86,335)
Yes	12	Management	14 ($102,663)
No	5	Management	14 ($121,316)
No	6	Human Resources	15 ($142,701)
No	3	Audits	13 ($102,663)
Yes	2	Audits	15 ($142,701)
No	12	Management	14 ($121,316)
No	5	Management	15 ($142,701)
Yes	6	Human Resources	15 ($142,701)
No	3	Audits	14 ($121,316)
Yes	4	Audits	15 ($142,701)
No	3	Investigations	14 ($121,316)
No	2	Audits	12 ($86,335)
No	12	Management	14 ($102,663)
No	5	Management	14 ($121,316)
Yes	6	Human Resources	15 ($142,701)
No	3	Audits	13 ($102,663)
Yes	2	Audits	15 ($142,701)
No	12	Management	14 ($121,316)
Yes	5	Management	15 ($142,701)
Yes	6	Budget	15 ($142,701)
No	3	Audits	14 ($121,316)
No	4	Audits	15 ($142,701)
No	5	Management	14 ($121,316)

Note. *n* = 34.

Two attitudinal questions asked about perceptions of performance before and after the training on a five-point Likert scale. The scale was intended as an ordinal psychometric measurement of attitudes, beliefs and opinion not forcing a yes/no response but indicating a degree of agreement or disagreement in a multiple choice type format (Likert, 1932). These attitudinal questions were intended for RQ1 analysis. As shown in Table 3, the descriptive statistics and Cronbach Alpha values for these two questions are within the Social Sciences norm of .70 or above (Acock, 2014).

Table 3

Means, Standard Deviations (SD) and Cronbach's Alpha Values for the Pilot Attitudinal Questions

Item (Omitted Variable)	Adjusted Mean (SD)	Cronbach's Alpha
1	8.867 (2.6)	.799499
2	8.993 (2.6)	.706279

Four factual questions (see Table 4) were based on usage of the application and asked how employees utilized various features. They were intended for analysis of RQ2.

Table 4

Pilot Survey Responses to Content Survey Questions

Item	Reponses	(%)
Please select the Emergenetics® application's ease of use?	Extremely easy	27.78%
	Moderately easy	55.56%
	Neither	11.10%
	Slightly difficult	0.00%
	Very difficult	5.56%
How did you feel about using the applications features?	Extremely effective	18.75%
	Very effective	31.25%
	Moderately effective	31.25%
	Slightly effective	12.50%
	Not effective at all	6.25%
How did you feel about your team's performance after training?	Extremely Satisfied	60.67%
	Very Satisfied	30.86%
	Neither	8.47%
	Dissatisfied	0.00%
	Very Dissatisfied	0.00%

Item	Reponses	(%)
	Extremely effective	31.25%
	Very effective	31.25%
How effective is the app in increasing your understanding of your team?	Moderately effective	25.0%
	Slightly effective	12.50%
	Not effective at all	0.00%

One question with a yes/no response asked if the individual was currently a supervisor. It was intended to identify the personal characteristics of the participants for RQ3 analysis. If the answer was "no," the survey ended. If it was "yes," then additional questions related to supervisors followed about their employees' performance before and after the training. Forty-eight percent of pilot respondents answered "yes" to being current supervisors and 52% of answered "no".

The fifth question in the pilot survey (see Table 5) asked how likely the participants were to recommend the training to others on a five-point scale from "definitely will" to "definitely will not."

Table 5

Responses for Pilot Survey Question on Training Recommendation

Item	Pilot Participant Reponses (%)	
7. How likely are you to recommend this training to friends or colleagues from OIG or other federal agencies?	Definitely will	18.75%
	Probably will	31.25%
	Might or might not	12.50%
	Probably will not	6.25%
	Definitely will not	31.25%

With no apparent anomalies or challenges to internal consistency in the pilot results, a tenth question about training timeframe and delivery format was added to the pilot survey instrument and deployed as the survey instrument for the present study (Appendix E).

Study Workshop Description

The Emergenetics® Meeting of the Minds™ four-hour program is a highly interactive workshop that meshes Emergenetics® insights with the organization's mission of investigating fraud waste and abuse in the federal government. Nine workshops with identical content were scheduled from January 2020 to September 2020, including employees from various office locations across the country. No workshops were scheduled from October 2020 to January 2021, and from March 2020 onward, the workshops were moved to a virtual format. The target population of 343 managers and their direct employees took the training course once during that timeframe, either in person or virtually. Leadership determined the rollout of participants based on divisional needs, starting with auditors and ending with HR staff. All 745 employees were to

complete the training in a two-year timeframe. As of March 1, 2021, 343 out of 745 had

completed the training. Those who participated in the pilot were not included in the study

sample of 343. Those scheduled to attend these workshops came from various

professional disciplines and were chosen to participate via an invitation from the training

division. Teams did not necessarily take the training with their own team members or

supervisors. The courses had an expected amount of 30 to 60 employees per workshop.

The workshop schedule delivered was as follows:

Table 6

Workshop Convenings

Date	Location	Number of Participants
January 15, 2020	Washington, DC	33
February 11, 2020	Atlanta, GA	35
March 23, 2020	Virtual	40
April 1, 2020	Virtual	37
May 4, 2020	Virtual	30
June 9, 2020	Virtual	57
July 8, 2020	Virtual	33
August 5, 2020	Virtual	35
September 2, 2020	Virtual	43

Total:	343

Study Procedures

To allow for knowledge transfer, after 2–4 weeks following the training, participants received a link embedded in the recruitment message (Appendix A) to the web-based survey (Appendix E) as a BCC email message. This was sent to 343 potential respondents, all of whom completed the training. The respondents were invited for follow-up interviews outlined at the end of the survey. The survey took approximately eight minutes to complete and sought to measure (a) employee attitudes and behaviors related to the training program and mobile application, and (b) the extent to which supervisors perceived that their team applied the knowledge in terms of team productivity and individual performance after the training.

Participants learned about the Emergenetics® mobile application's functions and were encouraged to download it during the training. In the quantitative phase, the instrument sought to address a potential relationship between the training model and employee performance with a sample of 77 survey respondents (77∕343=22.4% response rate). The information from this quantitative research was explored further in the qualitative phase. In the second phase, qualitative one-on-one and focus group interviews were used to probe significant performance indicators by exploring perceptions of the

effectiveness of the training with participants and to better understand and explain the quantitative results.

Qualitative Phase

This phase of the research provided an explanation of the QUAN results though individual interviews ($n = 22$) and focus group interviews with both supervisors ($n = 6$) and employees ($n = 6$), conducted separately with a total of 34 participants. The interview data helped to validate the results gathered with the QUAN survey instrument.

Individual Interview and Focus Group Instruments

Private individual interviews lasted for approximately 15 minutes via web conferencing. The interviews were semi-structured with open-ended questions. They were video and audio recorded via web conferencing software for transcription. Question areas included perceptions of the training workshop on individual performance and of engagement between employees and supervisors before and after the workshop, aligning with the survey.

This type of interview process allowed the researcher to control the line of questioning, and participants were able to provide historical information (Creswell, 2009). A brief outline of the research evaluation process was given in order to eliminate potential subjectivity. The interview process was necessary to provide validation of survey results and help the researcher understand the links to performance and training effectiveness. Questions for supervisor and employee interviews and focus groups can be found in Appendix F and Appendix G respectively.

Data Analysis

Teddlie and Tashakkori (2009) explained that data collection procedures and analysis should be performed simultaneously in sequential designs in mixed methods research. Primarily, this entails classifying things and events that may characterize the variables through qualitative analysis procedures (Maxwell, 2013). Survey results were compiled within Qualtrics software and analyzed by compiling descriptive statistics. The qualitative results from individual and focus group interviews were analyzed within and across participant categories using ongoing comparative techniques (Maxwell, 2013) to deduce themes and patterns.

To promote coding consistency, thematic analysis was conducted, the data was categorized chronologically and reviewed, and the process was repeated over a two-week period (Braun & Clarke, 2006). This coding methodology is consistent with the scale of the study with 22 individual interviews and two focus groups with 12 total participants. Orwin and Vevea (2009) described the single coder technique, which advises researchers to select transcripts at random to manually code and revisit the transcript after two weeks to compare themes. Coding is an "analytic process through which data is fractured, conceptualized, and integrated to form theory" (Strauss & Corbin, 1998, p. 3).

First Cycle Coding: Open Coding

To illustrate the results of the open coding method in the Emergenetics® training study, five themes are presented below. These are the categories representing the major concepts of the Emergenetics® training program as described by interviewees, emergent from the analysis processes. The examples and properties, or subcategories, correspond to

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the major influences of the Emergenetics® training program. For example, the

organizational challenges category includes properties of emergent themes and issues

with performance appraisals and rating accuracy, and the supervisory responsibilities

category covers emergent issues describing the lack of supervisor intervention in team

conflicts. These are illustrated by examples from the transcripts below.

Table 7

Open Coding Categories for Combined Qualitative Data

Category (5)	Codes	Examples/Quotes
Emergenetics® Mobile App	• Ease of use • Features • Relevant content • Guidance on how to use • Lack of understanding • Relevance to organization	"Well, I can see the benefit of having the app. It's really great how it's laid out and the different things you can do with it—especially if your whole team uses it. We could definitely use it to work better with each other. Like using the tips and profile sharing options."
Emergenetics® Effects on Team Challenges	• Emergenetics® training helped employees find their voice • Team members recognized differences in work styles after training	"I think our strengths as a team just got exaggerated after the training. Our team has great writers/communicators and also people that are conceptual and creative thinkers."

Category (5)	Codes	Examples/Quotes
Supervisory Interventions	• Organizational priorities affect supervisor engagement with employees • Supervisory style can be dependent on the upper leadership direction • Supervisor style can affect how teams operate • Guidance before and during work tasks is not always given • Budget concerns require supervisor intervention • Getting supervisor involved in team dynamics when work performance is low	"I trust my employees until they do something to lose it."
Performance Appraisal System	• Intervention (training) when performance is low • Employees' needs are personal, need to determine for high performance to occur	"I set weekly check ins that help keep people engaged."
Employees and Team Training	• Need for Supervisor guidance to lead/organize • Dependent on organizational budget and direction • Usually includes mandated training as a result of performance problems • Recognition of accomplishments motivates employees in their daily work tasks	"It got us to talk about issues maybe we wouldn't have- the need for personalized development"

Axial coding

In John H. Creswell's (2015) book *Educational Research*, he states that grounded theory research as a systematic process contains elements of self-correction that the research builds upon in subsequent phases. The second phase in axial coding ensures the researcher stays close to the data during the analysis process. In this second analysis phase, Creswell (2015) describes the steps the researcher takes in selecting one open coding category and positioning it at the center of the process being explored as a central phenomenon. Then, the researcher relates other categories to it. The other categories become the causal conditions, other factors that influence the phenomena and strategies, or the actions taken in response to the core phenomena, contextual and intervening conditions, and consequences or outcomes (Creswell, 2015). Deeper meanings behind similarities and differences are then compared and formed into a visual presentation.

The 22 individual interviews were transcribed followed by the 12 individuals in the two focus group interviews. The 22 individual interviews and two focus groups were manually coded using the transcriptions following the general procedure of grounded theory research (Creswell, 2015). In grounded theory research, the researcher conducts 20 to 30 field interviews. Then, the collected data are read at various stages of the coding process and the codes are created as categories. Each category has dimensional examples, such as quotes, for each code (Strauss & Corbin, 1997). The coding results are summarized with the model (or theory) developed by the researcher that is composed of the categories and subcategories (Strauss & Corbin, 1997). Then, the model is presented

in formats such as mind maps or matrices (Creswell, 2009). The three interview groups were analyzed separately and then compared for overlapping themes.

Creswell and Tashakkori (2007) describe the importance of placing a core category for the basis of writing the theory. The core category is the main theme of the process and must be central so that all other major categories can relate to it. In Figure 6, the researcher developed a theoretical paradigm model, adapted from Creswell (2015) on page 45, in an effort to generate theories. Figure 6 illustrates the paradigm model for the qualitative phase of the Emergenetics® study.

```
                        ┌─────────────────┐
                        │  Study Context  │
                        └─────────────────┘
                                 ⇩
┌──────────────┐  ┌────────────────┐  ┌───────────────┐  ┌────────────────┐
│ Casual       │  │ Phenomena-     │  │               │  │ Consequences-  │
│ Conditions-  │  │ Awareness about│  │               │  │ Team           │
│ Organizational│ │ team member    │  │ Strategies-   │  │ members        │
│ challenges,  │  │ individual     │  │ Supervisor    │  │ collaborate    │
│ Leadership   │  │ profile        │  │ interventions │  │ more after     │
│ mandated     │  │ preferences,   │  │ in team       │  │ training,      │
│ training,    │  │ Awareness of   │  │ dynamics,     │  │ Supervisors    │
│ Systematic   │⟹ │ team norms,    │⟹ │ Training      │⟹ │ engage with    │
│ inefficienies│  │ Awareness of   │  │ mandatory     │  │ team more after│
│ for rating   │  │ work conditions│  │ for all staff │  │ training,      │
│ performance  │  │ impacting work │  │               │  │ Supervisors    │
│              │  │ procedures,    │  │      ⇧        │  │ see need for   │
│              │  │ Supervisory    │  │               │  │ employee       │
│              │  │ intervention   │  │               │  │ engagement to  │
│              │  │                │  │               │  │ build trust    │
└──────────────┘  └────────────────┘  └───────────────┘  └────────────────┘

        ┌─────────────────────────────────────────────────────┐
        │                                                     │
        │  Intervention Conditions- Training mandatory for    │
        │  all staff, not taken with other team members,      │
        │  Lack of supervisor instructions for follow on      │
        │  training, Mobile app provides insight to profile   │
        │  data and tips for concept application in work life │
        │                                                     │
        └─────────────────────────────────────────────────────┘
```

Figure 6

Axial Coding: Paradigm Model of Emergenetics® in Federal Government

A more detailed representation of the paradigm was broken out into an axial coding mind map representation based on the examples from transcriptions of the data. Figure 7 presents five different themes and the associations among them. Each theme will be discussed below.

1. Mobile Application

Sup Need further guidance

Teams use daily

Team use for increase communication

Supervisor will use for insight of employee profile preferences

Easy to use interface and content

2. Team Challenges

Managing remotely poses increased role of supervisor

Virtual Training Delivery contraints

Teams recognize different work preferences after training

Personality conflicts

Mobile application allows for transparency of team profile for supervisors

3. Performance apprsaisal system

4. Supervisory interventions

Affected by supervisor engagement level

Annually

Style affects team performance

Mandates Training

Supervisor rated only

Takes direction from top leadership

Intervenes when needed

Concerned about resources for employee professional development

Accuracy concerns due to self certifying

5. Employee/team training

Supervisor guidance needed to organize

Budget constraints

Organizational buy-in required

Includes mandatory training

Infequently addressed

Figure 7

Axial Coding Paradigm Integration of Categories

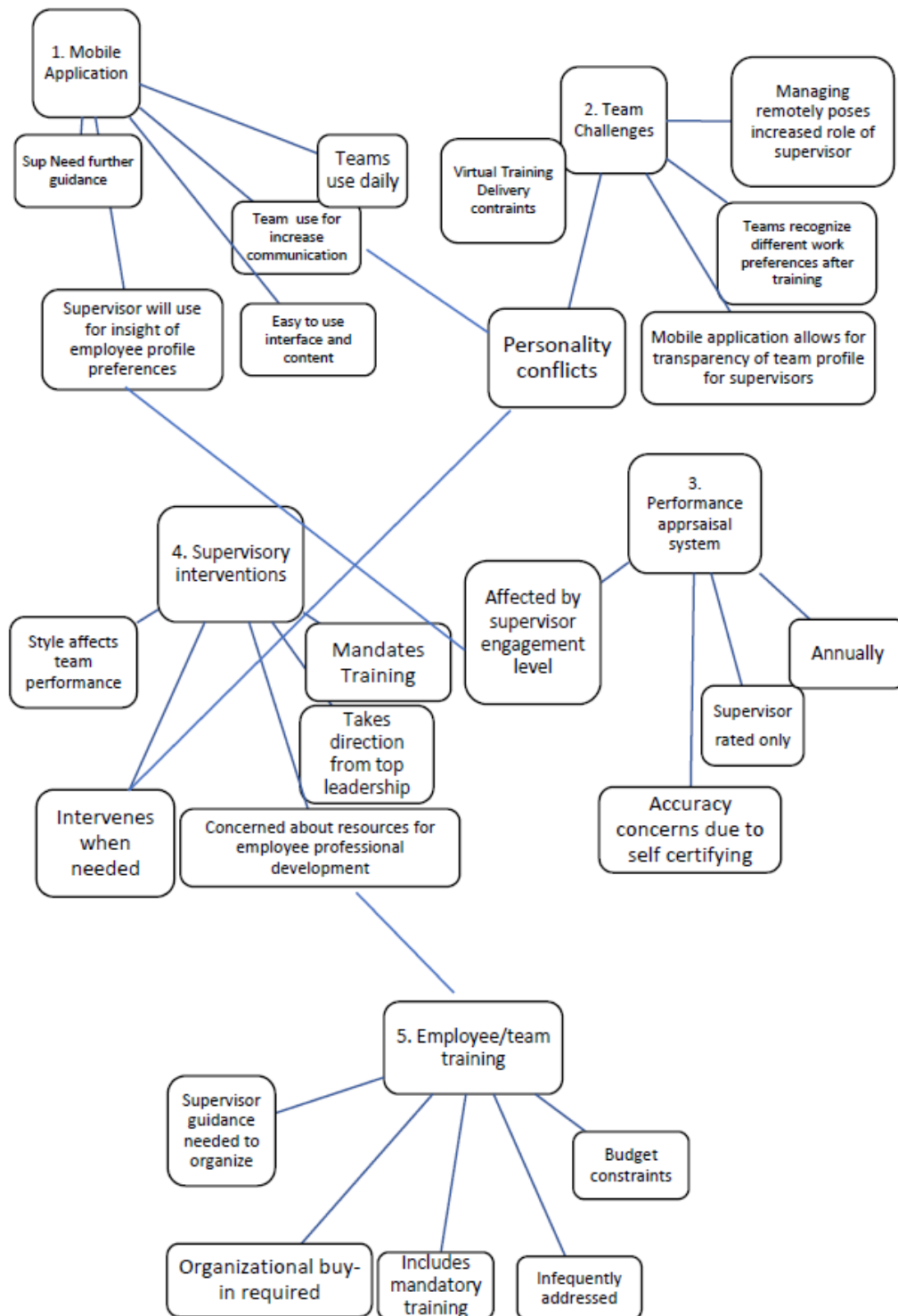This procedure may reveal differences in signaling single coder discrepancy error, in which the process will be repeated until few errors remain (Orwin & Vevea, 2009). To achieve the most accurate evidence, a checklist for validity was used, which included triangulation techniques and member checking (Maxwell, 2013) to verify the process.

Integration of Data

While the integration of QUAN and QUAL data is briefly addressed above, a more detailed discussion is necessary. In a study using three sources of data and mixed methods techniques, data carefully woven throughout the study provides well-formulated results, as well as a demonstration of the researcher's understanding of the methods used (Maxwell, 2013). Comparison analysis using performance appraisal data provided by the subject organization to understand whether there is a significant difference between the 2020 appraisal mean (before training) and 2021 appraisal mean (after training) was used to further validate the results.

In RQ1, surveys were analyzed first, and, in response, employee interview data was formulated based on the findings. Using this form of sequential sampling technique, multiple iterations of surveys were not necessary due to the validity from qualitative interviews on attitudes of the training's effect on performance. However, the thoughts of others can be difficult data to collect, so triangulation is appropriate for attaining accuracy (Creswell, 2009).

For example, supervisors can highly rate a learning delivery system like the mobile application for convenient professional development, while an employee may prefer alternate modes of training. A supervisor's survey results may also be high due to

the application's timeliness in delivering training to their direct reports with little effort from them. However, employees may want to leave the office for training due to the engagement factor that classrooms and face-to-face feedback training provide (Kitsantas & Dabbagh, 2010). By separating employee and supervisor responses by creating variables and cross tabs in SPSS, this bias was eliminated.

RQ2 data was integrated into a sequential approach using QUAN to QUAL data based on the extent to which the employee used the mobile application technology and its application for overall job tasks. Surveys sought to verify this data using quantitative tests to determine relationships between technology-based learning and self-perceptions of performance, such as team engagement. However, using a baseline point of measurement, like the Emergenetics® initial Meeting of the Minds™ workshop, validity threats arose due to the slight difference in those who downloaded the application (51%) and those who did not (49%). Validity threats also arose from those who took the training in a classroom setting (32%) and virtually (72%), since socialization in the workplace promotes engagement that may result in higher levels of satisfaction in course completion surveys (Saks & Gruman, 2011).

Since most technology-based courses lack social interaction, the retention of information may be high initially but fail to result in performance improvements in the long term (Kitsantas & Dabbagh, 2010). Designing separate surveys for each intervention and formulating interviews similarly to focus on the unique aspects of each intervention wasn't necessary, as integration of data from both interventions existed in the instrument. While various factors, including each employee's age, sex, and position in the

organization may affect outcomes, they can easily be isolated through testing to present organized results.

RQ3 integrates QUAN and QUAL data in an iterative manner, while also comparing the objective performance appraisal mean differences, as supervisors may contribute to changes in performance mean scores. Teddlie and Tashakkori (2009) describe this procedure as similar to but more complex than the sequential technique to reduce potential validity threats by using interview data to justify survey data. For example, when an employee resists technology for learning and the supervisor suppresses their interest in other forms of delivery, this may be illustrated as the employee downplaying effectiveness of the classroom training program. This issue is addressed in qualitative interviews for further explanation to avoid bias. Various threats to validity are addressed in detail in the next section.

Overcoming Validity Threats

When linking data in this study, validity threats were found that needed to be addressed. Maxwell (2013) states, "Demonstrating that you will allow for competing explanations is a crucial issue in addressing validity" (p. 148) and recommends adding a separate section on "validity" to acknowledge potential issues and provide plans to address them. This section identifies specific threats apparent in the study thus far.

In RQ1, interviewing supervisors and employees individually rather than in groups allowed them to speak freely about others, preventing potential barriers to data collection. However, as discussed in the section above, comparing classroom and virtual training interventions posed threats to validity. An employee is likely to rate classroom

training more highly than an online course due to the level of social interaction if it is valued. Analyzing the two types of interventions separately helped ensure accurate data. The researcher's own subjectivity in the research design process also posed a validity threat that was addressed multiple times during interviews by outlining the steps taken to reduce potential errors.

As an employee in the organization, I have a working relationship with the subjects. Additional steps were taken to ensure that the data collected was not affected by this bias. Since integrating data is the first step in providing quality research, addressing potential validity threats contributes to that quality (Teddlie & Tashakkori, 2010. To ensure quality, another researcher from outside the organization conducted frequent member checking to ensure that the relationship did not interfere with responses while remaining subjective. Maxwell (2013) described the importance of knowing one's role in the study and discussing it openly. With the apparent bias in this study, it was important to isolate and avoid any potential conflicts of interest that readers in the organization may perceive.

Another potential issue was the varied responses of supervisors and employees regarding job performance due to differences in job roles. By triangulating employees' interpretations of performance appraisal challenges, it was possible to check whether they aligned with the supervisors' responses and to account for outliers. When supervisors formally rate their employees on performance, they may use a self-assessment written by the employee and merely verify its accuracy. Hence, using data from this objective source posed threats in that the appraisal score mean difference may have been a result of

organizational factors other than supervisor engagement and effects of the

Emergenetics® training. Van Tiem et al. (2012) states in the HPT model that

environmental factors account for most organizational performance changes and should

be explored through front-end analysis (FEA) techniques. However, there may be some

discrepancy between how supervisors think their employees perform and what the

performance data shows. Since there are many factors involved in the annual appraisal

process, as described in Chapter 2, this is the objective reasoning for integrating the three

sources of data in this study to reduce this threat to validity.

The third source of data from performance appraisal scores served as an objective

way to compare the two sources of data found through the work in this study, in an effort

to further validate the QUAN and QUAL findings and compare them with the literature

discussed in Chapter 2. Furthermore, Maxwell's (2013) and Teddlie and Tashakkori's

(2009) chapters on integrating data with mixed methods techniques provided a necessary

foundation for a thorough understanding of how two types of methods should be

combined harmoniously in one study. The checklist on validity (Maxwell, 2013, p. 126)

served as a crucial tool in verifying the process for achieving the most accurate evidence.

Figure 8 below illustrates the progression of study participants from quantitative to

qualitative methods.

Figure 8

Study Participants

Summary

Completing a research design matrix (see Appendix H) with data collection methods, sources for each question, and ways to reduce specific threats to validity helped closed gaps in the overall expectations for the research study. Moreover, identifying

threats and considering how data are collected helped link together various elements of the study. Member checking brought specific issues to light, such as the accuracy of a supervisor's ratings. Also, subject matter experts (SMEs) in the workplace helped the researcher understand barriers to collecting data from a learning system and may suggest available tools to provide metadata. Thinking through threats also helped prepare for data collection, analysis, and synthesis in the study, with the aim of gathering valid, reliable data which will be further discussed in the next two chapters.

Chapter Four: Results

Introduction

The purpose of this study was to determine how Emergenetics® training and use of the corresponding mobile application influenced employees and supervisors in the federal sector. Three research questions guided the study, utilizing both quantitative and qualitative data to help answer them. The questions are as follows:

1. What are the perceptions of the value of Emergenetics® training?

2. How do participants use the mobile application after training (if at all)?

3. How has Emergenetics® training influenced supervisor attitudes toward their teams' collaborative efforts?

RQ1 was answered from quantitative data through the survey instrument on perceptions of the value of the training from employees and supervisors. Qualitative data was gathered through supervisor and employee focus group sessions and explored potential team collaboration efforts between employees and supervisors.

RQ2 was answered through survey instrument data on mobile application use for participants who downloaded the mobile application. The focus group sessions and individual interviews explored the application's use through pointed questions and discussion.

RQ3 was answered from quantitative data gathered through the survey instrument for supervisor-only participants regarding the training's influence on team collaboration efforts. Team collaboration was further explored through qualitative data

from a supervisor-only focus group session and individual interviews with participants who had supervisory status.

Demographics were gathered through questions in the survey instrument and from agency-provided HR data, which helped identify the number of supervisors included in the study. The demographic data provides a profile of participants and are presented below. Findings outlined by each research question and the HR data follow, stemming from specific questions of the survey instrument, focus group sessions, and individual interviews.

Demographics

Gender

Table 8 compares the gender of the survey respondents with that of the total population of training participants, as provided by the organization's HR department. There were no significant differences between the respondents and the total population.

Table 8

Gender of Survey Respondents vs Total Population

Gender	Survey Respondents ($n = 77$)	Total Population ($n = 343$)
Male	42%	47%
Female	58%	53%

Position Level

Table 9 shows that nearly one-third of respondents (31%) were individual contributors, meaning they had non-manager status. Team lead positions totaled 30%, and managers totaled 26%. Executives made up 8% of respondents, and entry-level participants comprised 5%, which was similar to the profile of all workshop participants in Table 9. Most survey respondents' position levels were within 1–3% of the demographics of the population study from the HR data. Executive respondents were represented as 5% higher in the survey than the total population.

Table 9

Position Level of Population and Study Sample

Position Level	Survey Respondents ($n = 77$)	Total Population ($n = 343$)
Entry	5%	3%
Individual Contributor	31%	35%
Team Lead	30%	32%
Manager	26%	27%
Executive	8%	3%

Age Group

Table 10 indicates that the majority of the respondents (36%) were between 35 and 44 years of age. Those aged 25–34 made up 26%, 45–55 made up 22%, 55 and over made up 12%, and those aged under 25 accounted for only 4%. This is similar to the demographics of the total population from the HR data.

Table 10

Age of Study Sample and Total Population

Age Group	Survey Respondents ($n = 77$)	Total Population ($n = 343$)
Under 25	4%	2%
25-34	26%	24%
35-44	36%	38%
45-54	22%	24%
Over 55	12%	12%

Supervisory Status

The study also recorded the supervisory status of the respondents, which could influence their responses. The majority of the respondents (55%) were of supervisory status, meaning that they officially rated employees during annual performance appraisal rating periods. Non-supervisory respondents without official performance rating duties

comprised 45% of the responses. This also mirrored the results from the HR data of the

total population of 343 individuals, with 56% supervisory and 44% non-supervisory

individuals.

Of the 22 survey respondents who participated in the interviews and focus groups,

42% were male, and 58% were female. The other demographic characteristics of the

participants are outlined in Table 11. Coding Identifier refers to how the participant was

labeled in the researcher coding process. Years at Organization is the duration of time the

individual has been at the current workplace.

Table 11

Years at Organization of Participants From Individual and Focus Groups

Individual Interview Participants ($n = 22$)	
Coding Identifiers	**Years at Organization**
E1	2
E2	12
E3	5
E4	6
E5	3
E6	2
E7	12
E8	5
E9	6
E10	3
E11	2
S1	12
S2	5

Coding Identifiers	Years at Organization
S3	6
S4	3
S5	2
S6	12
S7	5
S8	6
S9	3
S10	4
S11	2

Focus Group Supervisor Participants ($n = 6$)

Coding Identifiers	Years at Organization
S1	22
S2	2
S3	15
S4	16
S5	7
S6	14

Focus Group-Employees ($n = 6$)

Coding Identifiers	Years at Organization
E1	2
E2	12
E3	5
E4	6
E5	3
E6	4

RQ1: Results From the Survey

To answer, "What are the perceptions of the value of Emergenetics® training?" the study used question 3 in the survey instrument to measure the value based on overall satisfaction. In survey question 3, 42% of survey respondents denoted the highest

satisfaction level "Very Satisfied" on the 5-point scale, and 33% indicated "Satisfied."

Question 4 asked how likely the individual was to recommend the training to friends or

colleagues inside or outside the agency on the 5-point scale. Of the survey respondents,

39% responded that they "Definitely Will" recommend the training, and 38% responded

that they "Probably Will." A total of 11% responded that they "Might or Might Not"

recommend the training, which was the neutral response on the 5-point survey scale.

According to tables 12 and 13, there were no major differences in satisfaction levels by

gender and mode of training delivery.

Table 12

Cross-Tabulation of Gender and Likelihood of Recommending Training

	Likelihood					
Gender	**Definitely Will Not**	**Probably Will Not**	**Might or Might Not**	**Probably Will**	**Definitely Will**	**Total**
Male	0	2	5	14	17	36
Female	0	2	7	16	14	34
Total	0	4	12	30	31	77

Table 13

Cross-Tabulation of Mode of Training Delivery and Training Satisfaction

Mode	Satisfaction					Total
	Dissatisfied	Somewhat Satisfied	Neutral	Satisfied	Very Satisfied	
Physical Training Room	0	0	5	11	7	22
Virtually	0	1	13	14	25	53
Total	0	1	18	25	33	77

RQ1: Results From the Qualitative Data

The main findings from Question 1 of the interview guide focused on the

individuals' overall training experience. This open-ended question gathered attitudes

about the value of the training from employees only. An employee with code E9 said, "I

think it's a great workshop and helps with the transparency of our team's preferred work

styles." An employee coded E7 commented, "It was important for our team to take this

training—we are more open afterwards, but we need to do more teamwork to drill down

into the specific issues, to make us efficient and work in a streamline manner." These

comments are consistent with the supervisor satisfaction attitudes toward team

collaboration outlined in the RQ3 qualitative results.

RQ2: Results From the Survey

In an attempt to answer, "How do participants use the mobile application after training (if at all)?" the study specifically sought information on the respondents' use of the mobile application, starting with whether they downloaded it to their mobile device following training; 51% downloaded the application, and 49% did not. Survey questions 5, 6, and 7 requested responses only from individuals who downloaded the mobile application about ease of use and how it may have been used in team collaboration efforts.

The layered cross-tabs in Tables 14, 15, and 16 show respondents who downloaded the mobile application, their organization position level, age, and mode of training (classroom or virtual) taken through the organization. Some observations from these tables include the following:

- A slightly higher proportion of managers responded that they had downloaded it (11 out of 31), as did entry-level staff (3 out of 4) compared to other groups.

- Equal numbers of downloaders and non-downloaders worked as individual contributors (12:12) and executives (3:3).

- A slightly higher number, 17 of respondents aged 35–44 downloaded the application (17:11) than respondents in the 25–34 age group (8:12).

- The majority of respondents who downloaded the mobile application after training had attended the training workshop virtually (53:24).

Table 14

Cross-Tabulation of Mobile Application Use and Age

Use	Age					Total
	Under 25	**25–34**	**35–44**	**45–54**	**Over 55**	
Downloaded	2	8	17	7	5	39
Did Not Download	1	12	11	10	4	38
Total	3	20	28	17	9	77

Table 15

Cross-Tabulation of Mobile Application Use and Position Level

Use	Position					Total
	Entry	**Individual Contributor**	**Team Lead**	**Manager**	**Executive**	
Downloaded	3	12	10	11	3	39
Did Not Download	1	12	13	9	3	38
Total	4	24	23	20	6	77

Table 16

Cross-Tabulation of Mobile Application Use and Mode of Training Delivery

Use	Delivery		Total
	Physical Training Room	**Virtually**	
Downloaded	13	26	39
Did Not Download	11	27	38
Total	24	53	77

RQ2: Results From the Qualitative Data

To validate the quantitative results, the research used data from the focus group (*n* = 12) and individual interviews (*n* = 22) to answer RQ2. Axial coding was used to explore the use of the mobile application after training and how it potentially impacted their daily work tasks and work dynamics. The emergent themes from the data derived through axial coding resulted from all interviews, including individual interviews, followed by supervisor focus groups and finally employee focus group interviews.

After conducting all interviews, five categories emerged from the axial coding analysis process. Some aspects regarding the use of the application were reported to be positive, and some negative, in that more direction and guidance was needed from Emergenetics® facilitators on how to use the tool effectively following training. The follow-up interviews revealed positive effects on mobile application use at the individual, supervisor, and team levels, as shown in Table 17.

Table 17

Interview Evidence for Mobile Application Use After Training

Theme	Evidence
Supervisor perceptions of performance improvement of employees (from application use)	"The employees enjoyed thinking about their preferences in a new way, yet did not necessarily see the value in profiling/categorizing others, and also wrestled with the accuracy of the assessment due to the fact that it is based only on cursory, self-selected information." "They thought it was helpful in their jobs."
Individual perception of performance improvement from application use (all employees)	"I am able to interpret behaviors in a more objective way from colleagues." "[I] got to know everyone better." "[It has improved] how I interact within my daily work environment". "I have become more aware of my thoughts. And the why." "I used it to craft communications and the delivery of products to colleagues and supervisors." "[It] gave me a better idea of how I communicate." "I became more aware of my personal traits, strengths, and weaknesses." "[It] helped us understand ourselves better."

Theme	Evidence
Improvement in employee-supervisor relationships from application use	"I feel like I was better able to customize my deliverables based on audience preference for processing information." "I am able to interpret behaviors in a more objective way." "[It gave] me insight into me, my supervisors, and my staff."
Effect on team dynamics of application use	"When working on a team, I look at each individual and how they need information presented to them. I also look at how each of us collectively add to the team." "I am more aware of how others think and how to approach the various personalities." "It helped me reaffirm focus on all four main elements of the results. I think it's helpful for my team and customers to see my results as well." "I can see things from others' perspectives."
Neutral feelings on application use after training from all employees	"It did not affect performance." "Not measurably." "No noticeable impact on my performance."

RQ3: Results From the Survey

Supervisor-specific data were analyzed to answer the third research question: "How has Emergenetics® training influenced supervisor attitudes toward their teams' collaborative efforts?" Frequencies and cross-tabulations were used to compare supervisor-only variables from the survey questions.

Questions 8, 9, and 10 from the survey instrument asked about participants'

current supervised employees, what their management style was, and how many years'

experience in supervision they had. Individual interviews helped to answer this question

with in-depth discussions from a supervisor-only focus group. This study specifically

examined supervisor-only use of the mobile application, starting with whether they had

downloaded it to their mobile device following training. All supervisors who answered

yes to downloading the application ($n = 41$) and their years of management experience

can be seen in Table 18. The majority of downloaders ($n = 12$) had 5–10 years of

experience.

Table 18

Cross-Tabulation of Application Download and Supervisory Experience

Use	Supervisory Experience (Years)					Total
	0–2	2–5	5–10	10–20	20+	
Downloaded	5	4	10	3	2	24
Did Not Download	0	5	12	0	0	17
Total	5	9	22	3	2	41

This survey specifically sought information regarding supervisors' preferred management style. Table 19 shows the of the 41 supervisor responses, the majority did not identify with the standard styles which increases importance about the value of the training. This was indicated by 63% of respondents choosing the "other" option. The second highest response chosen was the participative management style (27%), meaning these leaders prefer to include team members in decision making.

Table 19

Survey Respondents Regarding Their Preferred Management Style

Management Style	n	%
Autocratic	3	7%
Persuasive	1	2%
Consultative	1	2%
Participative	11	27%
Other	26	63%

Note. $N = 41$.

An observation drawn from Table 20 is that most managers found the mobile application to be "very effective" or "extremely effective" for team collaboration.

Table 20

Mobile Application Effectiveness in Team Collaboration From Supervisor-Only

Respondents

Answer	*n*	%
Extremely effective	33	43%
Very effective	35	45%
Moderately effective	5	6%
Slightly effective	1	1%
Not effective at all	5	6%

Note. $N = 41$.

RQ3: Results From the Qualitative Data

In determining the interrelationships of categories and subcategories during the axial coding process, several themes emerged. To protect identities, a code identifier is given for each interviewee, denoted by the type of interview they participated in: "II" for individual interviews, and "FG" for focus group interviews. This is followed by either an "S" for supervisor or an "E" for employee, followed by a number, which refers to the order in which they were interviewed.

Question 1 from the non-supervisory ($n = 6$ employees) focus group asked, "How did Emergenetics® training affect your team's performance?" The data from this question illustrated that communication channels between team members increased as a result of training but did not directly affect performance. A quote from one employee,

coded E1, was that, "Emergenetics® has provided another common frame of reference to assist in working through sometimes challenging team dynamics." When asked if performance changed after training, another employee responded with, "Well, the instructor was good and overall the results are positive but no changes in my performance after the training happened, per se."

Supervisors were also satisfied with the training and commented on their teams' collaboration efforts as a result. However, multiple comments were concerned with the need for more follow-on activities and guidance in how to continue the work with their teams.

Question 3 from the supervisor-only focus group session specifically addressed supervisors' perceptions of their team's performance before and after the training. One supervisor noted, "More follow up with the concepts is needed, and it needs to be taught it in a team-based format, rather than random people like the workshop, for more effective team training." Another respondent in the supervisor-only focus group ($n = 6$ supervisors) mentioned their role in team processes.

> The team seemed to work better together after using the training tools, but as far
> as myself as the supervisor, I see that I can get involved more with team
> dynamics, as before I thought it was up to them; I had no role unless they needed
> it [help], pushing things through [the system].

Supervisors felt that they needed further guidance on how the technology could help them manage a remote workforce and allow for increased collaboration among their team. Supervisor FGS1 discussed their frustration with the subject in response to the

question on how application use influenced their teams: "There was really no direction to tell us how to use the tool with our teams. The follow-up wasn't promoted, or wasn't instructed to us to do, so I don't think it has."

Interviewee E3 suggested that the application was helpful for increasing communication between themselves and their colleagues because of the ease of use and transparency in preferred communication styles. The employee also mentioned increased collaboration after training.

> One team member and I are able to collaborate in a way where we can build upon ideas and make them better; we were not able to do this before. Other members of the team also challenge me in good ways—some are more forthcoming, and this tool offers more introspection in terms of where to start with communication styles.

The next category describes aspects of the performance appraisal system. This was created because of the overlapping issues of the performance rating system, described by employees and their supervisors in the focus group and individual interviews. When Emergenetics® and performance links were inquired about, the performance appraisal process was discussed as the official and only way performance was measured at the organization, governed by strict federal guidelines. This supervisor, in the focus group interview, was frustrated by their role in the performance appraisal process.

> Yeah, the process puts pressure on supervisors to give good ratings, but if they don't work as a team, they are not accountable. More specific team training would

help since the performance process has not been part of that. From what I see, the employee is working great, but I see the rest of the team frustrated with them, but they work well with me. I just don't see what goes on.

The last category is supervisory interventions, meaning times when supervisors intervene in workplace issues between teams or in assisting employees to get work products accomplished through organizational processes. The employees below noted their supervisors' interventions in the context of the work challenges they faced. Employee E2 from the individual interviews gave the following example:

Well, I am in the middle of a long, difficult project, and sometimes you get small wins that can be a morale booster and just make you feel great. For example, the project I am on is expected to take three years, and we are in the beginning stages of that. So, if my supervisor can help someone—I am in a customer-facing job— so if I can help a team member when they're stuck, that keeps things moving.

Employee IIE2 from the supervisor-only focus group interviews gave an example of supervisor involvement.

So, we had training to develop with HR, and leadership at the top had questions, so it was put on hold. Well, we never heard anything, so I kept asking my boss to ask at the high leadership level, but we can never get any information from them. So I pretty much gave up on it.

Supervisor FGS gave an example of a challenge with the organization's processes.

Yeah, in Audits, we have team leads who help intervene, and we work things out as our audit reports have strict deadlines with little time to play around, which makes things easier, multiple levels of supervision, so I can get things done.

The last category of the axial coding model for Emergenetics® training covers a variety of forms of employee development, which relates to the supervisor role. Part of the performance appraisal process includes employee development discussions, which force a relationship between the employee and supervisors. Also, team training is initiated by supervisors, is mandatory for all members of the team, and is rarely talked about together as a team. Below, a supervisor who participated in the focus group interview, FGS1, described their perspective on their role in the process.

We need team building resources in the budget; people work in silos, and when there are data calls, no one will help, and things get slowed down. I think Audits has their processes refined, but in the Office of Management, there is a "me-only" culture, but when the executives need the data everyone scrambles, it's embarrassing. It also makes my job that much harder.

The same interviewee also discussed the role they play in employee development.

Well, we do that every year with performance plans, and I ask them what they need in terms of training. We took this Emergenetics® training, but it was paid for by management, and we didn't have to do anything, just sign up and attend, so it helped me get my employees to take training in a timely way.

In contrast, some supervisors paid little attention to the subject or did the minimum required in the process of initiating training for employees and teams. This is

described by supervisor FGS4: "Our office is understaffed, so not much time for training unless it is needed for their IT certifications." Supervisor FGS6 said, "It is required, and you have to update the individual development plan (IDP) form in Audits every year. If we don't use the training money, someone else will!"

HR Performance Appraisal Data

The quantitative and qualitative results from the study sample are reinforced by the HR data pre- and post-performance appraisal scores of the study population. The scores showed a significant change in the mean population performance appraisal scores after the training.

The agency provided raw score data from 343 employees who took the training during the year timeframe. The researcher reviewed the data for outliers and found 97 employees either did not have all pre- and post- test scores due to attrition or were too new and not yet rated. The researcher used the cleaned data from the remaining 246 employees and explored appropriate statistical tests to analyze the potential mean difference in 2019 scores compared to 2020 scores. A paired sample t-test was conducted to determine if there was a difference in the mean performance appraisal scores for employees before participation in the Emergenetics® training workshop, as compared to after the training. The analysis of pre- and post-test scores from the study population was conducted to validate the QUAN and QUAL data from the study sample.

The assumption of normality was tested and met for the distributional shape of the paired differences. Review of the S-W test for normality: SW = .962, df = 245, $p < .001$, skewness (-.477), and kurtosis (-.432) statistics suggested that normality of the paired

differences was reasonable. The boxplot (Appendix I), suggested a relatively normal distributional shape, and there were no outliers present. The Q-Q plot and histogram suggested normality. This was not an issue because of the large sample (N=246). Homogeneity of variance was tested by reviewing the ratio of the raw score variances. The ratio of the smallest (FY 19 scores = .227) to the largest (FY 20 scores = .247) variance was less than 1:4; therefore, the homogeneity of variance assumption was met. The individuals were not randomly selected; therefore, the assumption of independence was not met, creating the potential for an increased probability of Type I or Type II errors.

From Appendix I, it can be seen that the FY 19 data and post-test data were collected from a sample of 246 employees, with a pre-test mean of 4.28 (SD = .476) and a post-test mean of 4.36 (SD = .489). Thus, appraisal scores increased from pre-test to post-test. The dependent *t*-test was conducted to determine if this difference was significantly different from 0, and the results indicate that the pre-test and post-test means were significantly different (t = -2.023, df = 245, p = .044). Thus, the null hypothesis that the performance appraisal means were the same at both points in time was rejected at the .05 level of significance. The effect size d (calculated as the mean difference divided by the standard deviation of the difference) was .635. Using Cohen's (1988) guidelines, this is interpreted as a medium effect. The results provide evidence to support the conclusion that the mean FY 19 appraisal scores prior to Emergenetics® training were lower than the mean FY 20 performance appraisal scores after the training.

Summary of the Results

Exploration of RQ1 through quantitative data revealed that the majority of participants valued the training through two questions on their satisfaction and how likely they were to recommend the training to colleagues. The qualitative interview data revealed similar overall satisfaction with the training through one question asking about the overall satisfaction with the training.

RQ2 data analysis through survey results uncovered that the majority of moderately experienced supervisors used the mobile application after training. Also, the data showed that the mobile application was effective in increasing collaboration efforts among employees and their teams. This was further explored through individual and focus group interview data, which showed similar findings regarding mobile application use by those who downloaded it. The prediction of precepted value derived from Emergenetics® training was that the use of the mobile application was beneficial for the communication of teams. However, for the majority of supervisors, the application was downloaded but not intuitive enough to use without further guidance from trainers for follow-on team-building activities, which was explored through RQ3.

RQ3 revealed that supervisors were more effective at communicating with their team after the training, based on the qualitative data results from interviews. The results from supervisor focus groups and individual interviews found that supervisors needed more guidance for implementing employee training and the use of the mobile application with their teams. Team performance appeared to be improved from the findings from both the survey instrument and individuals and focus groups.

The results from the study sample were validated by HR performance appraisal data provided by the organization. The analysis of pre- and post-test scores from the study population was conducted to validate the QUAN and QUAL data from the study sample. A paired samples t-test determined there was a statistically significant difference in the mean performance appraisal scores for employees after participation in the Emergenetics® training workshop. A discussion of the results of the study sample and analysis of organization-provided performance appraisal data will be discussed in the following chapter.

Chapter Five: Discussion and Recommendations

Introduction

This chapter includes a discussion and interpretation of the major findings of the present study as related to the literature on mobile application adoption, team collaboration, and supervisor employee engagement in the public sector. The findings in this study provide evidence of best practices relative to the literature, which is informed by real industry experience. The chapter concludes with the study limitations, areas for future research, and conclusions.

 The chapter discussion and future research opportunities will help answer the following research questions:

1. What are the perceptions of the value of Emergenetics® training?

2. How do participants use the mobile application after training (if at all)?

3. How has Emergenetics® training influenced supervisor attitudes toward their teams' collaborative efforts?

Discussion

The data from the surveys and interview data were consistent in representing positive perceptions of the Emergenetics® training on the individual, supervisory, and team levels. Results from the study revealed that participation in Emergenetics® training may have had a direct impact on performance, with increased communication between employees and supervisors through the mobile application. The HR performance data provided by the agency indicated an increase in performance appraisal

scores post training. These results indicated that applying the Emergenetics® training concepts in a virtual work environment proved effective in team collaboration efforts.

Technology Adoption Related to the Emergenetics® Mobile Application

Emergenetics® training seemed to affect employees using the application differently than those who did not. About half of the sample (49%) did not download the mobile application and thus could not answer the question of how it affected their team. The literature states that adoption is dependent on peer-to-peer contact and to the extent employees' influential contacts use these applications (Waizenegger et al., 2020). The study sample of individuals who downloaded the application (51%) indicated that they used it daily with their team members as a communication tool. While organizations quickly moved work processes online during the pandemic, the lack of success in implementing technology has long been an issue. This study measured the adoption of the Emergenetics® mobile application by both employees and supervisors, as these two groups used technology in different ways. Alami (2016) found that these challenges stemmed from two main sources: software and people. Software, by its very nature, is difficult to quantify and measure, and people are naturally resistant to having their work measured (Murphy & Cormican, 2015). The importance of project management is critical in technology deployment, implementation, and measurement for rapid adoption (Murphy & Cormican, 2015).

IT programs in the federal sector are expensive and difficult to implement, and success rates are low. Alami (2016) stated that 20% to 25% of IT projects do not provide return on investment (ROI), and that project management is documented to be a major

cause of IT project failure. Researchers also found that all stakeholders, such as users and software developers, should be more involved in the entire process (Murphy & Cormican, 2015). More studies in federal workplaces can help address these challenges to smooth technology implementation for users, especially supervisors with little time for training. The results of the present study are in line with the literature that proper guidance of mobile applications is necessary for the audience to determine how to best use the technology for their benefit.

Direct Manager Influence is Critical

The supervisors in this study expressed a desire to improve their teams' performance with collaboration tools in virtual work environments. The qualitative results indicated that supervisors found training not personalized enough, since some took the training with individuals outside their team. The teams that took the training together comprised auditors who reported the highest satisfaction levels and application of training concepts as a result of training-led activities. Gao and Sai (2020) confirmed that social norms impact human behavior and can aid in team collaboration. Waizenegger et al. (2020) found the performance of a virtual team was significantly improved when team processes were adapted to the affordances of their environment. Rice et al. (2007) stated, "Adaptation can occur very rapidly if teams are trained on the technology as well as on work processes that best exploit it" (p. 3). This supports the findings of the current study that additional guidance on Emergenetics® concept application was necessary for supervisors following training

This study found that supervisors also needed more guidance and instructions for using the Emergenetics® mobile application for connecting with their employees. Gao and Sai (2020) stated that during the pandemic, the absence of ad-hoc in-person meetings meant supervisors needed to find other ways to engage with their employees. This resulted in a lack of connection with their subordinates, as they relied heavily on intra-office interactions (Gao & Sai, 2020). In virtual environments, technology can be used to enable employees and supervisors to connect using social affordances and material features (McGrath et al., 2016). The technology in the present study invited social interaction by allowing users to add colleagues to their network, share content, and comment on Emergenetics® profiles. Supervisors reported needing more personalized ways to interact with their teams using technology, and used the mobile application to do so.

Employees in this study voiced that they had growth opportunities, but not all felt their supervisors supported them. The federal performance appraisal process does not account for the amount of responsibility or energy individuals express in team environments. Extant literature states that the ability to work well in teams does not happen organically. Authentic teamwork skill building requires more energy than simply dividing individuals up. Team members need to be taught how to communicate with each other, how group dynamics work, how to build a consensus, and how to make progress in a discussion (Woodman & Sherwood, 1980).

With technological advances in remote work, research suggests that telework is growing rapidly with more than 25 million teleworkers in the U.S., and growth rates of

11 to 30% in other areas of the world (Golden, 2020). Newman and Ford (2021) recommended that leaders ensure their teams have appropriate remote access to technology and provide guidance in using Zoom or other group collaboration tools in order to hold brainstorming sessions, meetings to problem solve, sustain organizational culture, and allow for other informal interactions. This is in line with the study's findings that organizational support is needed to further enable team collaboration through technology.

With teams ranging in size and complexity, Kittelman et al. (2018) state that providing team skill guidance does not guarantee success. Without proper communication channels, teams can have a negative effect on experiences and attitudes toward future teamwork (Chapman & van Auken, 2001). The findings in this study are aligned with the literature that individuals are more likely to have positive attitudes about group work if team management issues, such as organizational norms and evaluation criteria are known. Leaders can improve the performance output and engagement of their teams by ensuring HR policies are clear and reflect relevant circumstances, such as remote hiring, to ensure employees' needs are met now and for the future (Newman & Ford, 2021). The findings of the present study were similar to the literature, in that the absence of team management skills and guidance may result in organizational dysfunction.

Limitations

There were various limitations in regard to the context of the study. The sample size of those who completed the survey provided individual results but those results do

not necessarily reflect the results of the study population. The length of the study accounted for the government to perform work for one fiscal year. By increasing the length of the study to gather additional data and to further allow application of training concepts in teams may have an impact on the study results. The researcher's position as an employee in the organization, while well known to participants, may have impacted the study as potential bias. Another potential limitation of the study is the reliance on one specific training approach to improve team collaboration, that is, using the Emergenetics® concepts to measure the effectiveness of the workforce. The literature would be enriched by including multiple training concepts and programs that benefit the federal sector. These offerings should provide various modes of training delivery to reach a larger audience in terms of sample size and additional government agencies. A replication of this study in other federal workplaces is needed to investigate whether the results are unique to the organization studied or whether there are similar themes that result from federal processes. By using the methods outlined in this study in various federal agencies, the results could be used to compare results among federal sectors. Several areas for future research on targeted demographics, such as specific teams or supervisors, could add to the findings as well.

Recommendations for Future Research

There has been limited research on the use of tools and technology, such as the mobile application developed by Emergenetics®, in applying training concepts in the workplace. Given that training interventions can be knee-jerk reactions to low performance and engagement, current research has shifted toward using appropriate

technological tools to improve the performance of knowledge workers. The expansion of research conducted in the federal sector from a longitudinal study to further explore potential relationships between training and performance would benefit the field of HPT. There are opportunities for using technological and psychometric tools with remote teams that would benefit federal workplaces. This area requires further research, and the present study offers a first step toward best practices.

Although there has been a significant increase in studies measuring the effectiveness of performance interventions in the workplace, as well as engagement between supervisors and employees, most research has focused on the appraisal process (Hatry, 2013). One of the noticeable differences in the results of this study, as compared to existing studies, was the emphasis on supervisor roles in team collaboration versus the emphasis on individual performance seen in the literature (Askar, 2018; Hatry, 2013; Howard et al., 2017). Individuals were not necessarily considered the sole influencers of team collaboration success in this study. There were instances in which employees noted personal development challenges that affected collaboration, but the study was not designed to investigate how those factors may have affected team performance. Since supervisors often have final input regarding employee performance appraisals and career development opportunities, an individual's behavior can be directly impacted as a result. Examining roles in team collaboration efforts through the lens of supervisors and the effort to develop employees and teams directly impacted supervisors' perceptions of being a successful manager.

The participants, mainly supervisors, acknowledged some challenges with organizational norms in terms of team collaboration. The participants did not see these as barriers but as part of the organizational norms that exist in federal bureaucratic processes. The references also included technology having a higher influence on performance than supervisor engagement. The employees in this study had mixed thoughts on supervisors' roles in team collaboration efforts, and were skeptical that Emergenetics® training would help bridge the communication gap. Further research should include exploration of Emergenetics® training concepts with employees and supervisors after a series of follow-on activities for teams in order to measure the application of concepts by all team members. Conducting research with both supervisors and employees in workplace settings will be beneficial and will provide opportunities to isolate engagement variables because of the complexity of the relationship.

Conclusions: What Should Happen Next

Since federal organizations have unique missions and challenges, it is reasonable to suggest that the federal workplace should not be completely reliant on external training and psychometric concepts to address the lack of communication in human interactions. The positive changes toward improving communication channels between team members and supervisors seem to be evidence of broader organizational process changes that help employees with professional development. What remains unclear is whether the supervisor is motivated to support the individual in continuing to perform and achieve organizational goals.

The study contributes to the existing knowledge concerning performance-based training interventions in the federal workplace. HPT research has focused on instructional methods and training effectiveness, mainly in corporate settings. The purpose of this study was to explore the potential impacts of Emergenetics® training in a federal workplace and further explore the intervention's influence on supervisors and use of the mobile application. This study is significant because the literature on the topic is limited to the private sector and higher education environments. Additionally, no prior research has investigated Emergenetics® training or the use of the mobile application in the federal workplace. The study uniquely sought to investigate the influences of employees and supervisors separately through mixed-method approaches.

The study used research findings from three sources. The first source was gathered using a survey instrument. The second source was through qualitative methods of focus group discussions and individual interviews with both supervisor and employees. The final source of data came from agency-provided HR performance appraisal scores pre- and post-training. The results presented in Chapter 4 suggest that the perceived value of training was positive for both employees and supervisors. The respondents provided examples of how to implement the use of training concepts in collaborative team environments. Also, both employees and supervisors found the use of the mobile application favorable in bridging communication gaps hindering team collaboration. Data gathered through the focus group sessions suggested that additional follow-up supervisor-led team-based training is necessary to determine if the impact of the Emergenetics® training positively affected employees and their supervisors. The

concept was not used enough in team formats to show a positive or negative influence that could directly contribute to an increase in performance at the organization. The federal performance appraisal score data indicated that there was a significant effect from the training based on the increase in mean performance appraisal scores from 4.3 in 2019 to 4.4 in 2020. Despite its significance, follow-up research is necessary to isolate the variables and determine if other environmental factors at the organization could account for the increase, other than participation in the training.

The study's methodological framework, grounded theory, is helpful for education researchers as it offers deeper understanding of a phenomenon, specifically the influence of Emergenetics® training on employee engagement, team collaboration, and organizational success. The results of this study are beneficial to both federal leaders and performance improvement professionals responsible for designing and evaluating workforce development programs. Understanding that many factors influence workplace performance, including unique appraisal processes and supervisory roles in employee development, the results may assist with formulating strategies and programs that address these concerns based on organizational needs. Finally, investigating the relationships between employees, supervisors, and technology in successful engagement practices as the next steps is critical for addressing the organizational health of federal organizations.

Appendix A: Participant Recruitment Email

IRB # 1661322-1 Emergenetics® Training for Federal Employees
Date: January 20, 2020

We are seeking voluntary participants for a study. This study will only be used for the purposes of a student project at George Mason University, and your information will not be shared. The study will involve a survey, individual, and group discussions, and informal interviews.

This research is being conducted to identify how firms in the professional services sector establish the metrics/measures of the business impact of employee learning. You have been nominated by Angela Low to participate based on your commitment to your own learning and development as a professional. If you agree to participate, you will be asked to participate in a survey of approx. 10 minutes, interview, and group discussion of approx. 15 minutes each. Total participation time will be approx. 40 minutes.

During discussions and interviews, you will be asked to share your experiences and thoughts about the learning opportunities that the agency offers and the extent to which you feel those opportunities support your professional development. Group discussions and interviews will be audio recorded and transcribed.

The data in this study will be confidential. The digital transcripts of all interviews will be kept in a password-secured file accessible only to the researcher and housed in a locked campus office. During transcription, participant names will be converted to alphanumeric identifiers, and no individually identifiable information will be disclosed or published. Typed transcripts will be sent to each interviewee to confirm transcript accuracy. Neither the names of the participating organization nor their employees will be included in the publication of results. The survey will take approximately 10 minutes to complete and be received through your email. Interviews and discussions will be approx. 15 minutes in length and take place in a closed door conference room at the agency.

Transcripts will be available for your review. Audio recording will be conducted, with your consent, and all data and transcripts will be destroyed after five years. While it is understood that no computer transmission can be perfectly secure, reasonable efforts will be made to protect the confidentiality of your transmission. The de-identified data could be used for future research without additional consent from participants. Although focus group participants will be asked to keep the contents of the discussion confidential, due to the nature of a focus group, the researcher cannot control what participants might say outside of the research setting. All recordings will be stored for five years and then destroyed immediately.

If you choose to participate, please sign the attached consent forms and submit to Angela Low at [Redacted].

Appendix B: Informed Consent Form – Survey

RESEARCH PROCEDURES

This research is being conducted to identify how Emergenetics training potentially affects workplace performance. You have been nominated by Angela Low to participate based on your commitment to your own learning and development as a professional. If you agree to participate, you will be asked to participate in an online survey using Qualtrics of circa 10 minutes. During the survey, you will be asked to share your experiences and thoughts about the training that the agency offered and the extent to which you feel the Emergenetics app attributed to your workplace engagement. The link to this survey will be received through your agency email.

RISKS

There are no foreseeable risks for participating in this research.

BENEFITS

There are no direct benefits to you.

CONFIDENTIALITY

The data in this study will be confidential. The data collected during the survey will not require personal idenitifable information and will be used solely for the purpse of the study and not shared. Survey responses are not linked to individual interview and vice versa. Neither the names of the participating organization nor their employees will be included in the publication of results of the study. While it is understood that no computer transmission can be perfectly secure, reasonable efforts will be made to protect the confidentiality of your trasmission. The de-identified data could be used for future research without additional consent from participants. All data will be stored in a locked office on campus and be destroyed after five years. The Institutional Review Board (IRB) committee that monitors research on human subjects may inspect study records during internal auditing procedures and are required to keep all information confidential.

PARTICIPATION

Your participation is voluntary, and you may withdraw from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty or loss of benefits to which you are otherwise entitled. There are no costs to you or any other party. Inclusion criteria for the study includes employees of the agency who have completed Emergenetics training.

CONTACT

This research is being conducted by Dr. Shahron Williams van Rooij, Associate Professor, Learning Technologies Division, College of Education and Human

Development at George Mason University. She may be reached at [Redacted] for questions or to report a research-related problem. You may contact the George Mason University Institutional Review Board (IRB) Office at [Redacted] if you have questions or comments regarding your rights as a participant in the research.

This research has been reviewed according to George Mason University procedures governing your participation in this research.

CONSENT
I have read this form and agree to participate in this study.

_____
Name

_____
Title

_____
Signature

_____
Date

Appendix C: Informed Consent Form – Focus Groups

RESEARCH PROCEDURES
This research is being conducted to identify how firms in the professional services sector establish the metrics/measures of the business impact of employee learning. You have been nominated by Angela Low to participate based on your commitment to your own learning and development as a professional. If you agree to participate, you will be asked to participate in a **virtual focus group discussion using Zoom** of circa 15 minutes. During you will be asked to share your experiences and thoughts about the Emergenetics training and the extent to which you feel the mobile app support your engagement in the workplace. Group discussions will be audio recorded and transcribed to ensure the accuracy of data. Consent to audio recording is required for participation. Audio recording(s) will be produced from an external recording device and occur during virtual focus groups held in Zoom software. The Investigators will not utilize Zoom's recording functionality ensuring full control of the data. Recording will occur during focus groups to capture all data from discussions that would otherwise be difficult to capture by note taking alone. Participants will sign, scan and return the consent form to [Redacted] prior to the focus group session. During the focus group, participants will receive notice when the recoding begins by the Investigator's voice. The purpose for recording is for analysis only by the Principal and Student Investigators.

RISKS
There are no foreseeable risks for participating in this research.

BENEFITS
There are no direct benefits to you.

CONFIDENTIALITY
The data in this study will be confidential. The digital transcripts of all focus groups will be kept in a password-secured file accessible only to the researcher and housed in a locked campus office. During transcription, participant names will be converted to alphanumeric identifiers and no individually identifiable information will be disclosed or published. Typed transcripts will be sent to each focus group participant to confirm transcript accuracy. Neither the names of the participating organization nor employees will be included in the publication of results. While it is understood that no computer transmission can be perfectly secure, reasonable efforts will be made to protect the confidentiality of your trasmission. Focus group responses are not linked to surveys and vice versa. In lieu of names, alpha-numeric codes corresponding to the participant's practice area (e.g., IT=Information Technology) and function level (e.g. S=Supervisor) will be constructed. During the focus group, the participant will be referred to by his/her alpha-numeric code (e.g/ S1IT) so that the actual identity of the interviewee is never

divulged on the recording. Focus groups will be conducted virtually in Zoom and audio recorded using a separate audio recording device, not connected to the Zoom software or Cloud virtual storage. The de-identified data could be used for future research without additional consent from participants. Although focus group participants will be asked to keep the contents of the discussion confidential, due to the nature of a focus group, the researcher cannot control what participants might say outside of the research setting.. All recording data will be destroyed immediately after transcription is complete. Interview transcript data will be held in a locked office on campus and destroyed after five years. Participants may review Zoom's website for information about their privacy statement. https://zoom.us/docs/en-us/privacy-and-security.html The Institutional Review Board (IRB) committee that monitors research on human subjects may inspect study records during internal auditing procedures and are required to keep all information confidential.

PARTICIPATION
Your participation is voluntary, and you may withdraw from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty or loss of benefits to which you are otherwise entitled. There are no costs to you or any other party. Inclusion criteria for the study includes employees of the agency who have completed Emergenetics training.

CONTACT
This research is being conducted by Dr. Shahron Williams van Rooij, Associate Professor, Learning Technologies Division, College of Education and Human Development at George Mason University. She may be reached at [Redacted] for questions or to report a research-related problem. You may contact the George Mason University Institutional Review Board (IRB) Office at [Redacted] if you have questions or comments regarding your rights as a participant in the research.

This research has been reviewed according to George Mason University procedures governing your participation in this research.

CONSENT
I have read this form and agree to participate in this study including audio recording of the focus groups sessions.

_____
Name

_____
Title

_____
Signature

_____
Date

Appendix D: Informed Consent Form – Interviews

RESEARCH PROCEDURES
This research is being conducted to identify how firms in the professional services sector establish the metrics/measures of the business impact of employee learning. You have been nominated by Angela Low to participate based on your commitment to your own learning and development as a professional. If you agree to participate, you will be asked to participate in a one-on-one semi-structured virtual interview via web conference of circa 15 minutes. During the interview you will be asked to share your experiences and thoughts about the learning opportunities that the agency offers and the extent to which you feel those opportunities support your professional development. Interviews will be audio recorded and transcribed.

RISKS
There are no foreseeable risks for participating in this research.

BENEFITS
There are no direct benefits to you.

CONFIDENTIALITY
The data in this study will be confidential. The digital transcripts of all interviews will be kept in a password-secured file accessible only to the researcher and housed in a locked campus office. During transcription, participant names will be converted to alphanumeric identifiers and no individually identifiable information will be disclosed or published. Typed transcripts will be sent to each interviewee to confirm transcript accuracy. Neither the names of the participating organization nor their employees will be included in the publication of results. While it is understood that no computer transmission can be perfectly secure, reasonable efforts will be made to protect the confidentiality of your transmission. The de-identified data could be used for future research without additional consent from participants.

PARTICIPATION
Your participation is voluntary, and you may withdraw from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty or loss of benefits to which you are otherwise entitled. There are no costs to you or any other party. Inclusion criteria for the study includes employees of the agency who have completed Emergenetics® training.

CONTACT
This research is being conducted by Dr. Shahron Williams van Rooij, Associate Professor, Learning Technologies Division, College of Education and Human Development at George Mason University. She may be reached at [Redacted] for

questions or to report a research-related problem. You may contact the George Mason University Institutional Review Board (IRB) Office at [Redacted] if you have questions or comments regarding your rights as a participant in the research.

This research has been reviewed according to George Mason University procedures governing your participation in this research.

CONSENT

I have read this form and agree to participate in this study.

_____
Name

_____
Signature

_____
Date

Appendix E: Web Survey Instrument

1 When did you attend the Emergenetics "Meeting of the Minds" Training Session?

○ 0-3 Months ago (1)

○ 3-6 Months ago (2)

○ 6-12+ Months ago (3)

2 How did you attend the Emergenetics Training?

○ In a physical training room (1)

○ Virtually (2)

○ Do not recall (3)

End of Block: Logistics of MOTM Training

Start of Block: Workshop Training Experience

3 Overall, how satisfied are you with your training experience during the Emergenetics Meeting of the Minds (MOTM) workshop?

○ Very Satisfied (1)

○ Satisfied (2)

○ Neither (3)

○ Unsatisfied (4)

○ Very Unsatisfied (5)

---

4 How likely are you to recommend this training to friends or colleagues from OIG or other federal agencies?

○ Definitely will (16)

○ Probably will (17)

○ Might or might not (18)

○ Probably will not (19)

○ Definitely will not (20)

End of Block: Workshop Training Experience

Start of Block: iPhone Application

5 Have you downloaded the Emergenetics mobile application?

○ Yes (1)

○ No (2)

Skip To: End of Block If Have you downloaded the Emergenetics mobile application? = No

---

6 Please select the Emergenetics app's ease of use?

○ Extremely easy (1)

○ Moderately easy (2)

○ Neither (3)

○ Slightly difficult (4)

○ Very difficult (5)

---

7 How effective is the app in increasing your understanding of your team?

○ Extremely effective (1)

○ Very effective (2)

○ Moderately effective (3)

○ Slightly effective (4)

○ Not effective at all (5)

End of Block: iPhone Application

Start of Block: Supervisor

8 Do you currently manage/ supervise employees in OIG?

○ Yes (1)

○ No (2)

Skip To: End of Survey If Do you currently manage/ supervise employees in OIG? = No

Skip To: End of Block If Do you currently manage/ supervise employees in OIG? = Yes

End of Block: Supervisor

Start of Block: Supervisor Additions

9 What kind of management style resonates with you in managing your employees?

○ Autocratic- Characterized by strong, centralized control with a single source of authority. Communication flows from the top down (only one way) and team members are expected to follow orders. (1)

○ Persuasive- Taking the time to invite questions rather than levying "do this or else" policy mandates. Managers will discuss the basis for the decision making process with team members. (4)

○ Consultative- Where policy and decision making rests with managers and also encourage a two-way form of communication. Consultative managers will often hold discussions with team members to hear their opinions and input prior to finalizing a decision. (6)

○ Participative- Managers spread the authority and power throughout the organization by presenting problems and issues for discussion and then working with employees to reach a final decision. (9)

○ Other (12) _____

---

10 How many years of management experience do you currently have?

○ 0-2 (1)

○ 2-5 (2)

○ 5-10 (3)

○ 10-20 (4)

○ 20+ (5)

Appendix F: Virtual One-on-One Interview Questions – Two Types of Participants

Supervisor Interview Questions

1. How have you used the Emergentics app with your team?
2. What questions did you receive from employees before training? After?
3. How have your teams performed in terms of producing at the organization before training? After?
4. What effects of your management style impact your employees' performance? How?
5. Describe your involvement in your teams' daily work processes. Example?
6. How do you use the Emergenetics app with your team?

Employee Interview Questions

1. How was your overall training experience?
2. How did you feel about your team before training? After?
3. How did you feel about your relationship with your supervisor before training? After?
4. How do you feel about using the Emergentics app?
5. What are some challenges you face? How can the app help address them?

Appendix G: Virtual Focus Group Questions – Two Groups

Supervisors

1. Did the Emergentics training affect your team's performance? How?
2. How do you use the Emergentics app as a supervisor with your team?
3. What was the differences you noticed with team collaboration before training? After?
4. How would you describe your management style?
5. What effects of your management style impact your employees' performance? How?

Employees

1. How did the Emergentics training affect your team's performance?
2. How has your experience been with using the Emergentics app to increase team performance?
3. What was the differences you noticed with team collaboration before training? After?
4. How would you describe your supervisor's management style? Do you agree with it?
5. When a successful work product is produced by the team, explain how your supervisor was involved with the process?

Appendix H: Research Questions Matrix for Data Collection

Research Questions (RQ)	Data Collection Methods	Sampling Decisions	Data Analysis	Validity
RQ 1 What are the perceptions of the value of Emergenetics® training?	-Interviews -Surveys -Reports from HR analytics -Performance appraisal data	-Interviewing employees -System report/data review for completions	-Descriptive statistics analysis	-Member checking
RQ 2 How do participants use the mobile application after training (if at all)?	-Survey instrument data -Follow-up interviews -Reports from L&D system	-Interviewing employees -App report/data review -Data from using various features, including individualized results tabbing, viewing colleagues' profile data, and viewing supervisor's profile data	-Transcription and coding for themes	-Triangulation -Variable isolation using SPSS

| RQ 3 How has Emergenetics® training influenced supervisor attitudes towards their teams' collaborative efforts? | -Survey instrument -Follow-up interviews -Reports from the electronic performance management system (ePAS) | -Interviews with managers -Report/data review -e-HRMs data from HR data analytics office | - Gather data from audio recordings, transcriptions of interviews, and coding to construct themes | -Member checking -Triangulation |

Appendix I: Performance Appraisal Data Analysis

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	FY 19 Rating	4.2810	246	.47612	.03036
	FY 20 Rating	4.3628	246	.48981	.03123

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	FY 19 Rating & FY 20 Rating	246	.137	.032

Tests of Normality

	Kolmogorov–Smirnov[a]			Shapiro–Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
FY 19 Rating	.088	246	<.001	.962	246	<.001

a. Lilliefors Significance Correction

Paired Samples Effect Sizes

			Standardizer[a]	Point Estimate	95% Confidence Interval	
					Lower	Upper
Pair 1	FY 19 Rating – FY 20 Rating	Cohen's d	.63472	−.129	−.254	−.003
		Hedges' correction	.63570	−.129	−.254	−.003

a. The denominator used in estimating the effect sizes.
Cohen's d uses the sample standard deviation of the mean difference.
Hedges' correction uses the sample standard deviation of the mean difference, plus a correction factor.

Paired Samples Test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	FY 19 Rating – FY 20 Rating	−.08187	.63472	.04047	−.16158	−.00216	−2.023	245	.044

Descriptives

			Statistic	Std. Error
FY 19 Rating	Mean		4.2810	.03036
	95% Confidence Interval for Mean	Lower Bound	4.2212	
		Upper Bound	4.3408	
	5% Trimmed Mean		4.3013	
	Median		4.3000	
	Variance		.227	
	Std. Deviation		.47612	
	Minimum		3.08	
	Maximum		5.00	
	Range		1.92	
	Interquartile Range		.70	
	Skewness		-.477	.155
	Kurtosis		-.432	.309

Normal Q–Q Plot of FY 19 Rating

Mean = 4.28
Std. Dev. = .476
N = 246

FY 19 Rating
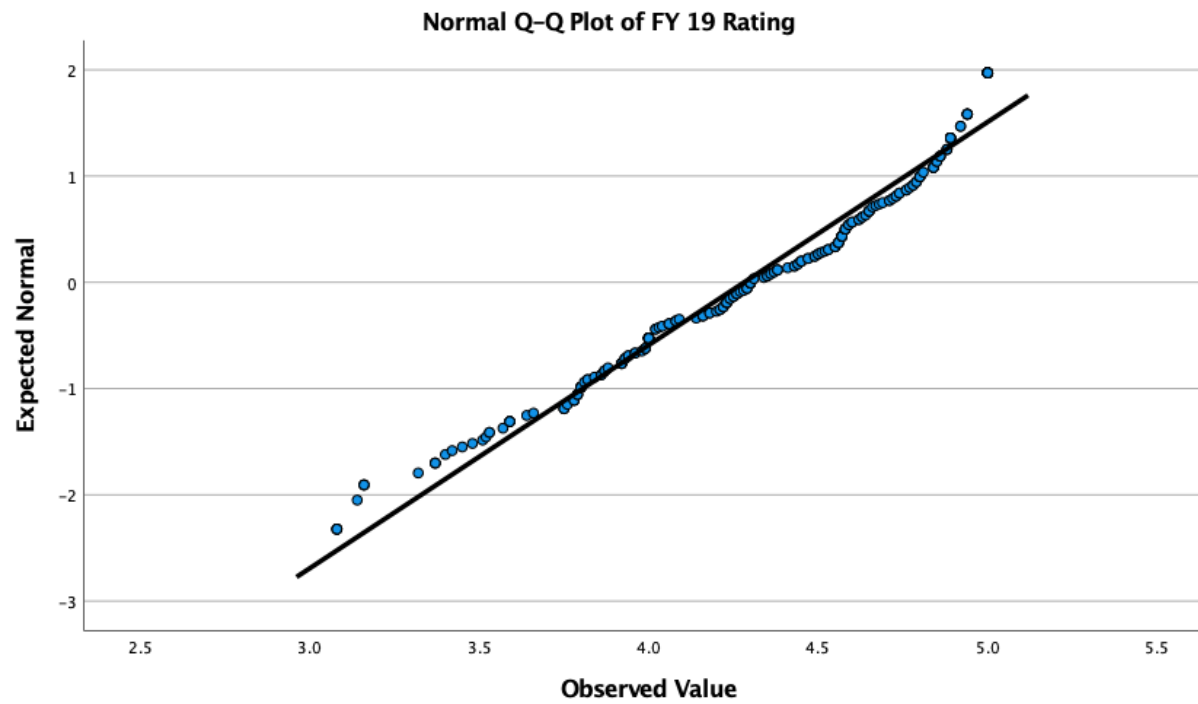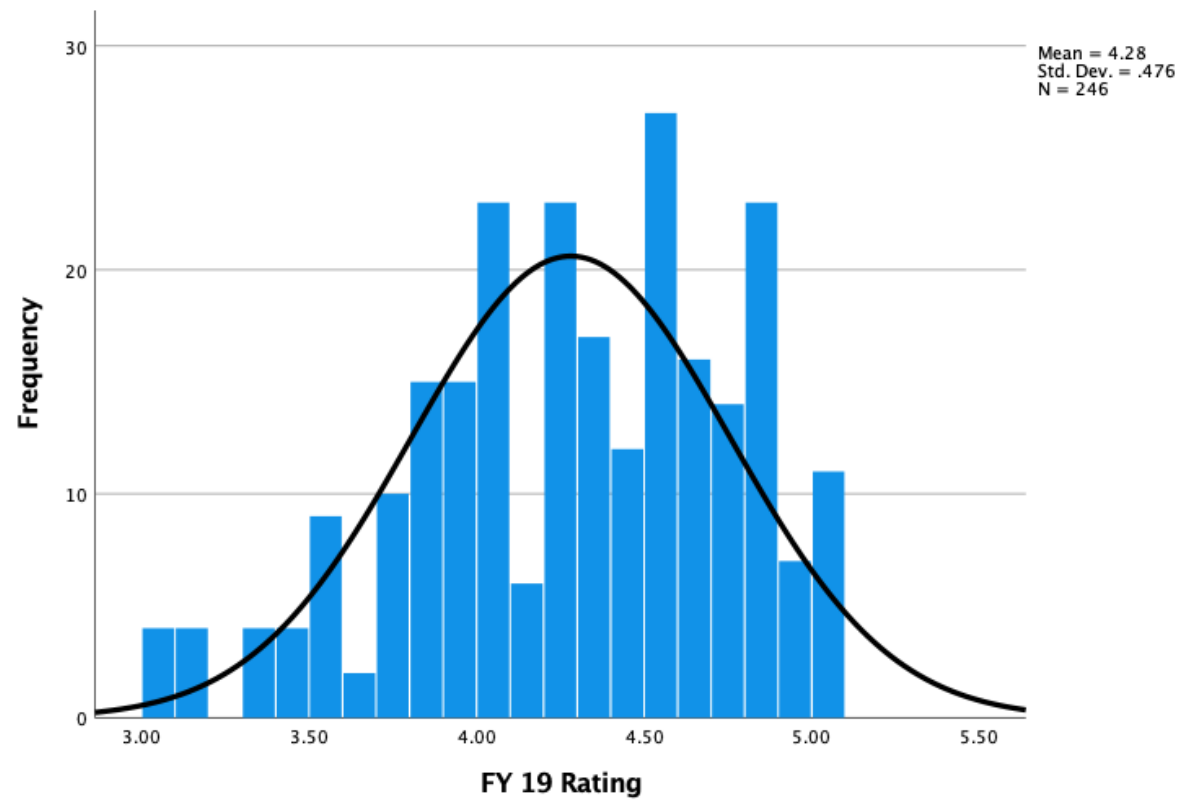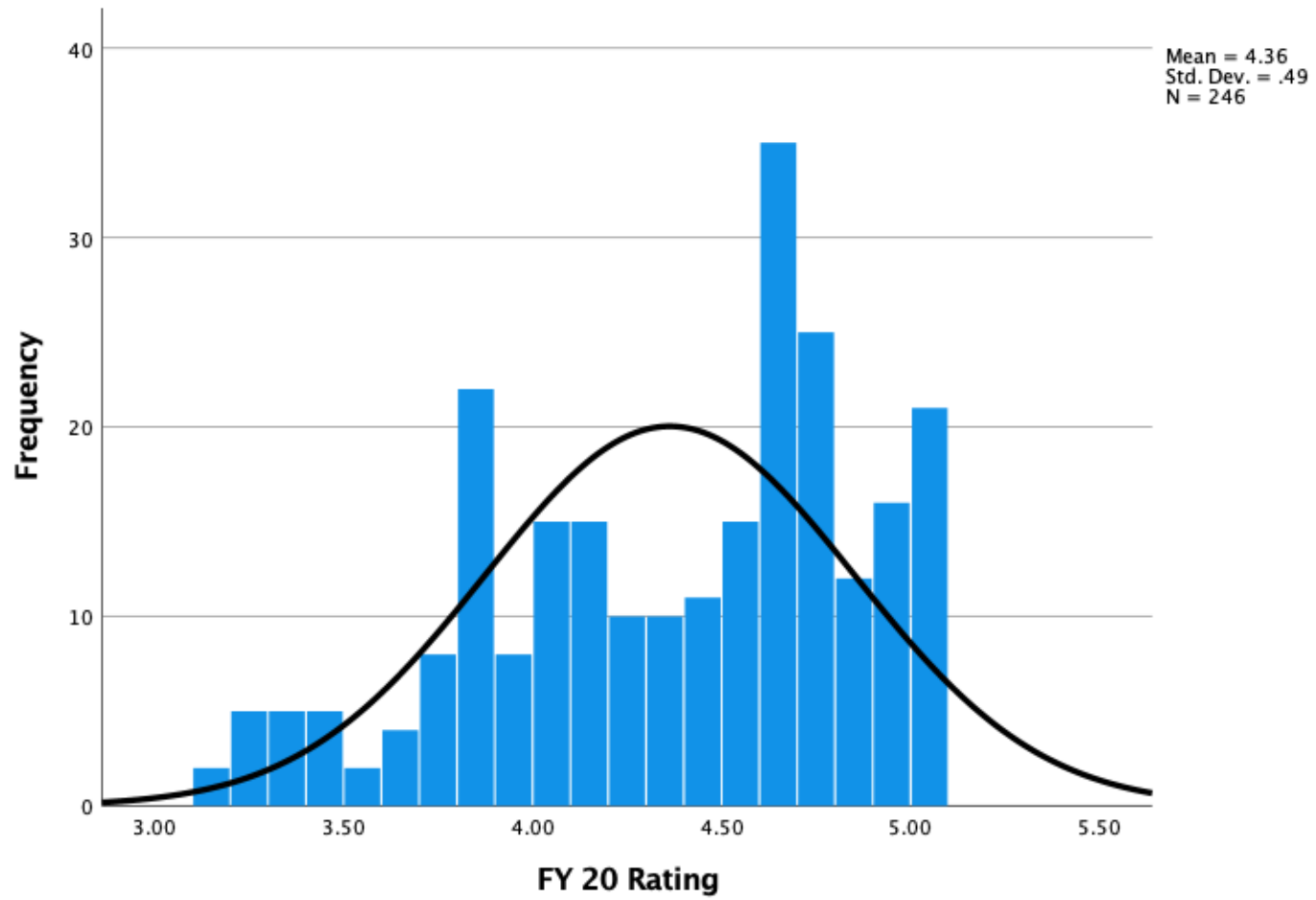
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BIOGRAPHY

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