

EMPLOYEE INNOVATION TO PROMOTE
EMPLOYEE ENGAGEMENT

by

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DEDICATION

To my loving and supportive mother and father, Jan and David Kelly, who have encouraged my pursuits in STEM throughout my entire life and refuse to let me settle for less than I could achieve.

To my sister, Rebecca Kelly, who has been constantly supportive caring throughout my journey.

And to my husband, Aaron Clennan, who has been in my corner and supporting me since day one on the quest for my biggest accomplishment yet.

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ABSTRACT

Employee innovation as a form of employee engagement is affected by numerous organizational factors and personal employee attributes. This study modeled the system of factors impacting the manifestation of employee innovation. Additionally, this model evaluates the achievement of engagement and impact on the competitive advantage as a result of employee innovation. A questionnaire for psychometric indicators was provided to two government owned production maintenance groups at the same naval base. Using structural equation modeling with latent variables, this study collected 190 survey responses to measured indicators for innovation, formal devices, relationships, self-efficacy, and motivations. Additionally, historical data was collected to measure indicators for engagement and perceived competitiveness. This study supports innovation as method for achieving employee engagement with a positive, significant direct effect between the latent variables. The chosen metrics for perceived competitiveness indicators did not hold strong correlations and further analysis resulted in indeterminant effects of innovation on performance metrics. This study confirmed the presence of previous factors found impactful to employee innovation, but with further analysis on the direct and indirect relationships within the system. Organizational factors such as formal devices and relationships did not have a direct impact on innovation and are mediated by intrinsic attributes such as self-efficacy and motivations. These intrinsic attributes have a significant impact on innovation and are mediated by the presence of formal challenges within the workplace. Furthermore, control mediates the effect of formal devices on the first step of the innovation process specifically, idea generation. The use of organizational factors in pursuit of employee innovation is achieved through the realization of employees' personal intrinsic attributes of self-efficacy and motivation.

CHAPTER ONE

INTRODUCTION

The way companies develop competitive advantages is changing with the pace of technology development and market expansion (Foster & Kaplan, 2001). Drucker discussed evolution of knowledge and the world economy from 1967 forward using historical evidence of inventions and recent world wars (Drucker, 1992). The technology available doubles every two years and economic activity doubles every five years (Drucker, 1992; Roser & Ritchie, 2018). These two, long standing principles characterize the extreme changes and threats that rise regularly within competitive industries. In 2007 only 7% of American companies were both the market share leader and a profitability leader in their respective industry, while in 2017 only 60 United States Fortune 500 companies were also Fortune 500 in 1955 (Perry, 2017; Reeves & Deimler, 2011). By 2010 the United States dropped from the second most competitive global economy to fourth and continued to drop to tenth in 2020 (Myers, 2016; Nerenber, 2010; News, 2020). This decline occurred during the same time frame where other countries, such as Israel, China, and Chile, began a drastic rise in global economic competitiveness (Wright, 2017). A closer look shows that each of the countries with rising competitive economies were providing funding and many other resources for startups and other innovations (Wright, 2017). These most recent statistics support Drucker's explanation of expansion and inclusion of markets as new technology becomes available through globalization despite companies in the United States falling behind in economic innovation.

The overarching lesson from these data points is that competitive advantages are not easily developed or kept by one organization and therefore are difficult to sustain. The inability to adapt

new strategies and execute change management effectively is lowering the average duration a company spends as a leader of their industry (Foster & Kaplan, 2001). The development of a competitive advantage is imperative for all organizations, public and private. While private sector relies on this competitive advantage for profit and continuation, public sector relies on a competitive advantage to adequately serve a civic interest effectively. Therefore, all organizations within the United States must find a new strategy for the continuous development of a competitive advantage within the evolving world economy.

The concept of the classical, sustainable competitive advantage was developed and published by Michael Porter throughout the 1980s and 1990s when the companies that succeeded in their industry market excelled at cost-benefit balance, identifying the target market, and differentiating themselves from competition (M. E. Porter, 1987). The competitive advantage is described as a more abstract but recognizable concept. Indicators of the latent presence of a competitive advantage were suggested to be metrics such as, but not limited to, profit, increase in sales, and customer retention (Gleißner, Helm, & Kreiter, 2013; Sachitra, 2016). Ultimately, the competitive advantage concept captures the performance of an organization according to the goal or purpose driving the work performed (Flamholtz & Hua, 2003; Sigalas, Economou, & Georgopoulos, 2013). Thus a more accurate measurement of a competitive advantage may be unique to the context of each organization and industry context. In the 1980s, the competitive advantage distinctively belonged to companies who could forecast changes within these three areas and change the organization appropriately (M. E. Porter, 1987). The classical competitive advantage is effective when forecasted events initiate organizational change for coping with market shifts and advancements in technology.

Research by Lewin (1951) and Kotter (1979) has categorized organizational change as either episodic or transformational (Poole, Van de Ven, & Ebrary, 2004). Episodic change is initiated by the event of an outside force and follows a traditional sequence of unfreezing the organizational structure, changing, and then refreezing the structure until the next event (Lewin, 1951; Weick & Quinn, 1999). The results are large, distinctive changes that are visible once the organizational structure refreezes. Episodic change is successful in a stable environment where the change made is a direct result of the forecasted or occurred event. Transformational change, in contrast, is continuous and has results that become slowly visible over time. The organization is an ever-developing entity based on a set of goals, culture, and vision. Transformational change does not wait for outside forces to direct the next movement. Rather, the organization will freeze to assess the current state, rebalance resources and efforts as needed to control the direction in which the organization is developing, and then unfreeze to allow continuous change to proceed (Kotter & Schlesinger, 1979; Weick & Quinn, 1999). Transformational change does not require a stable environment to guide an organization's strategy.

Porter's classical competitive advantage utilizes the assumption that organizational change occurs in a stable environment and is episodic. In modern markets, industry is no longer clearly defined or categorized and the amount of technology and diversity of workforce skills available to every organization continuously grows. Hence, today's competitive market landscape is not stable enough to sustain success of companies that only employ the classical competitive advantage (Reeves & Deimler, 2011).

The new competitive advantage can be likened to adaptability (Reeves & Deimler, 2009). The companies that develop the capability to learn and change quickly will lead these newer,

larger, overlapping markets (Denning, 2013). Companies have been successful utilizing employee engagement to aid in implementing transformational organizational change (Groscurth & Shields, 2016; Leonard & Coltea, 2013; Reeves & Deimler, 2011; Shool, 2010). Employee engagement refers to the emotional connection employees have with their organization, which influences behaviors and efforts in many activities (Whittington, Pettigrew, Peck, Fenton, & Conyon, 1999). Managers who ranked in the top quartile of Gallup's Change Management Index engaged 77% of their employees while managers in the bottom quartile only engaged 1% (Tung, 2014). While an effective concept in facilitating successful change management, especially in cases of transformational change, there is a long list of managerial and structural elements needed to support the implementation of the employee engagement definition and concept. Elements used to better engage employees include open and transparent communication, involvement of employees in planning, making work collaborative, integration or consideration of employee personal lives into structure and policy, encourage and empower ownership of their work and outcomes, encourage ideas and suggestions for improvement, and provide flexibility in resources, technology, and support (Bailyn, Fletcher, & Kolb, 1997; Cui, Davis, & Huang, 2016; Groscurth & Shields, 2016; Leede & Stoker, 1999; Shool, 2010). Rarely are these concepts utilized individually as many companies rely on a combination for successful employee engagement. Regardless, every form of employee engagement requires different resources for support (Engelen, Weinekotter, Saeed, & Enke, 2018).

One key tenet of successful employee engagement is employee involvement. The act of involving employees can be implemented in a variety of functions, capacity, and levels (Gandhi & Sauser, 2008; Kelly & Schell, 2017b; Rinehard, Smith, & Spencer, 2014). Employees from the

frontline and through every successive level of management can be included in many areas of organizational functions such as, but not limited to, planning, improvements, training or skill development, and customer relations (Fell-Carlson, 2004; Gandhi & Sauser, 2008; Rinehard et al., 2014). Even higher organizational activities such as budgeting or job design, have benefited from employee involvement (Fell-Carlson, 2004; K. Singh & Onahring, 2019; S. P. Singh, 2018; Törner, 2011). Employee involvement can range from passive action such as being regularly informed of the thought process resulting in managerial decisions to a more active role in contributing input to specific areas of higher organizational operations (K. Singh & Onahring, 2019). Both capacities of employee involvement are found to be vital in successful change management efforts (Engelen et al., 2018; Gandhi & Sauser, 2008; Leede & Stoker, 1999).

Employee involvement provides benefits to both the organization and the employees. By involving employees in higher organizational functions, the work force experiences greater commitment and loyalty to the company, a greater sense of ownership, and higher job satisfaction (Cui et al., 2016; Fell-Carlson, 2004; Lloyd, 1996). The employees of this engaged workforce then benefit the company with higher performance along with greater motivation to contribute to improvement efforts more often (Cui et al., 2016; Dundon, Wilkinson, Marchington, & Ackers, 2004; Fell-Carlson, 2004). Companies with more engaged workers had over two times the revenue growth as companies without engaged workers in addition to a 10% increase in customer satisfaction and 20% increase in sales (Occupational Outlook Handbook, 2011). However, the largest justification for employee engagement is not the benefit of engaged employees but the cost of disengaged employees. Gallup estimates that disengaged employees cost companies in the United States up to \$550 billion per year (Retallick, 2015). Furthermore, disengaged workers result

in high voluntary turnover rates as well as lower customer satisfaction and product quality due to poor job performance (Warner, 2018).

As a company experiences continuous change towards organizational goals, developing and maintaining a competitive advantage will require higher performance in current functions in addition to the ability to enter newer developing markets (Kotter & Schlesinger, 1979). Employee engagement has the capacity to ease the transformational change required to maintain a company's competitive advantage. However, with many methods available to engage employees, the challenge is to determine the most beneficial method at the least cost to resources.

Effective employee suggestion systems are one form of engagement that provide benefits following company investment. Suggestion systems achieve employee engagement by encouraging critical thinking of every day work, active participation in improvement efforts, and ownership of bottom-up communication (Bakker & Albrecht, 2018; Warner, 2018). Employee suggestion systems provide valuable innovations and opportunities for companies to improve their competitive advantage. Ideally, the resources expended in the endeavor for engagement pay returns in the form of innovations. Additionally, utilizing current employees for the purpose of improvement increases the value of an existing workforce resource investment. While the concept of engagement seeks to address employees at all levels, frontline workers are the subject matter experts of the daily value-added work performed in the company. Frontline workers are involved in the day to day operations of their company and serve as the subject matter experts of the current functions (Kelly & Schell, 2017b). Therefore, the focus of this research will be on the frontline worker contribution to improvement which is one-way companies can engage their employees.

Problem Statement

Historically, the research in achieving employee innovation has left gaps between systematic factors affecting the process of contributing ideas and the effect contributions have on organizations as a whole. The literature providing a basis for the design of suggestion systems can be categorized as either published theory-based systems or case studies. Both categories take opposite approaches and achieve results that confirms where the opposing category begins with as depicted in Figure 1. The theory-based systems use motivation concepts to propose the structure of a system without any follow-up tests of effectiveness (Bartol & Srivastava, 2002; Bassford & Martin, 1996; Carrier, 1998; O'Brien, 1995). Conversely, case study publications document current systems in place and dissect the structure into the comprising factors (Kelly, 2018). The compiled findings of both categories ultimately confirm a set of factors present within a system based on an end goal of collecting suggestions. The problem addressed in this study is the gap in systematic factor considerations within employee innovation, including the connection to employee engagement and organizational benefits.

The metrics and methods of measurement determining the success of a suggestion system are widely debated. Therefore, this lack of consensus creates a barrier in connecting employee innovation to engagement and organizational benefits. While efficiency, quality, job satisfaction, and adherence to safety standards are some common metrics to evaluate the success of an improvement, they all focus on sub-systems of the entire organization (Lasrado, Arif, Rizvi, & Urdzik, 2016). Those studies that analyze larger company performance metrics such as cost savings or new revenue generated limit the evaluation to the impact of a singular contribution from the entirety of a suggestion system (Lasrado et al., 2016). With the determination of success criteria

for employee innovation comprised of eclectic metrics, there is no clear, singular method of measuring the value of suggestion systems as a whole to provide justification for the resources utilized in support of this form of engagement. On the other hand, studies developing a grounded theory have consistently identified the presence of elements and themes comprising effective suggestion systems. These approaches utilize qualitative methods of interviews, historical records, observations, and questionnaires (Boyd, 2017; Kelly & Schell, 2017a; Pilly, 2016; Xin Li, 2016; Yates, 2011). Each qualitative study found themes which begin to form a general consensus on many broader concepts.

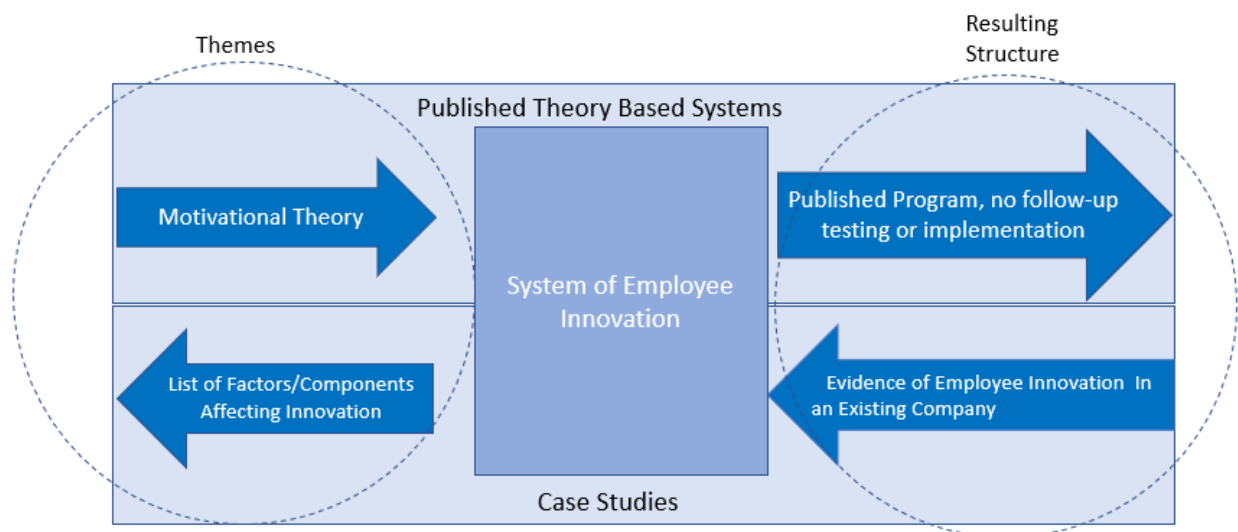


Figure 1: Two Categories of Suggestion System Literature

With a growing consensus on elements present in suggestion systems from qualitative work, the relationships between these elements can be modeled and tested. A quantitative study by Frese, Teng, and Wijnen in 1999 built a model grounded in organizational and motivational psychology.. This model was the first to depict how these factors and their effects formed

systematic relationships around employee innovation and centered the structure on employee's role in suggestion systems.

Expansion on the Frese et. al. (1999) approach by using compiled research to consider the entire suggestion system would go beyond testing the presence of the factors to the strength of their effects on employee innovation. This includes understanding the relationship between a suggestion system and metrics relating to an organization's overall success or improvement. Understanding the impact of these relationships will bridge the gap between theory and practice when improving how to elicit and utilize employee contributions. This research will focus on connecting and measuring the factors within an employee innovation system for the purpose of idea generation, elicitation, and utilization. Employee innovation encompasses the idea of working to improve effectiveness of their organization through their own ideas and initiative. Furthermore, this research will evaluate the value of employee innovation by measuring the effect of suggestion systems as a form of engagement to enhance an organization's competitive advantage.

CHAPTER TWO

LITERATURE REVIEW

The roots of frontline employee engagement can be traced back to the Industrial Revolution with Fredrick Taylor. The timeline in Figure 2 shows the historical progression and development in employee engagement theory and literature.

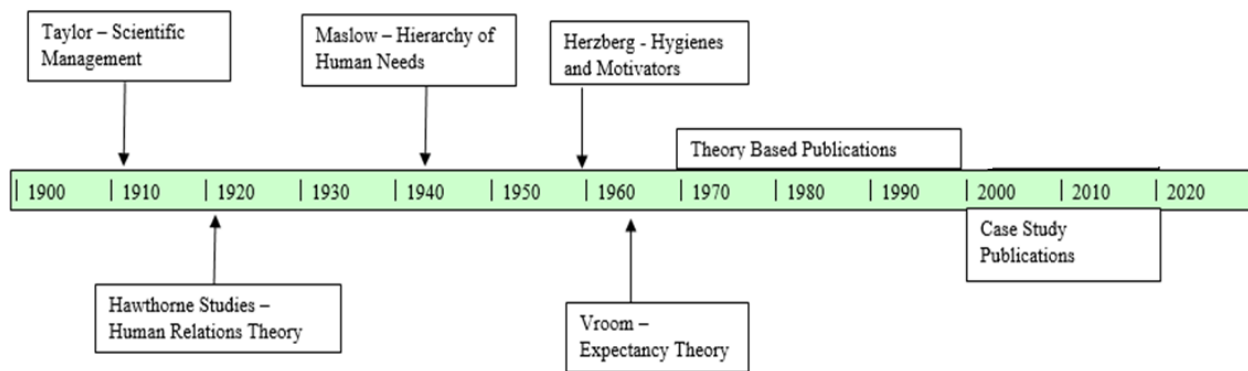


Figure 2: Employee Engagement Literature Timeline

The Theories of Motivation in Employee Engagement

Taylor published his theory of scientific management during the height of the Industrial Revolution. The publication shuttled in concepts of attaining the highest production while managing employees (Taylor, 1911). The basis of the theory attributed low performance partially to old management styles provoking employee initiative ineffectively, resulting in lazy workers (Taylor, 1911). Throughout the newly published theory are anecdotes about observed working conditions and the increase in production given certain settings. Incentivized pay was a management technique championed throughout the theory; the pay scheme operated on workers

receiving a wage based on their performance (Taylor, 1911). Therefore, those first-class workers who performed work the one best way and produced more were paid higher wages than those who produced less. This one best way methodology involved many elements to support the creation of the most efficient, standard process of completing any task.

While many other techniques leveraged a similar notion that workers were primarily motivated by money, there was one instance that sought to additionally incentivize workers through better working conditions. In a bicycle ball bearing inspection group, the women working were provided more breaks, shorter hours, more holidays, and individualized attention from their manager for skill improvement in addition to the higher wages for higher productivity (Taylor, 1911). The principles of scientific management were company profit centric in design and the success of such practices were only descriptive and observational at the time of publication. Even though the use of Taylor's principles were often construed to focus on the benefit to the company, in reality his focus on system level benefits worked for the betterment of both the organization and the worker. The effects of scientific management were the beginning of defining employee engagement.

Studies surrounding employee engagement became more prevalent shortly after a review of the Hawthorne Studies in the 1920s. While the original objective of the experiments at the Hawthorne plant of the Western Electrical Company were to observe environment changes on worker output, not employee engagement, the findings were the beginning of interest in research of informal mechanisms that affected performance of workers (Mayo, 1949). The planned experiment was to observe the effect different working conditions (e.g. room illumination or breaks) had on performance of a selected group of workers. However, the measured results were

unpredictable as a function of environmental change. Performance continued to increase even when environmental conditions were returned to the less than ideal control settings (Mayo, 1949).

Under re-examination by Elton Mayo there was a intrigue surrounding an informal culture's influence on worker output. Mayo implemented an interview program to better examine and understand this phenomenon. The interviewed employees who took part in the experiment confirmed that the performance output was unrelated to the changing experimental conditions. By receiving attention through the experiment, employees had increased job satisfaction by feeling heard and a stronger group identity among their coworkers which encouraged higher cooperation between peers and subsequently with management (Mayo, 1949). The Hawthorne studies were one of the first published papers to report on the essence of employee engagement and its effect on performance. The conclusion stipulated employees knew they were being observed during the experiment. This encouraged higher performance levels with each experimental condition change (Mayo, 1949). This conclusion is the initial prescribed Hawthorne Effect that was later proven to only be partially true (Muldoon, 2017; Stephen, 1992).

Many critiques followed Mayo's findings on the Hawthorne studies, mostly from sociologists. These critiques questioned the validity of the stipulated conclusion based on methods and theories applied in post-analysis (Stephen, 1992). The commonly defined Hawthorne Effect attributing participant performance, actions, or behaviors as a result of knowing they are being observed has little to no data support in re-examination of original data nor in attempts to replicate aspects of the study (Levitt & List, 2009; Muldoon, 2017). With the common definition of Hawthorne effect being questionable, the critiques were aimed more at the methods and defense of the sociology field rather than the focus of industrial psychology relationships (Stephen, 1992).

Elton Mayo's examination and interviews for the Hawthorne studies speaks more to the presence of interpersonal relationships within work groups and between employees and management than to the debated Hawthorne effect (Brannigan & Zwerman, 2001; Stephen, 1992). The interviews provided some of the first documented, qualitative evidence of the informal mechanisms influencing employee behavior and became the new basis for human relations theory, a new alternative to scientific management (Brannigan & Zwerman, 2001).

Since the effect of employee engagement in the Hawthorne studies was not directly measured, conclusions were unclear on exactly what kind of actions by management could produce higher performance. Through the latter part of the 20th century, large developments were made in the field of industrial psychology considering different forms of motivation, employee engagement, and performance.

Motivating employees begins with understanding basic human motivation. Maslow (1943) developed a model to demonstrate the hierarchy of needs, as seen in Figure 3. According to this theory, humans are motivated by the need to fulfil each level successively; the lower level must be achieved prior to attaining the next level (Maslow, 1943). The basic needs include two levels containing what is most vital to a life: physiological and security. Next are needs that address the nature of humans as social beings. This includes our need to belong to a group and then confirmation of those relationships for our esteem (Maslow, 1943). Self-actualization is the top-tier of motivation because a human can live a full life without achieving this level; this level implies living beyond just making ends meet (Maslow, 1943). As one level of needs is achieved, a person then is motivated by achieving the next tier.

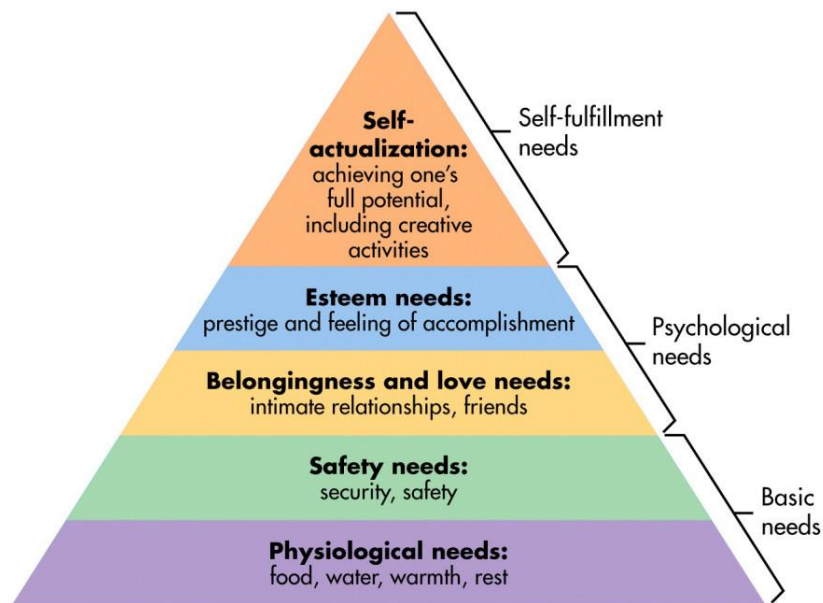


Figure 3: Maslow's Hierarchy of Needs (McLeod, 2018)

When looking to motivate employees, Herzberg utilized Maslow's hierarchy to create the concept of a hygiene within organizational practices. A hygiene refers to an organizational practice's minimum level of performance to prevent employees from becoming dissatisfied (Herzberg, Mausner, & Snyderman, 1959). Table 1 lists these hygienes as potential demotivators (Herzberg et al., 1959). Meeting these hygienes at a minimum level of acceptability is preventative rather than curative in the case of de-motivating employees (Herzberg, 1987). All hygienes listed by Herzberg can be classified into the bottom three levels of Maslow's hierarchy, therefore meeting the basic needs of a human being. The maintenance of these hygienes prevents the decay of performance from dissatisfied employees, however, it will not aid in improving performance above standard levels due to not addressing the two highest tiers of Maslow's hierarchy (Herzberg et al., 1959).

Table 1: Herzberg Hygienes and Motivators (Herzberg et al., 1959)

Herzberg Hygienes	Herzberg Motivators
Supervision	Achievement
Policies & administration practices	Recognition
Physical working conditions	Work itself
Salary	Responsibility
Benefits	Advancement
Job security	
Personal relationships	

Later, Herzberg developed a list of motivators whose absence contributes little to dissatisfaction but whose presence contributes largely to satisfaction (Herzberg, 1966). Such motivators that fuel greater performance from employees are list in Table 1. These motivators address a human's need for autonomy, self-understanding, and need for creativity in the upper levels of Maslow's hierarchy (Herzberg, 1987).

While Herzberg approached motivation from the standpoint of continual and itemized organizational practices, Vroom approached the problem from a broader perspective of cause and effect. Vroom developed the expectancy theory which hinges the success of any employee's endeavors on three beliefs (Vroom, 1964).

1. The employee believes they have the ability and skill to successfully complete the task.
2. The goal is at the proper expectation and can be achieved.
3. A sense of control that their effort will correlate to a positive outcome (Vroom, 1964).

In practice, this means the organization or manager must provide knowledge, support, and resources to their employees to possess the skills needed for a task given with a clear objective. Since Vroom, the research has been expanded into different leadership styles for managers to properly support the needs of their employees in this chain of effect from effort to performance.

An example of Vroom in modern leadership styles is the current model for situational leadership (Vroom & Jago, 2007).

Importance of Employee Engagement in Modern Work Force

The seminal research surrounding motivational theory of the work force is over fifty-years old. While many of the psychological principles utilized appear to meet organizations' needs in employees, motivations have changed as younger generations join the work force (Fishman, 2016; Gursoy, Chi, & Karadag, 2013; Martin & Ottemann, 2016; Soni, Upadhyaya, & Kautish, 2011). Herzberg's motivators and hygienes have continued to be relevant in modern work design, but may have evolved with the multi-generational work force. The previous research on motivation studied the work force employed at the time: traditionalists and baby boomers. As individuals from Generation X and Generation Y (i.e. Millennials) joined the workforce, studies found that few of the same organizational practices were effective (Fishman, 2016).

As of 2016 the millennial generation makes up the majority of the workforce and their expectations for employers are significantly different from previous generations (Fry, 2018). Working millennials are attracted to jobs that have meaningful work, show higher desire for work-life balance, opportunity for authority and autonomy, recognition for work, and transparent operations with clear communication between employees and management (Fishman, 2016; Gursoy et al., 2013). While many of these aspects were desired by previous generations they were viewed as perks, whereas Millennials report these as non-negotiable parts of their career expectations (Gursoy et al., 2013; Martin & Ottemann, 2016). In addition, millennials report lower rates of work centrality (i.e. life built around a job) and higher rates of non-compliance with standing company policies and status-quo (Gursoy et al., 2013). Furthermore, professional

development opportunities are not seen as a privilege by millennials, they are expected to be included in the company culture and operations (Martin & Ottemann, 2016). The millennial generation continues to challenge norms and posit themselves as ambitious risk takers and does so by demanding that motivators and tools for self-actualization be offered when considering a career with any company.

These are not whims of young and ideal professionals just beginning to adapt to the working society; these values are carried deep into developed careers as seen with the eldest of the millennial generation (Kuron, Lyons, Schweitzer, & Ng, 2015). Generation Z, successive to millennials, are now entering careers with their own set of unique motivators alongside the multi-generational workforce. Part of developing and maintaining a competitive advantage is being a desirable employer, being viewed as an organization with recruiting and retention practices that meet the needs of employees (Swarnalatha & Prasanna, 2013). Employee engagement is no longer a unique endeavor taken on by companies to ensure they have the top pick of millennial candidates, but a necessity for maintaining a workforce (Swarnalatha & Prasanna, 2013). Therefore, employee engagement is required to hone a competitive advantage.

Competitive advantage is focused on exploiting the strengths of an organization, especially in basic competencies such as retention and loyalty (M. Porter, 1995; M. E. Porter, 1987). Porter noted that statistically the most competitive companies have high company loyalty among employees; this is one less problem facing these organizations in the form of employee turnover rates (M. Porter, 1995). The market for recruiting new employees continues to be competitive and retention can be even more difficult without employee engagement. As millennials get settled into their career, 67% would leave their current position if a job lacks growth opportunities or avenues

for leadership development (Bridge, 2018). Therefore, employee engagement is required to retain millennial employees and utilize their full abilities for the company's objectives as well as prepare for the successive generation Z workforce.

This study does not seek to measure or further investigate specific behaviors of the up-and-coming generational workforces. The recognition of the eclectic employee desires supports the importance of effective change management through employee engagement within organizations going forward. The need for employee engagement and the associated benefits are crucial to the sustainment of the competitive advantage as the workforce continues to evolve.

The Use of Motivation in Employee Innovation to Achieve Engagement

All forms of employee engagement require resources to implement. These expenditures can be justified when the resulting effect from an engaged workforce is an improvement to competitive advantage. One form of employee engagement that can decrease the cost of engagement and can increase the resulting payback from invested resources is a suggestion system (Bassford & Martin, 1996; Lasrado et al., 2016). All companies already have a set of frontline employees performing the value-added work of an organization. Because they are closest to the product or customer, they can be experts on the current state of operations (Crail, 2006; Khanna, Mitra, & Gupta, 2005; Pilly, 2016). Utilizing frontline workers as subject matter experts and sources of innovation decreases the additional resources needed to identify opportunities. Additionally, the product of a suggestion system should be employee innovations which are contributions that improve the competitive advantage by recognizing opportunities within current and new work.

Employee innovation has integrated motivation theory for the purpose of engagement through two types of published literature. The first category includes systems constructed of seminal theory of organizational psychology but which are untested. The second category includes literature documenting implemented systems within companies describing the development and results within their specific context. The further categorization of these two types of literature is summarized in Table 2.

Much of the first category hinges on integrating Herzberg's motivators with the three tenets of Vroom's expectancy theory. The main motivator utilized in these theorized suggestion systems is reward and recognition for contribution and achievement. The philosophy on type of rewards for contribution and performance exists on a scale of extrinsic to intrinsic. Extrinsic rewards are tangible prizes such as money, gifts, or time off. Intrinsic rewards are the intangible and are experienced emotionally by the rewarded such as recognition, pride, ownership, or joy. There are rewards schemes that rely completely on extrinsic rewards such as money and physical items (Bartol & Srivastava, 2002). This scheme hinges on the formal interactions and documentation of the product of these interactions to provide a fair process in determining which employees deserve to be rewarded as there must be a record of where the contribution originated (Bartol & Srivastava, 2002). Any intrinsic rewards reaped by employees from informal interactions is of little to no consequence for this type of suggestion program because the company cannot intentionally utilize it as a benefit.

Table 2: Employee Innovation Literature Categorization

Mechanism	Study	Type of Mechanism
Published Theory Systems (Kelly & Schell, 2017a) (Kelly & Schell, 2017b)		
Extrinsic Reward Schemes	Bartol & Srivastava (2002)	Formal
Intrinsic Reward Schemes	O'Brien (1995) Konrad (2006)	Informal
Mixed Reward Schemes	Carrier (1998) Bassford & Martin (1996)	Informal/Formal
Management Involvement	Bassford & Martin (1996) Marx (1995)	Formal
Promotion	Carrier (1998)	Formal
Structured Submission and Review Process	Mangan (1992) Bell (1997) Opt (1998) Fairbank, Spangler, & Williams (2003)	Formal
Case Studies (Kelly, 2018)		
Employee Driven Design	Serpell & Ferrada (2007) Purcell & Hutchinson (2007) Trudel, Cobb, Momtaham, Britnell, & Mitchell (2016) Fell-Carlson (2004)	Formal
Job autonomy	De Lurdes Calisto (2015) Lewis (1993)	Informal
Open/transparent Communication	Brockmann (2017) McEvoy, Escott, & Bee (2011) Jaaron & Backhouse (2011)	Informal
Educational Program	Harris & Natarajarathinam (2015) Borkowski, Deckard, Weber, Pardon, & Luongo (2011) Newton & Ellis (2005)	Formal
Adapted Program	Toussaint & Berry (2013) Boucher & Doak 2012 Mazur, McCreery, & Rothenberg (2012)	Formal
Company Developed Program	Choundry (2014) Akin, Brook, Byers, & Lloyd (2016) Robinson & Larson (1990) Dambisya & Matinure (2012) Pranksy, Shaw, & McLellan (2010)	Formal

On the other end are reward schemes that rely solely on the intrinsic reward and internal gratification employees receive through aiding their company in improvement or innovative

efforts. These also see large returns in individual and organizational performance. When employees are involved in activities that require intellectual and effective contributions, the employees feel valued and recognized by management (O'Brien, 1995). Most suggestion systems based on psychological theory exist somewhere in the middle of the two extremes with a combination of intrinsic and extrinsic rewards (Bassford & Martin, 1996; Carrier, 1998). Rewards are only one of the ways in which these theorized systems differ from each other.

Another major point of distinction in the theorized suggestion system literature are the methods by which an employee can submit a contribution. A common concept of a suggestion system is a suggestion box where employee contributions are collected either anonymously or with names, the box is emptied, and reviewed as depicted in the process in Figure 4 (Mangan, 1992). From this point the suggestions may be implemented or discarded depending on the company's dedication to utilizing frontline worker innovation. The concept of a suggestion box has not changed much from the original simplicity in all of its development. Alterations and improvements to suggestion systems have been made by integrating technology and adding transparency into the process (Fairbank, Spangler, & Williams, 2003). Further developments include emphasizing management involvement, support, and promotion of the system in the objective and process (Bassford & Martin, 1996; Carrier, 1998; A. E. Marx, 1995).

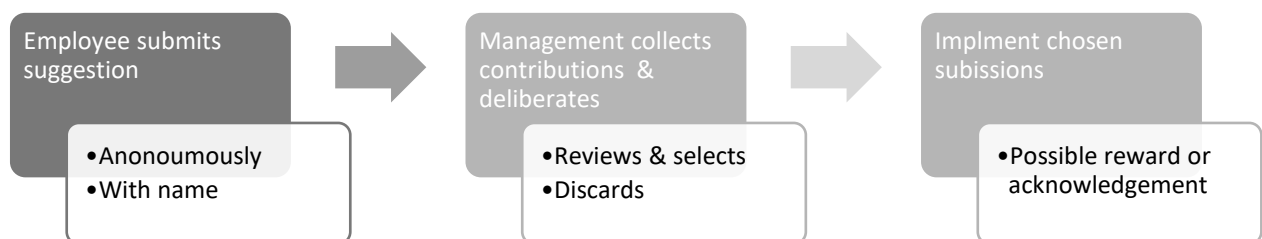


Figure 4: Employee suggestion process

Largely, the subject matter of developing suggestion systems using theory has fallen out of literature after initial development in the 1980s (Kelly & Schell, 2017a). While these are all systems designed around psychological principles that have proven relationships and expected outcomes, effects of the systems themselves have gone largely untested since their publication. There is little to no follow up reported or published of a company trialing a published theorized system. In addition, these published systems do not have a measure of effectiveness or performance to justify and verify their use. Furthermore, these theorized methods do not plan adjustments for any organizations' unique context should it be needed. This is a major point of contention when analyzing the theorized form of literature due to the concluding recommendation of many papers being a blanket statement to apply the system with little consideration for individual organizational differences.

The second type of existing literature surrounding employee innovation are singular case studies from companies reporting their methods and situational context for what each perceive as successful. These are important pieces of building an understanding of how we effectively engage employees because there are tangible results for specific contexts, even if the measure of success is dependent on the company in the case. Despite real world application, no study recommends implementing an identical system without consideration of individual organizational characteristics (Kelly, 2018). Most commonly published methods of engaging employees for innovative contributions successfully can be categorized as either reliant on company culture or a defined program.

Those companies that are reliant solely on culture tend to be defined by the employees to include job autonomy and transparent and open communication (Kelly, 2018). By developing an

employee centric company culture, frontline workers design around what daily operations and values align with both the company and the needs of the work force; therefore, strengthening the company's vision in frontline employees (Lloyd, 1996). In addition, employee-driven design requires job autonomy which provides a sense of ownership and can be beneficial to both performance and improving upon current work to support various organizational objectives (Fell-Carlson, 2004; Konrad, 2006). Cultures defined by employees almost always explicitly includes transparency from management. This enables frontline workers to fully understand the process in which top-down decisions are made and have the ability to monitor the status of bottom-up communication (Konrad, 2006). Having these characteristics in place allows a company to rely on the organizational culture in every day work to encourage frontline contributions (Kelly, 2018).

Programs are another common method for enabling employee innovation in the literature. These programs take the form of educational programs, an adapted program, or employee/company designed program in reported case studies. Educational programs are a source of knowledge sharing and skill development for employees which contributes to a sense of ownership in daily work (Borkowski, Deckard, Weber, Pardon, & Luongo, 2011; Harris & Natarajarathinam, 2015). These educational programs typically have feedback portions throughout, providing frontline employees with appropriate cues to use new skills for contributions (Borkowski et al., 2011; Newton & Ellis, 2005). Adapted programs take principles of other frameworks such as LEAN and integrate the objective of employee contributions into a larger organizational practice (Boucher & Doak, 2012; Toussaint & Berry, 2013). This means those principles can be morphed to fit desired processes and mechanisms for employee innovation while being supported by the adapted framework (Kelly, 2018). The employee/company designed

programs similarly require support of values and principles but lean on those already present in the organizational culture (Choudhry, 2014; Kelly, 2018; Parnsky, Shaw, & McLellan, 2001). These employee/company designed programs use a wide variety of processes and elicitation methods such as daily meetings, rapid improvement events, and variations on the suggestion box (Akin, Brook, Byers, & Llyod, 2016; Choudhry, 2014; Mazur, McCreery, & Rothenberg, 2012; Robinson & Larsen, 1990). All case studies used in the aforementioned program categories also include some form of incentivization with a combination of intrinsic and extrinsic reward.

However, the presence of a program or process for contribution is not enough to elicit valuable employee innovation. In any case study about successful endeavors for employee innovation, the focus and key consideration is the organizational culture. The available literature indicates that programs must be supported by a strong culture to be successful. A strong culture is shown within the literature as a collection of factors that recognize the informal and formal mechanisms and principles structuring employee and management relationships. These factors encompass concepts such as trust from transparent communication or belief in value of personal ideas through management's support (Brockmann, 2017; Yates, 2011). Further capturing culture's role in employee innovation is discussed in more depth in the analysis of components of suggestion systems.

Both categories of literature discussed above share a common quality in lacking a unified definition of effectiveness. Theory based systems build on seminal organizational psychology but are untested while the case study literature works backwards by reporting on perceived successful systems already in place. However, both approaches lack alignment and clarity as to what the suggestion system is meant to achieve and how to measure that achievement.

Many theory based systems designed to achieve engagement assume benefits will arise naturally without any extra resources or structures in place (Konrad, 2006; O'Brien, 1995). A few adapted programs in case studies mean to achieve a critical thinking work force by using altered frameworks of chosen suggestion systems (Mazur et al., 2012; Toussaint & Berry, 2013). While other case studies seek to achieve an uninhibited culture of innovation, measured by how many suggestions are submitted, not necessarily how many are used (Akin et al., 2016; Boyd, 2017). The ultimate question when designing a suggestion system involves the system's effectiveness in meeting a purpose.

Robert Daft (2008) approaches effectiveness from a larger, organizational design level by saying "effectiveness is complex because different stakeholders have different interests and needs that they want satisfied by the organization" (p. 39). Measuring effectiveness is unique in every organizational context (Daft, 2008). Daft (2008) further expands the definition to "effectiveness evaluates the extent to which multiple goals...are attained" (p. 75). The stakeholders of a suggestion system is a long list, but those most immediate are the frontline workers and the management of the organization. The goals and needs of both stakeholders have not been key considerations in much of the literature on designing suggestion systems. However, employees are frequently viewed as an indirect stakeholder in suggestion systems aiming to improve job satisfaction. But employees are not the only stakeholder in the employee innovation process and are not alone sufficient representatives of the system. The reviewed literature lacks sufficient consideration and design to meet management needs or the development of a competitive advantage.

The Effective Components of Employee Innovation

From the two categories of literature above, frontline workers want to feel engaged through higher order motivations. Meeting these motivations is a potential way to measure effectiveness for suggestion systems for one immediate stakeholder, the front line workers. Another immediate stakeholder is company management, who serve as a representative for the overall organization's needs and goals. Management needs valuable contributions from the employee innovation process to aid in improvement of the organization; that is the purpose or end goal of engaging employees through employee innovation. Both employee and management must be considered when choosing components to build a suggestion system as the final combination should support an end product that meets both needs.

Some qualitative studies have focused on breaking down universal components of an existing employee innovation system and the possible existing relationships between these components. While the findings of each study used different names and groupings for the components indicated by themes, the descriptions and definitions are similar enough between the studies to compile a list of overlapping elements.

A recent case study at a Montana plastic injection manufacturer (MPIM) conducted a qualitative analysis using semi-structured interviews with frontline employees and management. It found broad themes that comprise the case company's suggestion system (Kelly & Schell, 2017a). The themes discussed by employees were culture, process, and reward. In addition to themes, this study addressed the need for effectiveness measures in order for a suggestion system to ultimately establish success criteria for the system.

Although this study did not have formal or quantifiable measure for effectiveness, participants declared the suggestion system in the study was effective based a collective expression

of job satisfaction and regularly meeting companywide metrics. Each of these themes have characteristics unique to the case company in order to make the program successful (Kelly & Schell, 2017a). Participants described an organizational culture that is collaborative, adaptive, and transparent which then supported the program and rewards system in place (Kelly & Schell, 2017a). The process was used to describe the sequence of events in the formal program. The process held a clear purpose and provided autonomy to frontline workers while making collaborative effort part of the daily routine. The participants also described the process of the program as efficient by integrating employee innovation with overall company metrics and making the sequence of steps transparent to the entire organization. In addition, the reward system was based on the organization's cultural values and had a large emphasis on intrinsic reward with little reference to extrinsic benefits.

A study by Yates in 2011 focused solely on culture's role in continuous improvement in companies. The findings from the analysis of 25 semi-structured interviews with upper-level managers asked questions to further define what parts of culture allow for employee innovation. There were three themes denoted as major dimensions of culture for continuous improvement. Through coding of the interviews the three major dimensions identified were deliberate and unintentional innovation, change management, and systems perspective (Yates, 2011). Each of these three major dimensions of culture for continuous improvement comprised of several minor dimensions listed in Table 3. A process that allows taking risks safely permits idea creation and integration in service to organizational progress and simultaneously enables planned and spontaneous employee innovation; hence both deliberate and unintentional innovation (Yates, 2011). The formal role of humans in the change management process includes being able to plan,

process, implement, and assess all stages of the organization during change (Yates, 2011). General systems theory, the third major dimension, is comprised of economic influence and strategic planning. These two minor dimensions are used to define long-term desired outcomes as a motivation for current operations and practices (Yates, 2011). In this way, this dimension addresses system effectiveness in a way that is dependent on creating a positive impact on organizational practices.

Table 3: Yate's Major and Minor Dimensions of Continuous Improvement Culture (Yates, 2011)

Major Dimension	Minor Dimension
Deliberate and unintentional innovation	Risk-taking
	Idea creation & hybridization of concepts
	Employee skill sets & perspective
Change Management	Leadership
	Cooperation & trust
	Capacity to change
General Systems Theory	Strategic planning
	Economic influence

The study by Yates (2011) addresses the breakdown in requirements for an organizational culture to promote employee innovation and drive continuous improvement. Overall, the literature show culture is a key aspect to support successful employee innovation. The ability to divide the concept of culture into defined elements present in an organization is an important base for translating an organization's goals into measures of effectiveness. While Yate (2011) interviewed the management level for testimony on a culture that utilizes employees for innovation in continuous improvement. There is no testimony to support the employee-level perspective that the culture aligned with bottom-up innovation since all responses are from the top-down perspective.

In a similarly focused study, Boyd (2017) explored what organizational environmental factors fostered employee innovation. The study focused on the internal environment, which encompasses organizational culture, rather than the environment in which the organization exists. This study conducted 15 semi-structured interviews with employees in non-supervisory positions in small-to-medium enterprises with less than 500 employees (Boyd, 2017). The transcripts of nine open-ended questions about the environment of each interviewee's organization and how it related to employee innovation were coded and defined into seven main themes: time to innovate, internal knowledge sharing, leadership supports innovation, empowerment, flexible schedule, feeling challenged, and employees feel valued (Boyd, 2017).

These seven themes' definitions closely aligned with the eight minor dimensions of continuous improvement culture by Yates (2011), with the exception of economic influence and strategic planning. These themes are mapped by commonality in Table 4. Risk-taking from Yate's research encompassed allowing a safe space for employees to experiment with innovation which includes allowing time and flexibility in schedules. Time to innovate and flexible scheduling aids in employees feeling less pressured to produce ideas while simultaneously performing regular activities (Boyd, 2017). Boyd's thematic definition of internal knowledge sharing and feeling challenged maps well to Yate's cultural dimensions of employee skill sets or perspectives, idea creation and hybridization, capacity for change, and cooperation and trust. Internal knowledge sharing demonstrates the cooperation and trust required between peers to hybridize their contributions to meet larger goals while expanding personal skill sets concurrently. Feeling challenged comes from learning and using new skills and perspective while interacting with peers and constructively challenging their contributions (Boyd, 2017). This connects one human aspect

of factors that foster employee innovation in an organizational environment. Finally, Yate's dimension of leadership contains the elements of Boyd's leadership supporting innovation, empowerment, and employees feel valued. Employee innovation is fostered by leadership that effectively encourages, supports, and aids or collaborates on the process of individual contributions (Boyd, 2017).

Table 4: Theme Mapping Between Studies

Boyd (2017) Themes	Yates (2011) Minor Dimensions	Commonality
Time to innovate Flexible Schedule	Risk-taking	Creates a safe, pressure-free environment for idea generation
Internal knowledge sharing Feeling Challenged	Employee skill sets/perspective Capacity for change Idea Creation & hybridization of concepts Cooperation & trust	The evolutionary process of collaboration and the human interaction required in each step.
Leadership supporting innovation Empowerment Employees feel valued	Leadership	All pieces of supervisor supporting the intrinsic needs of their employees

The studies by Yates and Boyd connect the cultural and environment aspects of employee innovation from two different stakeholders: management and employees. Boyd's interviews with employees led to thematic definition of environmental factors that overlap with the continuous improvement culture elements defined by Yates from interviews with upper-level management. The means are employee motivation and ends support management as a stakeholder. The key

difference is the minor dimensions of economic influence and strategic planning encompassed by the major dimension of general system knowledge in Yate's findings. This major dimension demonstrates the difference in effective stakeholder needs for employee innovation. While upper-level management will be more concerned with the larger direction and goals of the company and the subsequent organizational practices that relate to achieving those goals, employees are more focused on the immediate system considerations such as their closest leadership, peer to peer networking, and personal desires as demonstrated by the lack of mention of the holistic organizational direction in Boyd's interviews.

With culture and environment holding a key role in the success of employee innovation efforts, there is still a lack in shaping our understanding of effective channels or processes for employee innovation. A thesis of combined studies by Xin Li (2016) expands on the qualitative work with a mixed methods approach, exploring the mechanisms and methods in place that support a successful employee innovation system. The operating definition of effectiveness in Xin Li's work is the attainment of a goal focused on employees putting forth contributions. Therefore the study uses metrics of volume submitted as well as frequency (Xin Li, 2016). Through twelve semi-structured interviews and a two-day site visit to a casino gaming case company, Xin Li wrote rich descriptions of the multiple channels available to employees for contributing innovative ideas.

Four channels were available to submit ideas, but only two were open to all employees of the company while the other two were restricted to a few or a singular department (Xin Li, 2016). The findings for the available channels are summarized in Table 5. The curious finding is how the two channels that were unrestricted to the type of employee who could contribute (patent disclosure and open innovation challenge) saw large differences in frequency of submission and

scope of participation. Patent disclosure sought out intellectual property that would require a great deal of experience and skill while open innovation challenge was open to all employees yet the more complex channel saw a higher frequency in submissions (Xin Li, 2016). The conclusions of Xin Li's first study showed that the presence of a channel for contributing ideas does not guarantee participation. This may be due to a channel lacking the supporting factors identified in historical literature reviewed here but this was not commented on explicitly in the conclusions.

Table 5: Xin Li's First Study Findings (Xin Li, 2016)

Channel	Submitted Ideas	Objective	Official Scope of Eligibility	Actual Scope of Participation	Frequency of Idea Submissions
Patent Disclosure	Patentable ideas.	Build a strong portfolio of IP assets	All Employees	Narrow (those with sufficient skills and experience)	High
Pitch documents	Ideas for a new game.	Generate the best games	Employees in game studios	Medium	Medium
i-Lab ideas	Ideas for "radical" innovation	Long-term high-impact innovation	Employees in i-lab	Very narrow	High
Open Innovation Challenge	Ideas or solutions to the posted question	Brainstorm possibilities	All employees	Wide (employees across different businesses and locations)	Low

Each channel had a designated reward scheme at the end of the process and upon approval of the contribution. Although the case company does have a large emphasis on radical product innovation due to the nature of their market, the large difference in submission frequency in channels is notable. Further examining where this difference, Xin Li explored what other factors may affect the general frequency of employee contributions through channels that are unrestricted

and open to all employees in an organization (Xin Li, 2016). Through questionnaires, measures were collected and regression was used to find a relationship between less time pressure and greater probability of self-initiated employee innovations. These relationships were positive and stronger for employees who had less negative outcomes in past projects, greater preexisting propensity to innovate, and if the supervisor had worked with employees who innovated before (Xin Li, 2016). These factors are consistent with those found in the qualitative cultural and environmental research surrounding time to innovate and supportive leadership.

Xin Li's finding regarding employees with a high propensity for innovation is a concept that has scarcely been addressed beyond the employee level how integrated into a larger system. There are few case studies reporting successful reliance of organizations solely on the innate ability for innovation in employees (Kelly, 2018). Instead, this concept is often discussed as a form of self-efficacy and weakly supports itself as a standalone method of employee innovation. However, Xin Li (2016) approaches a propensity for innovation as a measure of confidence to experiment within formal and informal control mechanisms.

The third study was performed in a financial institution using employee-level data and loan data to measure degree of experimentation in employees with respect to decentralized decision making. Two populations were observed in the data. Those who were employed before an older, formal system for regulating decisions was removed and those who began work after. Employees worked at branches and were given formal permission to make decisions regarding local loans. It was found that employees who had been employed prior to the removal of the formal control system followed the group average and leader's degree of experimentation which tended to be more conservative (Xin Li, 2016). The older employees now relied on an informal control

mechanism to guide and benchmark their decisions. Those employees who began work after the removal of the system show higher degrees of experimentation in cases with higher risk (Xin Li, 2016). The newer employees did not have the caution or perceived limitation of decision control generated under the prior system. This study shows how the innate ability to innovate in each employee can be affected by prior experience with control mechanisms, both formal and informal.

This innate ability to innovate exists within any given employee and can be exercised or encouraged by cultural factors and the presence of formal or informal control mechanisms restricting channels of contribution. Pilly (2016) utilized a resource-based theory for why employee innovation from frontline workers, especially in-service industries, is more valuable in continuous improvements than solutions from research and development departments. Since frontline workers are present in every organization to perform work and have direct contact with the customer in the case of the service industry, they are cheap, readily-available, and knowledgeable resources (Pilly, 2016). This qualitative case study design interviewed managers and frontline employees of firms who were dedicated to creating service innovations. There were five firms selected with one manager and frontline employee from each interviewed. The study utilized open-ended interview questions and observations of the case companies to gain an understanding of the organizational practices in how frontline workers contribute their innovations and how management values these contributions.

There were four themes coded for understanding how frontline workers create innovations: contribution, feedback, innovation, and ideas. Contribution included the need for adequate training, support, and encouragement when analyzing the end of a service interaction in order to communicate an idea or comment up the chain of command (Pilly, 2016). Feedback refers to the

communication between management and the frontline about possible issues or contributed ideas; this encourages reiteration and provides transparency. The theme of ideas refers to the moment or point in a service that a frontline employee sees the need to solve an issue or simply improve the current service operation. The solution to an issue or improvement to current service is the definition of innovation, the fourth theme.

The way management values employee innovation in everyday work over that of a specific research and development department was described in three factors: resources, innovative leadership, and feedback acknowledgement. Pilly (2016) found that while frontline workers are a readily available resource, allowing extra measures in daily work is costly when regular service still has to be performed (Pilly, 2016). However, if individual managers are in full support of employee engagement and recognize value in improving their frontline service operations, then the extra time and financial resources required to maintain regular service and develop improvement innovations can be met. Innovative leadership refers to the concept that management is ever evolving just as the industry does; part of this is having management that supports frontline workers contributing to the improvements and innovations within their organizations (Pilly, 2016). Feedback acknowledgement addresses the communication with frontline employees from management's perspective. Frontline workers acknowledging feedback aids in building a relationship of trust between management and employees. This trust makes room for job autonomy and freedom needed for successful employee innovation (Pilly, 2016).

Pilly's (2016) study brings qualitative research on the subject of how innate ability for innovation fits into the larger concept of organizational practices and completes the systematic concept of employee innovation by connecting to successful achievement of improvement

innovation as demonstrated in Figure 5. While Pilly focuses directly on the service industry, the elements and themes are also present in other industries and organizations. The first of these qualitative studies, at MPIM, discussed how a successful contribution system consisted of a culture, a process, and a reward scheme; the successive literature reviewed here breaks each of those large elements into smaller components that bring greater definition to what organizational practices must be clearly present to encourage and enable employee innovation in individuals of the frontline.

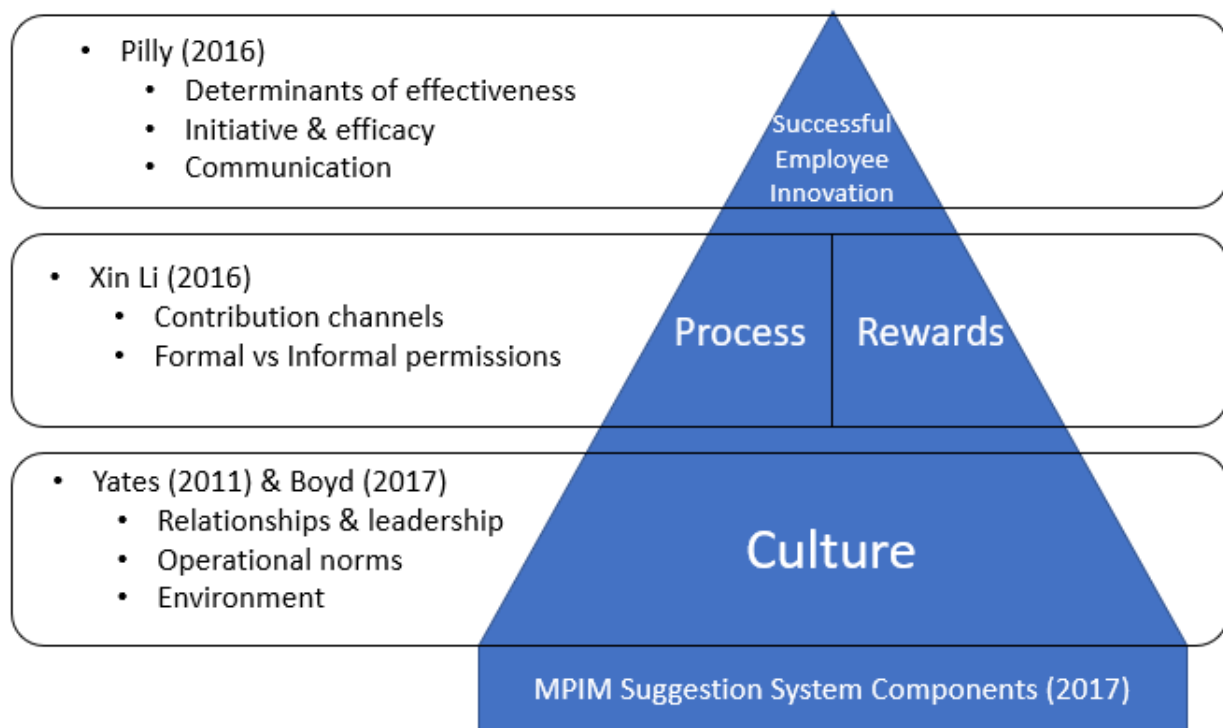


Figure 5: Qualitative Factor Research for Employee Innovation

Measuring Effectiveness of Engagement

The number of detailed case studies are creating a complete definition of the elements present in successful contribution systems. By compiling findings and their themes in organizational systems, we can build a consensus of the factors and relationships present for successful employee innovation. However, this the consensus is incomplete as it only observes the similar effects and confirming the presence of these factors and relationships focused within employee innovation systems. No evidence suggests one cultural or environmental factor has a stronger effect on employee innovation or that one method of eliciting contributions ensures the highest frequency of submission. Quantitative measurements of factor effects and method success would enable organizations to make better choices when developing an employee innovation system.

Quantitative measurements of systematic relationships in employee innovation is scarce. One study that used quantitative methods was Frese, Teng, and Wijnen (1999) which created a structural equation model (SEM) utilizing industrial and organizational psychology methods to measure the strength of relationship between systematic factors, the process of contributing innovations, and the effectiveness of achieving employee innovation. The summary of their model is shown in Figure 6 (M. Frese, E. Teng, & C. J. D. Wijnen, 1999). Although, the general model focused more on employee-initiated innovation rather than employee driven innovation fostered by organizational support, this study is foundational in considering ways employee innovation systems can be measured.

This employee-initiated orientation is evident by the four concepts grouped between proactiveness and aspiration and an additional, independent self-efficacy factor (M. Frese et al., 1999). There are five factors total that address some aspect of self-efficacy included in the 1999

model. The seems to indicate an over emphasis on the internal beliefs, motivations, and abilities of an employee rather than a balanced consideration of organizational factors. While self-efficacy has been supported as an important factor in successful employee innovation the presence and interaction with organizational factors is equally important (Kelly, 2018).

However, the general model includes many of the elements consistent with findings of even more recent qualitative papers including the cultural factors in the form of supportive leadership, suggestion inhibitors, and system responsiveness along with pieces of the actual process of submitting ideas and a reward if implemented. The model even contains a piece about the innate ability to innovate in each employee as an independent concept, including motivation, proactiveness, aspiration, and self-efficacy. However, reviewing the survey questions used in these studies to measure the relationships between these constructs does not include time to innovate or address knowledge sharing between peers.

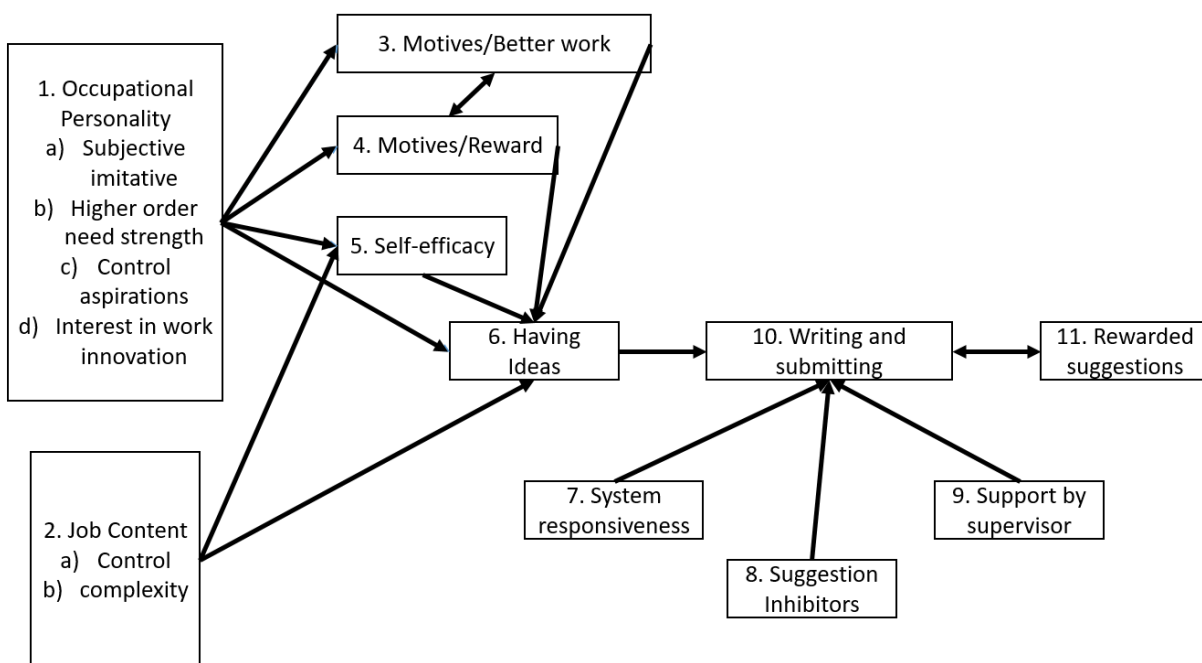


Figure 6: Frese et. al. General Model (M. Frese et al., 1999)

The study utilized four locations from one company in the Netherlands with a sample of 147 usable responses. The study used a 5-point likert scale for all questions pertaining to all factors asked participants if they strongly disagreed, disagreed, neutral, agreed, or strongly agreed with statements and were coded into values one through five accordingly. The exception was the measure of ‘writing and submitting’ and ‘rewarded suggestions’ factors which were a count of how many ideas were submitted total and the number of implemented suggestions by each participant. In addition, the occupational personality was broken into two factors of aspiration (made up of questions from subjective initiative and higher order needs) and proactiveness (mapped to questions from control aspiration and interest in work innovation) (Frese, Kring, Soose, & Zempel, 1996). Through multiple iterations of the model, adjusting for non-significant relationships, and altering dependent variables, the final and best fitting model was denoted as Model B*. Table 6 and Figure 7 provides details of the model. This model excluded rewarded suggestions and concluded system responsiveness and support by supervisor as insignificant in affecting writing and submitting ideas (M. Frese et al., 1999).

Table 6: Frese et. al. Path Model Fit Measures (M. Frese et al., 1999)

	Chi ²	df	p-value	GFI	AGFI	Standardized RMR
Model A	65.99	20	0.00000	0.95	0.83	0.066
Model A*	26.09	18	0.098	0.98	0.92	0.038
Model B	5.56	6	0.47	0.99	0.94	0.016
Model B*	3.84	5	0.57	1.00	0.97	0.018
Model C	10.73	9	0.29	0.99	0.88	0.025
Model C*	11.61	15	0.71	0.98	0.94	0.034

Note GFI = Goodness of fit index; AGFI = Adjusted goodness of fit index; RMR = root mean square residual; * = improved model, see text.

Model A: Suggestions submitted as dependent variable (rewarded suggestions not included).

Model B: Parsimonious model with suggestions submitted as dependent variable (rewarded suggestions not included).

Model C: Parsimonious model with suggestions submitted and rewarded suggestions as dependent variables.

The final model supported that the the personal ability to innovate and the internal desire to control their work enviornment positively affects having ideas and then submitting them. The model also demonstrated that inhibitors negatively impacted employees submitting suggestions as predicted and also found that higher complexity in jobs leads to a decrease in creativity. However, model B* shows that the ability to have a suggestion chosen and rewarded has no impact on writing and submitting. More importantly, the support by supervisor and system responsiveness factors expressed as very important in prior qualitative work, were found non-significant in supporting higher frequency of employee contributions.

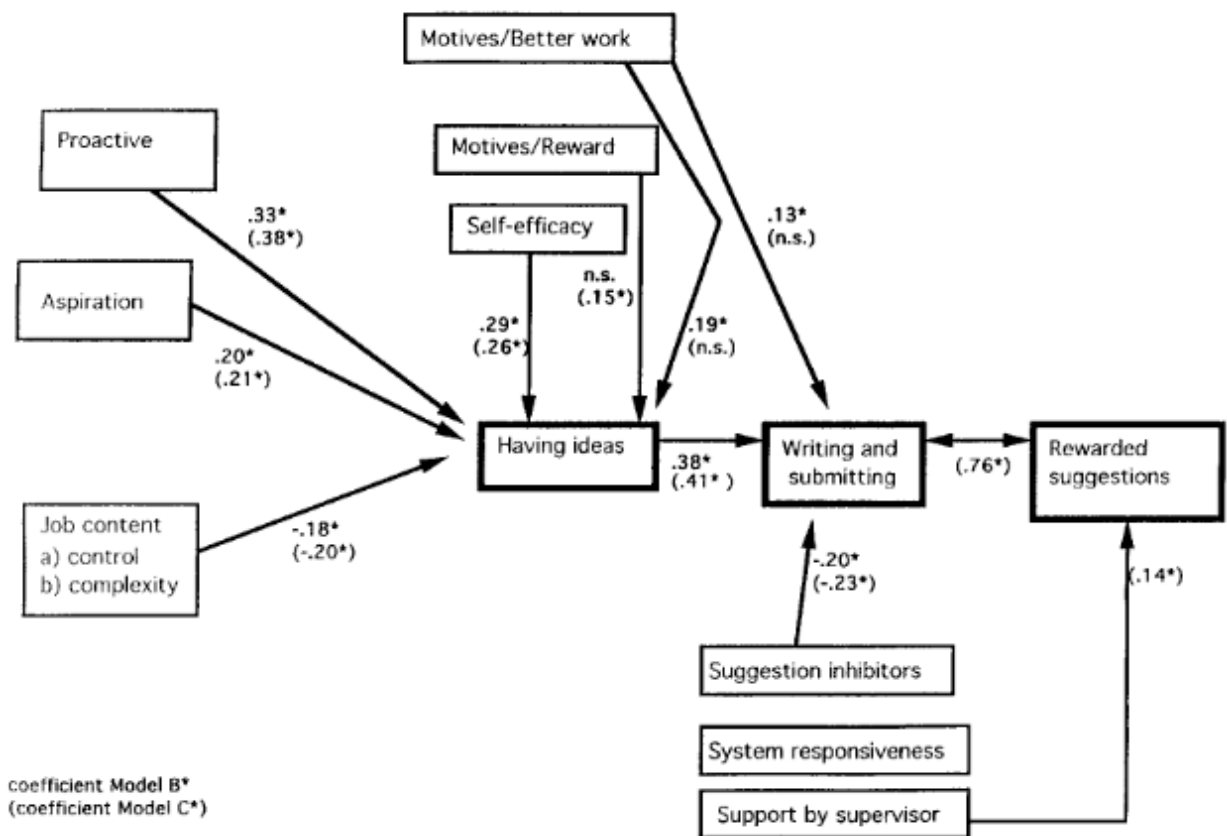


Figure 7: Frese et. al. final two models (Michael Frese, Eric Teng, & C.J.D. Wijnen, 1999)

Model C* better aligns with the theoretical framework observed in qualitative studies and reflects the described importance of discarded factors in Model B*. Model C* was created by adjusting B* according to modification indices. Although a poorer fitting model, the adjusted C* also seen in Figure 7, does not exclude the rewarded suggestions factor and is supported positively by the support from supervisor factor. In addition, the number of rewarded suggestions positively correlated with the writing and submitting suggestion. The disparity in model fit between B* and C* is not analyzed or explicitly explained in the final conclusions. Both were treated as equally good fits in final discussions (M. Frese et al., 1999).

Understanding the Impact of Employee Innovation

A large portion of the literature addressing employee innovation does not directly measure the added value of the frontline worker contributions in relation to the overall organization. This may be due in part to a lacking operational definition of success for employee innovation, as previously discussed. However, a review of the literature provides a compiled list of recurring critical measures of success to be: customer satisfaction, employee satisfaction, new revenue, cost saving, process improvements, commitment and accountability, sense of security, employee confidence, and product quality (Lasrado et al., 2016). The supporting literature for each measure is shown in Table 7. These are the metrics with observed impacts in various case studies which have been used to determine the success of a suggestion system. However, certain metrics appear more often than others within the compiled literature (Lasrado et al., 2016). This eclectic list demonstrates the varying level at which success is measured and how organizational context may influence the selection of a metric.

Four of the most common success measurements for employee suggestion systems are related to the wellbeing of the employees. Improved employee wellbeing in the form of satisfaction, confidence, security, and commitment is linked to greater employee performance and subsequently product quality and customer satisfaction (Cui et al., 2016; Fell-Carlson, 2004; Lloyd, 1996). However, these metrics do not directly address the larger impact on company performance.

The other five measurers for success are metrics which should capture the impact on company performance as a whole. Further investigation into the literature of the case studies that report these metrics as success criteria shows the evaluation on smaller subsets of suggestions or impact of a singular, radical improvement (Lasrado et al., 2016). This form of evaluation can skew understanding the employee suggestion system's impact and sustainability. While the impact of one contribution may improve company performance greatly, one innovation is not representative of the entire employee suggestion system. Therefore, this form of evaluation justifies allowing a system to rely completely on individual contributions rather than the collective, long term benefit. Analysis based on one contribution with a large enough impact to justify the resources to support other contributions of smaller impact ignores the purpose of a system to continually improve the organization's competitive advantage. Focus on the singular, large contribution limits the evaluation onto only the cost and benefit analysis presently. The desire for quick, large return on investments in supporting employee innovation does not negate the need for a proper, holistic analysis of the value of suggestion systems.

Table 7: Success Measures and Literature Support (Lasrado et al., 2016)

	Company Loyalty	Cost Saving	Customer Satisfaction	Process Improvement	New Revenue	Product Quality	Job Security	Employee Satisfaction
Bassford & Martin (1996) (Bassford & Martin, 1996)	X	X	X	X	X	X	X	X
Carrier (1998) (Carrier, 1998)	X	X			X		X	X
Gorfin (1969) (Gorfin, 1969)	X			X			X	
Dickinson (1932) (Dickinson, 1932)	X						X	
Milner, Kinnell, & Usherwood (1995) (Milner, Kinnell, & Usherwood, 1995)	X						X	
Lloyd (1996) (Lloyd, 1996)		X			X			X
Khanna, Mitra, & Gupta (2005) (Khanna et al., 2005)		X			X			
Leach, Stride, & Wood (2006) (Leach, Stride, & Wood, 2006)		X		X	X			X
Marx (2008) (Andrew E. Marx, 2008)			X					
Marx (1995) (A. E. Marx, 1995)								
Gupta, McDaniel, & Herath (2005) (Gupta, McDaniel, & Herath, 2005)			X					
Arif (2010) (Arif, Aburas, Al Kuwaiti, & Kulonda, 2010)			X			X		X
Arthur (2001) (Arthur & Aiman-Smith, 2001)				X				
Crail (2006) (Crail, 2006)				X		X		
Ahmed (2009) (Ahmed, 2009)						X		
Islam (2007) (Islam & Shuib bin Mohd, 2006)						X		X
Bell (1997) (Bell, 1997)								X
Binnewies, Ohly, & Sonnetag (2008) (Binnewies, Ohly, & Sonnentag, 2007)								X
Basadur (1992) (Basadur, 1992)								X

The expenses of an employee suggestion system extend beyond monetary and tangible considerations. Beyond the budget to support materials and man-power for ensuring the system's

operations, there must be: dedicated time for employees to create ideas, dedicated time for supervisors to support employees and their ideas, supervisors with enough experience and training to lead and support their frontline employees, and support from executive management for the purpose of employee innovation (Engelen et al., 2018; Lasrado et al., 2016). There is a great disparity in implementing employee engagement programs within companies propagated by claims of no additional money or time to budget for engagement programs or a lack of experience and support from executive and senior management to make employee engagement a priority (Fordham, 2016). An analysis of the holistic impact of the entire employee suggestion system on company performance can aid in the justification of the resources needed to implement employee innovation as a form of engagement.

Baer and Frese (2003) modeled the direct effect of process improvements as a result of employee innovation on company performance and measured the significant positive relationship. This supports the operational hypothesis of all employee suggestion systems. The model also included systematic factors of climate for initiative and climate for psychological safety as mediators between innovations and performance. Climate for initiative captures how well company culture allows for employees to act on self-efficacy. Climate for psychological safety captures how well company culture supports the trustworthiness for employees to have their ideas heard without fear. While many studies chose various performance metrics as indicators for successful employee innovation, Baer and Frese (2003) is one of the few studies that systematically considers if metric improvement could be influenced by the system of factors promoting the generation of ideas in addition to the ideas ultimately utilized.

Critiques and Gaps within Connecting Literature

Studies surrounding employee innovation have collectively established the path of stepping stones from motivational theory to using suggestion systems to improve competitive advantage. This path and the connections through literature is depicted in Figure 8. Motivational theory, from Taylor to Vroom, provided the core concepts for building the first theorized systems with expected results. However, the expected results were never confirmed through testing and evaluation. Case studies that report success of employee innovation within companies builds off of motivational theory by utilizing different elements to encourage contributions. Case studies are tangentially connected to theory-based systems since both sets of literature share many of the same factors that should encourage employee innovation. Within case studies, some utilize quantitative methods to support the inclusion and use of factors by measuring the individual effect on employee innovation. However, these quantitative methods measure the success of employee innovation at different points along the path. Within a sequence of employee innovation there is idea generation, elicitation, and utilization. Ultimately, the journey through these three steps of innovation should impact the competitive advantage. However, the competitive advantage is latent and is measured by key performance indicators (KPIs) specific to organizational context.

Studies that seek to measure the culture of innovation generally stop at the idea generation part of the sequence. A culture of innovation indicates that employees are thinking of ideas but does not explicitly measure if the ideas are being submitted for consideration or if those ideas are usable or valuable. One step further in the sequence are studies using the number of ideas submitted as a measure of success within employee innovation which measures the achievement of elicitation. Once more, that does not guarantee the ideas contributed are valuable to the organization.

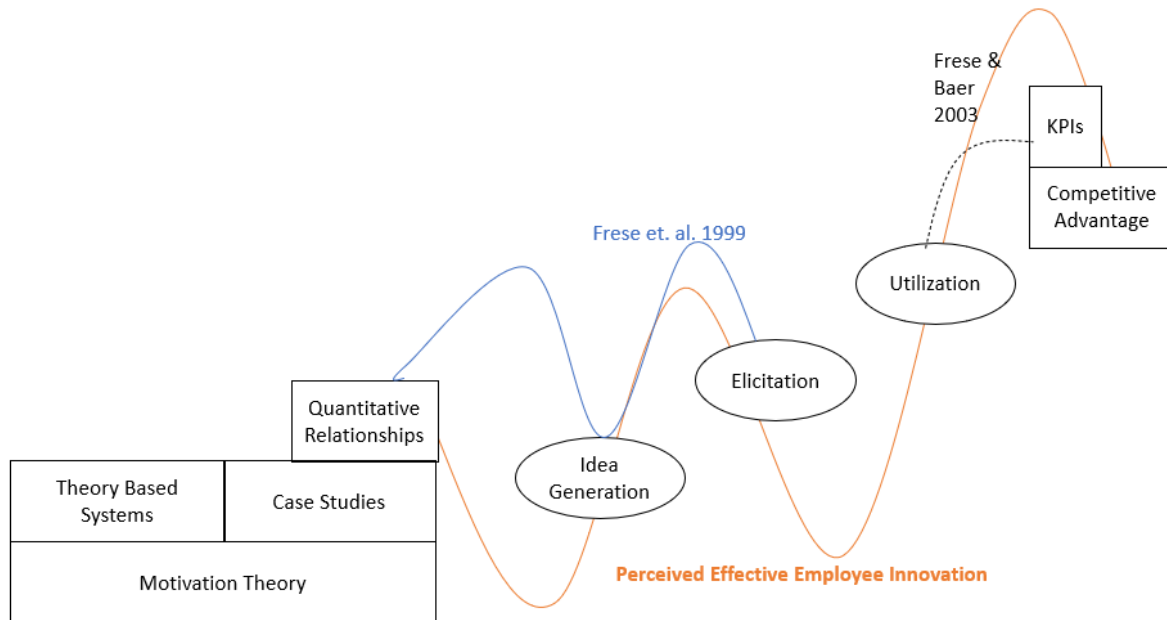


Figure 8: Gaps within Connecting Literature

Frese et. al. modeled through elicitation with the 1999 general model and provided the connecting factors between generation and elicitation. While rewarded suggestions within the 1999 general model could represent the step of utilization, the measured effect showed how the factor rewarded suggestions was an influential variable rather than another response (M. Frese et al., 1999). Furthermore, the best fitting model B* did not adhere to the theory used to build the general model and the C* model sacrificed fit for modified, theory-based relationships. Neither of these models were reconciled and prevent this line of study from moving past elicitation to connect idea utilization to the employee innovation system.

The study by Frese et. al. (1999) and the final two models provide two possible conclusions without a definitive choice. First, some organizational factors, such as support from a supervisor, are not as important in achieving a higher number of submitted contributions from employees as the literature and theory suggests. This conclusion posits the ability to properly achieve employee

innovation relies heavily on individual employees' internal motivations and desires as well as their ability to innovate while properly removing inhibitors. The relationships previously observed and emphasized in qualitative literature may not be supported in quantitative data, therefore a possible misattributed and non-significant factor in employee innovation systems.

The second conclusion is that the overall data set or model built does not accurately reflect the theoretical framework. The study acknowledges limitations by sampling one company, although four locations, and defends the data via chosen factors and measurement tools. Sample era and location should not be significant contributors to poor model fit due to all historical studies ranging in international locations with workforces at the time of publication throughout decades. Therefore, the sample may not be a significant contributor to the poor fit of the final model. In regards to the structure of the model, much of the literature used as grounded theory to build the 1999 model is consistent with these modern studies with a few notable exceptions.

One of these notable exceptions is the over-emphasis of self-efficacy within the model. Bandura originally defined self-efficacy as "people's judgements of their capabilities to organize and execute [a] course of action required to attain designated types of performances" (Bandura, 1986, p.391). Frese et. al.'s factor for self-efficacy is more concerned with the situational ability to think of a suggestion and submit it; this only represents one facet of the original self-efficacy definition (M. Frese et al., 1999). But the factors of proactiveness, made up of subjective initiative and higher order need strength, and aspiration, comprised of control aspirations and interest in work innovation, are all additional facets to the original self-efficacy definition. Subjective initiative has been concluded to act as a motivator for higher involvement at work, increased idea generation through involvement, increased need for achievement, and increase in self-efficacy

(Bandura, 1977, 1986; Bateman & Crant, 1993; M. Frese et al., 1999; Kuhl, 1992). Higher order need strength has been positively related to increased intrinsic motivation for persistence, increased involvement in activities that go beyond required work, and increased mastery experience (Bandura, 1977, 1986; Oldham & Cummings, 1996; Warr, Cook, & Wall, 1979). Studies found that those with high control aspirations actively take charge of situations at work which leads to higher mastery experience (Ashford & Black, 1996; Bandura, 1977, 1986). Those with higher interest in work innovation search for ideas which leads to higher mastery experience (Patchen, 1965). Therefore, five measured factors represent at least one or more facet of self-efficacy. With two factors of the general model being concerned with an employee's personal motivation; this leaves only four factors that explain external influences on employee innovation. This over-emphasis on self-efficacy may be contributing to issues with conclusions in the 1999 study with regard to the limited organizational factors measuring as non-significant.

Another notable exception is the lack of factors such as peer-to-peer relationships and time to innovate. These factors did not become prominent in employee innovation literature until after the publication of 1999 study. Hence, there may be factors missing from the model due to the time gap between publication and this review. These factors could provide additional theoretical support and may improve fit by explaining greater amounts of variance.

These two possible conclusions sit opposite each other on extreme ends; either decades of qualitative data supporting the presence of various organizational factors' effect on employee innovation is incorrect or the general model does not accurately reflect the same qualitative data through measured relationships or chosen sample. Simply put, there is a discrepancy between

historical research and the construction of the 1999 study. The true reality of employee innovation systems may lie somewhere between these extremes.

Since the publication of Frese et. al.'s (1999) study there has been no expansion or further investigation into any of these possible explanations from the quantitative approach. This study has been referenced as a possible framework and support for personal initiative literature, but none reconcile follow-up data with either explanatory option. The measurement and confirmation of what factors and relationships significantly affect achieving employee innovation will properly inform organizations where resources are better utilized and where they are wasted in pursuit of this goal.

With the goal of employee innovation aimed at improving competitive advantage, the sequence depicted in Figure 8 should link to a measurement of overall company performance. Effective utilization should have an effect on key performance indicators (KPIs) that indicate the health of the organization or change in the competitive advantage. While the methods of Baer & Frese (2003) connected this piece theoretically, the measurements and implications of the concluding model have practicality issues.

The 2003 SEM developed lacks some of the complexity of the system that supports process improvements from employee innovation. For instance, the model only includes climate for initiative and climate for psychological safety with both having a direct effect on company performance and mediating the effect of process improvement on company performance (Baer & Frese, 2003). Both climate factors are included in the 1999 employee suggestion system models and studies in some capacity as mapped in Table 8. Frese, one of the authors that produced the 1999 SEM of employee suggestion systems, found many other factors significant to the generation

of process improvements from frontline workers that are not included within this 2003 study (Baer & Frese, 2003). Additionally, these climate factors mapped to several factors from the 1999 SEM study that were found to be non-significant in affecting employee innovation including system responsiveness and supervisor support. Furthermore, making these two factors mediators of the relationships between process innovation and company performance negates the purpose of measuring the direct effect. If factors are to be considered for mediating the effect, the holistic system must be considered.

Another issue with Baer & Frese's model is the measurement of company performance. Company performance is measured as a return on assets between 1997 and 1998 (Baer & Frese, 2003). The return on assets does not reflect the explicit improvement of performance within a company due to various influences from factors not captured within Baer & Frese's study. The measurement of company performance with the relationship to process innovation does not directly match up within the context of invested asset value determined by market performance and may be too high level of a performance indicator for success criteria. A very loose assumption used in the development of the model was that process improvement would lead to cost saving and therefore, more capital to invest that would have a return. This assumption clarifies the choice to use return on assets as the measurement, but the theory used in developing the model does not support the use of return on assets. Overall, the study provides literature framework support for connecting utilization of ideas to organizational KPIs but was demonstrated in a narrow scope.

Table 8: Corresponding Factors Between Studies

Baer & Frese (2003) Factor	Frese et. al. (1999) Factor
Climate for Psychological Safety	System Responsiveness
	Supervisor Support
	Suggestion Inhibitors
Climate for Initiative	Self-efficacy
	Proactive
	Aspiration

The gap in the literature between utilization of employee innovation and the possible change within an organization's competitive advantage is cause for concern due to the many management publications suggesting the use of certain forms of employee engagement to produce a hypothesized improvement in performance metrics. Without the bridges for this gap being understood, the prescribed tools within employee innovation as a form of engagement is unsupported, misguided, and a potential waste in resources. An analysis to connect the sequence of factors resulting in employee innovation to a competitive advantage with direct measurement of the impact of a suggestion system on key performance indicators for companies while considering the factors that support generation, elicitation, and utilization of ideas will close this gap. The current literature reflects these as separate considerations for study and can either provide effective factors to promote employee innovation or a measured change in singular metrics as a result of one contribution. Thus far, the conclusions from these studies are limited in practicality when building an employee suggestion system. They also do not define the impacts of existing organizational factors. This research seeks to bring both pieces together in a systematic analysis and connect the entire sequence. The result of this research will provide clarity to the connection between factors for promoting employee innovation and the effect in the organization as measured by the competitive advantage.

CHAPTER THREE

METHODS

A Systematic Modern Study of Models

This study will bridge the gap within the literature by focusing on constructing a model that connects employee innovation and organizational competitive advantage. The model will be constructed from both sides of this gap and connect at the utilization of employee innovation. Therefore, one part will build upon the Frese et. al. (1999) study and the second will focus on resulting innovation and the consequence experienced as a competitive advantage.

As one of the only quantifiable models of suggestion systems available, the study by Frese, Teng, and Wijnen (1999) needs greater, modern consideration. The model posed two possible conclusions that are potentially valuable to understanding employee innovation and where organizations can best allocate resources in support of this objective (M. Frese et al., 1999). However, the study is two decades old and was performed at a singular organization as a participant group which limits applicability to modern industry. These limitations can be remedied with a secondary study in the current market environment of the United States.

A secondary study also offers a chance for expansion of the model to include recent qualitative developments in innovation and engagement. The general model shown previously in Figure 6 for Frese et. al. does not include an aspect of time to innovate and knowledge sharing between employees; two elements emphasized as important in supporting employee innovation (Boyd, 2017; Yates, 2011). Furthermore, the best fitting model previously in in Figure 7 concludes that support from management and system responsiveness is non-significant when attempting to

achieve employee innovation (M. Frese et al., 1999). This is contradictory to much of qualitative evidence provided in the study's framework (M. Frese et al., 1999). Additionally, the concept of manager support and system responsiveness remained a key theme in recent qualitative studies (Boyd, 2017; Yates, 2011). Therefore, a modern study allows integration of newly described components from suggestion system studies and can verify if certain qualitative data over emphasizes non-significant relationships and factors.

In addition to including modern factors in the model, this expanded study is also an opportunity to bring the system of employee innovation into context of the organization as a whole. The 1999 model has multiple factors that address intrinsic characteristics of individual employees, but only three addressing organizational factors (M. Frese et al., 1999). The intrinsic characteristics include five factors that over represent the multiple facets of self-efficacy. This emphasis on intrinsic characteristics over organizational factors implies the success of an employee suggestion system as a product of the type of people employed rather than the type of environment an organization creates for innovation. The conclusions that can be drawn from a model focused on employees' intrinsic characteristics limit the response of an organization in action to address these factors. Examples of actions in response to intrinsic attributes is by using some innate characteristics to inform changes in hiring practices, to use motivations may support the use of a reward system, and possibly determine appropriate training for more malleable traits. Pragmatically, this model orientation identifies failure in managerial support to fulfill the tenets of expectancy theory in pursuit of employee innovation; but does not support how or why the shortfall exists. This secondary study will expand the model with support from recent studies to orient the factors with balanced focus on the entire system of the organization. This change enables

organizations to understand what structures within their control affect the performance of an employee innovation system in a modern context.

The proposed study furthers the validity and development of the model developed in Frese, Teng, and Wijnen (1999) with expansions on the model and inclusions of comparative metrics for competitiveness of companies and between organizations.

Structural Equation Model Considerations within Employee Innovation

The objective of this study is to address the gap in understanding how systematic factors affect employee innovation and subsequently a perceived competitive advantage. This gap will be closed by expanding the Frese et. al. (1999) general model to more accurately represent employee innovation systems in a modern-day context. Similar to the methods employed by Frese et. al. (1999) this study will utilize structural equation modeling (SEM) to systematically measure the impact of factors affecting employee innovation. SEM was selected since it provides a more complete picture of a system by utilizing latent variables to include the presence of error within factors. Additionally, SEM allows for the analysis of latent variables; a capability not utilized in the 1999 study. The benefit of latent variables in SEM is the ability to capture factors that are not directly observable.

The inclusion of latent variables may allow for additional benefits, such as reduced model dimensionality while ensuring adherence to the foundational concepts used to construct the model. Model dimensionality increases as indicators are loaded onto more than one variable and therefore creates a more complex model to fit. Model dimensionality is reduced by grouping each observed variable as an indicator of a singular, more abstract concept represented by a latent factor (Kline, 2015). These observed indicators are often a psychometric measure obtained through

questionnaires. All but two of the observed variables in the 1999 study were measured using psychometric tools. The expanded model will also leverage psychometric tools to measure many of the observed variables. The subjective nature of psychometric measures relies heavily on the perception of participating individuals. Using latent variables in the construction of the expanded employee innovation SEM will ease the effect of participant perception on the overall fit of the model and provide flexibility to the indicators based on the abstract concepts included.

This study will expand the model by including observed factors supported by modern literature and exploring the use of latent variables to more accurately reflect the relationship of factors within a system supporting the larger concept of employee innovation. The framework of data collection and analysis were developed using research questions that, when answered, will close the literature gap. These research questions defined the type information needed, and therefore, the factors and relationships needed for measurement.

Research Questions

The appeal of focusing resources and efforts within organizations on employee engagement comes from the potential benefits of engaged employees. Benefits reaped from engaged employees include increases in service and product quality, higher productivity, higher attendance rates, lower turnover, and higher customer satisfaction (Lasrado et al., 2016). All of these benefits contribute to a perceived competitive advantage of an organization. Therefore, to better justify putting resources into supporting employee innovation, any system must promote employee engagement.

RQ 1: Does employee innovation achieve the effects of employee engagement?

Attaining employee engagement reaps benefits for an organization across various performance metrics including increased customer loyalty, increased productivity, increased

product quality, and decreased employee turnover (Lasrado et al., 2016). Therefore, the use of employee innovation as a form of engagement should observe similar effects on performance. However, each case study has a unique way of measuring employee innovation that is not repeated in subsequent publications. Many seek to measure a culture of innovation, using some indicator of how empowered employees feel to think of ideas or state of innovation (Malhotra, Majchrzak, Kesebi, & Looram, 2017; Werner, 2017). This form of measurement captures the stage of idea generation. Other studies strictly observe the number of ideas communicated from employees to management, thus capturing the actual submission of suggestions (M. Frese et al., 1999). Very few have addressed the implication of implementing the submitted ideas. Furthermore, these often have lacked representation of utilizing employee innovations explicitly toward organizational improvement.

The constructs of employee innovation, employee engagement, and perceived competitive advantage previously discussed should be reconciled with the narrower latent variables as defined in this study. Employee innovation encompasses a broad range of both incremental and radical improvements. The effort of employee innovation is focused on improving the effectiveness of an organization through frontline ideas and initiatives but the variable utilized a narrower representation. Employee innovation measures the occurrence of innovation which is a subset of the process of a suggestion system. Achieving innovation then becomes defined as satisfying the multiple steps from creating, communicating, and then using an idea in the process of a suggestion system.

All three of these pieces, generation, submission, and utilization, may individually contribute to engaging employees as shown throughout the decades of literature (Kelly, 2018;

Mazur et al., 2012; Serpell & Ferrada, 2007). The Frese et. al. model (1999) addressed these three pieces as three different response variables: having ideas, writing & submitting ideas, and rewarded ideas. If employees can be engaged at any one of these stages, then the performance metrics used to represent an organization's perceived competitiveness should reflect the impact of the engagement.

Employee engagement is defined as the emotional connection to one's organization and its goals. When this construct is reframed in relation to employee suggestion systems, the latent variable is focused on understanding how employees own their work as a result of achieving innovation. Likewise, the intangible construct of the competitive advantage is made palpable by defining perceived competitiveness. The latent competitive advantage hinges on adaptability and is reflected in the survival and growth of the organization. Perceived competitiveness is defined by more concrete measures of performance within the organization as a representation of improvement over time. There is no set standard of performance metrics to determine the concrete definition of the competitive advantage, this study defines the measurable perceived competitiveness as organizational metrics, such as profit and customer retention, that are specific to larger organizational goals.

The research question will be answered through the hypothesized relationship between the three latent constructs of employee innovation, employee engagement, and the associated organizational performance metrics as reflected below.

H1: Employee innovation positively affects employee engagement at any point in the suggestion process.

H2: Employee innovation positively affects a perceived competitive advantage at any point in the suggestion process.

H3: Employee engagement and perceived competitive advantage are positively correlated.

The steps of idea generation, submission, and utilization collectively represent the process of innovation and serve to gauge the system's level of employee engagement within an organization. Idea generation is the act of an employee critically thinking about their work in terms of opportunities, idea submission is a result of an employee taking ownership and responsibility for those opportunities within their work, and idea utilization demonstrates the compatibility of employee initiatives with the priorities of management (Binnewies et al., 2007; Herzberg, 1979). All three steps to achieve engagement through innovation must be supported by a system of both organizational factors that management can control and factors intrinsic to individual employees that provide awareness to an organization.

This study seeks to improve the usefulness of Frese et. al.'s (1999) conclusions which relied heavily on intrinsic attributes of employees such as self-efficacy and motivations. Instead, this study will include greater representation of organizational factors. While there is continuous support in literature for facets of self-efficacy and motivation of employees significantly affecting employee innovation, the over emphasis of these factors limits organizations to focusing on the type of people they hire rather than organizational structures in place for the purpose of influencing innovation. Both intrinsic employee attributes and organizational structures are represented throughout literature and shown to affect the different stages of employee innovation.

The usefulness of the Frese et. al. (1999) model for an organization is questionable since there are fewer factors in their model that are within control of management than those measuring

existing intrinsic values of their employees. Ultimately, the collections of factors within the system inform the organization what structures to invest resources in when supporting employee innovation, so balance is problematic.

RQ2: What organizational factors impact employee innovation?

For organizations to harness benefits of employee engagement through the use of suggestions systems, they must create systems that directly impact employee innovation. These systems will then promote the generation and submission of ideas for review and implementation. Organizations have control over many factors within their working environment that can promote or hinder employee innovation. The working environment contains many devices explicitly defined by management such as roles and responsibility, the work itself, and how regular business processes (e.g. communications) are performed. There are also devices that are less explicitly defined by management but still regulated by company mission and values, such as relationships between peers and between employee and supervisor, that can impact the creation and communication of ideas within an organization. This research question will be answered by measuring the hypothesized relationship between factors of organizational structure and employee innovation as shown below.

H4: Formal devices positively affect employee innovation.

H5: Formal and informal relationships positively affect employee innovation.

RQ3: What impact do personally intrinsic factors of individual employees have an impact on employee innovation?

The literature indicates not all factors impacting employee innovation are within management's control. These factors are specific to individuals and represent personal attributes

intrinsic to each employee. The factors concerning personal attributes within a collective group of employees are outside the of organizational management unless done though changes in hiring practices. However, the impact of personal attributes on employee innovation may influence how other tools are designed. For example, the attributes of employees could indicate what kind of rewards might elicit higher engagement within an innovation system. Similarly, the level of self-efficacy can determine the type of managerial structure that best empowers employees in the innovation system. But these factors act as indicators of other possible structures under control of management rather than the effectiveness of existing structures within the employee innovation system. This research question will be answered by the hypothesized relationship between intrinsic employee attributes and employee innovation as shown below.

H6: Employee self-efficacy positively affects employee innovation.

H7: Employee motivation factors positively affects employee innovation.

Each of these seven hypotheses demonstrate the use of latent variables and further justification for approaching the model using SEM methodology. The literature review has demonstrated a large collection of factors suspected of impacting the success of employee innovation but none study the same set of factors under the same definition and measurement. The analysis of this collection of studied factors supports the use of latent variables to identify the larger concepts within the employee suggestion system that are indicated by other observable factors. These hypotheses are reflected by the latent variables' structural equation model in Figure 9.

By seeking to understand the most significant factors in the employee innovation system, this study will find a useful balance between organizationally controlled structures and intrinsic

employee attributes. This balance will be accomplished by including a limit of one observable factor for each concept within both categories of intrinsic and organizational factors without deconstruction of any one concept into multiple niche factors. Creating a model that captures this balance and the strength of each factor begins to close the gap between the generation, submission, and utilization of employee innovation. The remainder of the gap within the literature is closed by connecting utilization of employee innovation to the larger context of the organization supporting the suggestion system. The perceived benefit of employee innovation as a form of engagement should affect larger organizational performance. The experienced benefit to overall organizational performance should be represented by perceived competitive advantage. Perceived competitive advantage is measured by specific metrics of interest that indicate various facets of organizational health, mission, or performance.

By seeking to understand the most significant factors in the employee innovation system, this study will find the correct balance between organizationally controlled structures and intrinsic employee attributes. This balance will be accomplished by including a limit of one observable factor for each literature identified and supported concept within both categories of intrinsic and organizational factors without deconstruction of any one concept into multiple niche factors. Creating a model that captures this balance and the strength of each factor begins to closes the gap between the generation, submission, and utilization of employee innovation. The remainder of the gap within literature is closed by connecting utilization of employee innovation to the larger context of the organization supporting the suggestion system.

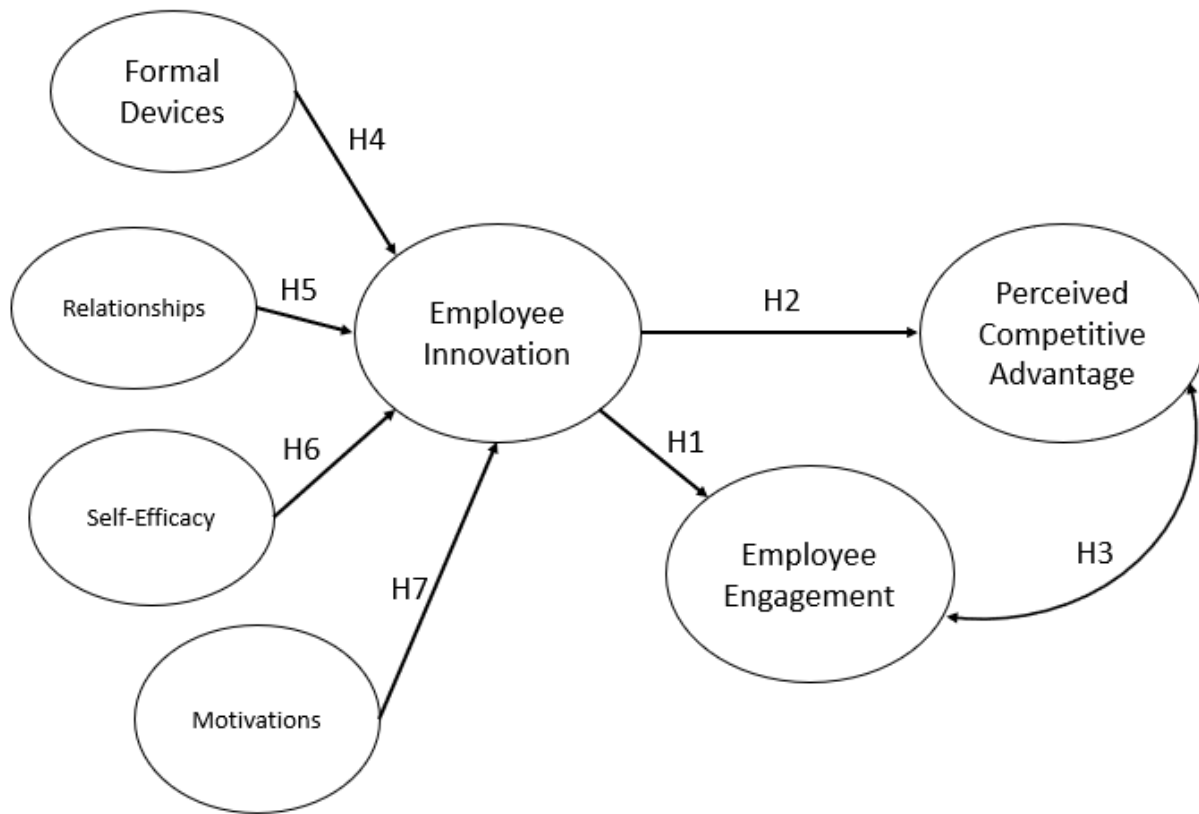


Figure 9: Suggestion System Latent Variable Structural Equation Model

The connection between employee engagement through innovation and perceived competitive advantage will determine the value of resources invested in focusing on factors included in suggestion systems. The answers to these three research questions will close the gap and provide quantitative supported reasoning for organizational focus on specific factors and tools within an employee innovation system. Each research question will be answered through the set of hypotheses developed alongside the construction of the models for this proposed study.

The Expanded Employee Innovation System Model

To address the three research questions, this study expands the 1999 model using research conclusions compiled from relevant literature and case studies from the past two decades (Kelly, 2018; Pilly, 2016; Xin Li, 2016; Yates, 2011). The expansion of the 1999 model will include the introduction of the latent variables represented by the seven hypotheses. Observed factors, both from the 1999 study and those added in this study, serve as indicators of latent themes by grouping commonalities between factor definitions. The observed factors will be assigned as indicators to the best aligning variable based on the evidence from compiled literature and tested during analysis. Latent models provide flexibility to systems attempting to model indirectly measurable factors through the use of collective indicators. Therefore, the use of a latent SEM allows the grouping of indicators by strongest correlation to support the assignment according to theory (Kline, 2015). By restructuring the 1999 model into a latent SEM with additional observable factors, this study will determine the latent factors and respective indicators best fitting an employee innovation system.

In order to address Research Questions 2 and 3, the following expansions of the model will provide a more representative balance of both organizational structures and intrinsic employee attributes as indicators to the latent constructs. Expanding the general model from 1999 serves two purposes. The first is to address the impact of employee innovation on a larger organizational level. The second is the inclusion of recently studied factors within employee suggestions systems. This research will evaluate each latent factor and observable indicator for their respective measured effect in the expanded model.

Using the framework from the general model in Frese et. al.'s study as a base as seen in Figure 6, each relationship was reviewed for justification to retain or change the modeled factor.

Each proposed relationship represents an effect in the process of employee innovation referenced in the compiled historical research. The expanded model shown in Figure 10 reflects all factors retained from the 1999 model in addition to the added factors and altered relationships.

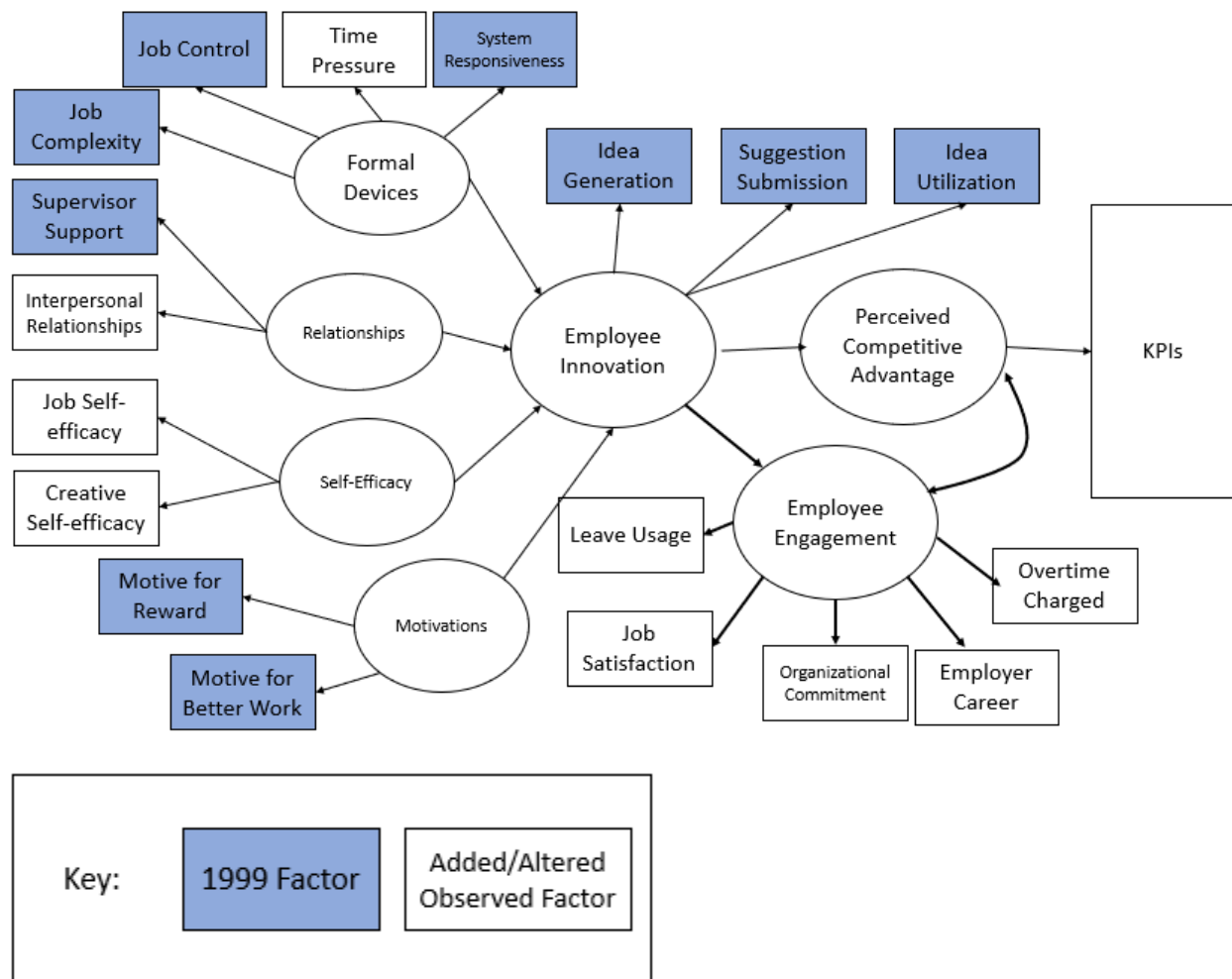


Figure 10: Expanded Model for Secondary Study

The gaps from the 1999 study evaluate within the context of conclusions from modern literature are addressed through various expansions and modifications as summarized in Table 9.

Motive for reward, motive for better work, supervisor support, system responsiveness, and all three response variables were retained. Notably, the factors for self-efficacy, proactiveness, and aspiration were combined into a single self-efficacy factor to reduce the over-emphasis of personal intrinsic factors in the model. Additionally, job complexity and job control were separated into two independent factors since modern studies have shown the potential opposite effect each could have on employee innovation. And the last model modification of an original factor was the removal of suggestion inhibitors due to the instrument's eclectic items all being represented more thoroughly in other factors within the model. For further detail about the retention and modification of the 1999 factors, see the comparison in Appendix A.

The retained and modified factors' relationships were analyzed and grouped as indicators to an appropriate latent factor derived from the current study's hypotheses. The combined factor for self-efficacy previously modified was split into two measurable indicators, job self-efficacy and creative self-efficacy. This allowed the inclusive latent factor of self-efficacy to meet the two-indicator minimum to measure latent variables (Kline, 2015). Additional explanation for grouping of factors as indicators for the various latent factors seen in Figure 10 is provided in Appendix A. While the 1999 general model provided the base for the model in this current study, additional factors from modern studies still needed to be included.

Table 9: Model Expansion Gap Closure

Frese et. al. (1999) Gap	Expanded Model Solution
Over Representation of Intrinsic Characteristics	Combination of proactiveness, aspiration, and self-efficacy into a single factor
Under Representation of Organizational Factors	Separation of job complexity and job control as well as addition of relevant organizational factors (see gap for Missing Modern Factors)
Inconclusive Disposition of Specific Factor Effects	Retention of Supervisor Support and removal of Suggestion Inhibitors
Missing Modern Factors	Inclusion of interpersonal relationships and time pressure
Poor Fit Model	Rebalance of organizational factors vs intrinsic characteristic; reconstruction of the model with latent variables
Missing Larger Context of Employee Innovation Effect on Company	Addition of a latent factor for perceived competitive advantage and relevant key performance metrics and indicators.

The factors added for consideration in the model include interpersonal relationships and time pressure as detailed in Appendix A. Interpersonal relationships aims at capturing the peer-to-peer support and collaboration when creating and submitting an idea which fits as a second indicator of the latent factor of relationships. Time pressure addresses the negative effect on producing ideas from lack of time. The amount of time available throughout regular work may not be immediately associated with a specific purpose of time to innovate. Therefore, the factor of

time available as defined by a latent formal structure can be measured as an inhibitor to employee innovation.

The expanded model without the right-hand latent factors (engagement and advantage) can be used as an internal measurement but does not capture how companies compare in performance of the competitive advantage as a result of employee innovation. This gap is of concern because without measuring the connection between achieving innovation and the effect on organizational performance there is a misunderstanding of the value of investing resources in such systems as discussed in Research Question 1. Misunderstanding the value of employee innovation within the context of perceived competitive advantage can lead to dedicating resources to supporting a suggestion system that does not provide a return on the investment. Misunderstanding can also cause the opposite response in refusing to provide necessary resources because of the perceived lack of value for organizational performance. The gap can be closed, and Research Question 1 subsequently answered, by connecting the output of employee innovation systems to the effect on goal-oriented metrics as an indicator of the latent, perceived competitive advantage of an organization and correlating level of employee engagement. In order to connect the effect between employee innovation overall to competitive advantage, the effect of employee innovation on organizational performance metrics will be modeled as shown in Figure 10.

Successful employee innovation in the proposed model results in positive relationships between innovation, engagement, and perceived competitive advantage. The competitive advantage of an organization is measured by goal-oriented performance metrics and may be specific to an organization or generalized for the their industry. Therefore, KPIs for the latent

construct perceived competitive advantage will be determined with input of the participating organization.

The latent factor of engagement is critical to connecting the results of employee innovation to the achievement of a competitive advantage. The research surrounding systematic factors that affect engagement heavily overlap with those that affect innovation in both historical research and this proposed model (Andrew & Sofian, 2012; Imandin, Bisschoff, & Botha, 2016). Research surrounding the outcomes of engagement and the indicators of the latent construct are used interchangeably in many models. Additionally, the list of indicators and/or outcomes is synonymous with many of the KPIs suggested to measure competitive advantage such as attendance, job satisfaction, production throughput, and quality (Andrew & Sofian, 2012; Imandin et al., 2016; Nimon, Shuck, & Zigarmi, 2016). This reinforces the need to connect innovation to the achievement of engagement and to the measure of competitive advantage.

Supporting employee innovation can be costly, especially on time, and it can be difficult to justify the return on the investment for a suggestion system. Some studies report that the payback in resources expended is the improved morale and satisfaction and therefore higher productivity as expected from engaged employees (Cui et al., 2016; Konrad, 2006). However, these studies do not report quantitative values or a link to larger implications for the company advantage as a result of employee satisfaction. A few studies quantify the improvement or savings in an operation as a result of one suggestion that when implemented had a large impact (Fairbank et al., 2003; Mazur et al., 2012). But these studies ignore any additional suggestions or benefits that arose from the same system that lead to the one large improvement. As the proposed model is concerned with a

systematic consideration of the factors that affect employee innovation, the evaluation of the impact on the competitive advantage should also be systematic in nature.

The measured effects within the larger impacts model will address the gap between employee innovation system output and the contribution to competitive advantage through the achievement of engagement. Closing this gap will provide contextual understanding to the dedication of resources within an organization that makes efforts for using employee innovation as a form of engagement and the expected return on investment in the form of effect on performance metrics. In the case employee innovation does not affect or improve the competitive advantage quantitatively, then there may be a less costly way of engaging employees. Alternatively, if employee innovation provides improvements that significantly contribute to competitive advantage, then the conclusions of the proposed study are even more important in understanding how to develop a successful suggestion system.

Model Instruments

The expanded model and larger impacts model hinge heavily on common conclusions from compiled historical and modern studies surrounding employee innovation systems and observed outcomes. The conclusions from decades of literature provide a representative account of the systematic relationships surrounding employee innovation within an organization and the respective effects. This inclusion of both modern and historical findings in the construction of the proposed study provides a form of longitudinal verification of factors and their effects to be modeled. Additionally, the same inclusion takes into account the modern industry context and the multi-generational shift within the work force.

This representative set of models can confirm within a current workforce the presence and influential strength of factors within employee innovation systems and the resulting effect of that system on organizational performance. The measurement of effects within the expanded model and larger impacts model will largely use questionnaires using items from appropriate instruments. Additional items will be measured using historical data from the participant organizations. However, the initial use the psychometric instruments will need to be piloted prior to pursuing a full study to assess validity and internal consistency due to age of the instruments and the alterations made to the model.

The instruments are under evaluation due to the two-decade gap and altered factor relationships could possibly render internal consistency from 1999 irrelevant. An acceptable Cronbach alpha of 0.7 or higher is typically acceptable and those lower under special circumstance; all of the instruments used in the original Frese et. al. (1999) study meet these requirements. However, the modern context and reorientation of the factor effects requires assessment and revalidation of each instrument's internal consistency (Nunnally, 1994).

Having ideas was originally measured with two items in the 1999 study and had a Cronbach alpha of 0.63. The lower internal validity was, again, attributed to too few items. This can be remedied by including the three items from Coelho, Augusto, and Lages's employee creativity instrument in the expanded model's instrument for having ideas (Coelho, Augustob, & Lages, 2011). The employee creativity items have an acceptable level of internal validity and address having ideas in a compatible manner as the original two items from the 1999 study.

The methods of measurement for the remaining two indicators of innovation were originally objective counts of ideas submitted and those rewarded. However, as previously

discussed, strictly objective measures leave a gap in the representation of organizations without formal systems. This gap is directly contradictory of the purpose of the inclusive expanded model. The gap is closed by utilizing subjective instruments for both submitting ideas and rewarded ideas but having only one as a self-report. For submitting ideas, the instrument for creativity by Zhou and George was used for employees to self-report their communication of ideas (Zhou & George, 2001). The instrument for creativity, published in 2001, has been used in numerous other studies with high levels of internal validity (Baer & Oldham, 2006; Zhou & George, 2001). Additionally, the instrument has been used in cases of both employee self-report and supervisor evaluation of employee (Zhou & George, 2001). However rewarded ideas will be completed by a different participant to limit self-reporting bias. Rewarded ideas were measured using the instrument for creative performance by Madjar, Oldham, and Pratt published in 2002 (Madjar, Oldham, & Pratt, 2002). The instrument for creative performance measured the success of individual employee ideas as an evaluation completed by the participating employee's immediate supervisor. This method of measurement acted as an external measure to keep inflated values of self-reported creativity in check (Ng & Feldman, 2012; Reiter-Palmon, Robinson-Morrall, Kaufman, & Santo, 2012).

The instrument used to represent each of the five aspects of self-efficacy in one's job was a combination of the first five items from Frese, Kring, Soose, and Zemple's 1996 self-efficacy instrument. Frese et. al. found the self-efficacy questionnaire to have a strong positive relationship with persistence and initiative at work to address areas of opportunity of both improvement and work (Frese et al., 1996). However, the last item in the Frese et. al. 1996 self-efficacy instrument will be excluded since the wording does not address any creative or innovative aspect of beliefs, motivations, or capabilities of a person; rather, the ability to become re-employed. Creative self-

efficacy will use the three items from the originating study by Tierney and Farmer published (2002). That study found initiative for creative purposes had a larger effect on innovative performance than job initiative (Tierney & Farmer, 2002). Both instruments were developed in studies that use self-efficacy to support the critical and creative thinking for improvements and suggestions.

The instrument for supervisor support in the original 1999 study had a Cronbach's alpha of 0.63 which was attributed to only having two items within the questionnaire. In order to remedy low internal consistency, there was an additional three items from Majdar, Oldham, and Pratt's work support questionnaire published in 2002 (Madjar et al., 2002). The work support instrument has a total of six items, three to address supervisor support and three to address co-worker support. The three that address supervisor support combined with the two items from the original 1999 study will provide a total of five items to improve the internal reliability of the instrument. The original publication for the work support instrument found a significantly positive relationship with creative performance at work and therefore is aligned with the hypothesized relationship in the expanded model as well as the 1999 general model and instrument (Madjar et al., 2002).

The expanded model retained the original instruments used by Frese et. al. for both job control and job complexity due to acceptable Cronbach alpha values in both the original instrument publication and the 1999 study. Moreover, both publications used both instruments to map the relationship of job content to persistence and initiative for creativeness at work (Frese et al., 1996; M. Frese et al., 1999).

While the original instruments for each type of motivation have an acceptable level of internal reliability, there are concerns with the wording of the items for motivation for better work.

The wording for items pertaining to motivation for reward address hypothetical responses and the motivation behind the choice through statements following a phrasing pattern of “I would [action] if [motivating condition]”. The items for motivation for reward directly focus the motivating condition as the possibility for rewards. However, the wording for motivation for better work does not focus on motivation, but rather capability by the use of phrasing “I [concrete action] when [situational condition]”. This phrasing only addresses if the employee currently does an action when the opportunity arises, not why. Therefore, the wording of the three items for motivation for work was altered to match the phrasing pattern within motivation for reward.

Appendix B reflects all instruments for the expanded model factors including altered wording or newly chosen questionnaires. The original instruments and their internal validity along with any proposed changes are summarized in Table 10. This summary includes internal validity of the original study that developed the questionnaire items, the internal validity of the questionnaire in the Frese. et. al. study, and the internal validity of any proposed changed or additional instruments.

Table 10: Frese et. al. (1999) Expanded Instruments

Factor	Measurement Instrument	Cronbach's Alpha from Original Study	Cronbach's Alpha from Frese et. al. (1999)	Change [new instrument original study Cronbach alpha]
Having Ideas	Frese, Teng, & Wijnen (1999)	n/a	0.77	Employee Creativity from Coelho, Augusto, & Lages (2011) [alpha = 0.84]

Factor	Measurement Instrument	Cronbach's Alpha from Original Study	Cronbach's Alpha from Frese et. al. (1999)	Change [new instrument original Cronbach alpha]
Idea Submission	Number suggestion submitted for each participating employee	n/a	n/a	Creativity from Zhou & George (2001) [alpha = 0.96]
Rewarded Suggestions	Number suggestion rewarded for each participating employee	n/a	n/a	Creative Performance from Madjar, Oldham, & Pratt (2002) [alpha = 0.99]
Proactive (subjective initiative)	Frese, Fay, Hilburger, Leng, & Tag (1997)	0.84	0.87	All grouped into one factor; measured with Self-efficacy from Frese e. al. (1996) [alpha = 0.7] and 3 items from creative self-efficacy from Tierney & Framer (2002) [alpha = 0.87]
Proactive (Higher order need strength)	Warr, Cook, & Wall (1979)	0.91 (study 1) & 0.82 (study 2)		
Aspiration (Control Aspirations)	Frese, Kring, Soose, & Zempel (1996)	0.87	0.74	
Aspiration (Interest in Work Innovation)	Patchen (1965)	r = 0.87 (test-retest reliability)		
Self-Efficacy	Frese, Teng, & Wijnen (1999)	0.63	0.63	
Job Content (control)	Semmer (1984)	0.78	0.81	No composite score, both instruments keeps separate
Job Content (complexity)	Semmer (1984)	0.67		

Factor	Measurement Instrument	Cronbach's Alpha from Original Study	Cronbach's Alpha from Frese et. al. (1999)	Change [new instrument original study Cronbach alpha]
Support by Supervisor	Frese, Teng, & Wijnen (1999)	0.63	0.63	Add 3 supervisor specific items from work support questionnaire from Madjar, Oldham, & Pratt (2002) [alpha = 0.7]
System Responsiveness	Frese, Teng, & Wijnen (1999)	n/a	0.7	None
Motivation for Rewards	Frese, Teng, & Wijnen (1999)	n/a	0.76	None
Motivation to Better Work	Frese, Teng, & Wijnen (1999)	n/a	0.72	Re-phrase of all 3 items; see Appendix B
Suggestion Inhibitors	Frese, Teng, & Wijnen (1999)	n/a	none	Removed

The instruments to be used for measuring the effects of the added factors of time pressure and internal knowledge sharing were chosen from studies seeking to measure similar effects between factors. The instruments with the corresponding internal consistency from their respective original studies are summarized in Table 11. These instruments can also be found in Appendix B.

Table 11: New Factor Instruments

Factor	Measurement Instrument	Cronbach's Alpha from Original Study
Time Pressure	Baer & Oldham 2006	0.76
Internal Knowledge Sharing	Madjar, Oldham, & Pratt (2002) non-supervisor specific items from work support	0.7 for total item set

The expanded model used the three co-worker specific items from the same work support questionnaire by Madjar et. al. (2002) to measure internal knowledge sharing. The three co-worker specific items from the work support questionnaire, as noted with the supervisor specific items, supported a positively significant relationship with creative performance (Madjar et al., 2002).

To evaluate the inhibitor of time pressure, the factor was measured using 5 item instrument for experienced time pressure by Baer & Oldham (2006). The time pressure instrument consisted of four items from Basadur, Taggar, & Pringle and one question from a innovation climate questionnaire (ICQ) (Baer & Oldham, 2006). The four items from Basadur et. al. measured lack of time, reverse coded the instrument for not lacking time, and found a positively significant relationship with value of creative ideas (Basadur, Taggar, & Pringle, 1999). Furthermore, Baer & Oldham combined these four items with one ICQ concerning time dedicated to creativity and found high experienced time pressure results in lower creativity (Baer & Oldham, 2006). Both of these studies support the use of the experienced time pressure instrument to test the hypothesized relationship with employee innovation response variables.

All the aforementioned instruments used a Likert type rating scale of 1 to 5 or will have multiple choice options to be scored analogous to the same scale for each item, as shown in

Appendix B. The composite score for each factor will be the average value of the respective instruments collective set of items for each individual.

Research surrounding employee engagement suggests many indicators that overlap heavily with various performance metrics and benefits of engaged workforces due to the synonymous nature of predictors and outcomes within the literature (Andrew & Sofian, 2012; Jyotsna & Soumendu, 2010; Rana, Ardichvili, & Tkachenko, 2014). In order to gauge employee engagement individually, the expanded model will utilize both subjective and objective measures for indicators. The subjective indicators to be used in the model will be job satisfaction and organizational commitment (Nimon et al., 2016; Shuck, Nimon, & Zigarmi, 2017). Employee engagement refers to the emotional connection to an organization which influences behavior at work. Job satisfaction demonstrates a feeling of meaningful work while organizational commitment demonstrates the dedication to the mission and intention of staying to support operations (Shuck et al., 2017). As the concept of organizational commitment has developed, there has been distinctive facets to describe the emotional connection to an organization (Allen & Meyer, 1990a, 1990b). As a result, the role of affective, normative, and continuance commitment combine to represent the complex measure of organizational commitment

The psychometric instrument used for job satisfaction is one of nine facets of Spector's original job satisfaction from 1985 that focuses on meaning of work. The other facets were not included due to length and scope of the observed factor within this study. The instrument items are four statements rated from 1 to 5 (strongly disagree to strongly agree). The psychometric instruments used for the three facets of organizational commitment are those from the original Allen & Meyer (1990). These 15 statements are rated using the same scale as job satisfaction.

These psychometric questionnaires are not included in the pilot study since these are only indicators of a latent factor that was tested in both instruments' original studies. Job satisfaction had a Cronbach alpha of 0.78 and organizational commitment has been used in multiple studies with a ranging internal consistency of 0.74 to .88; both are above the acceptable threshold (Allen & Meyer, 1990b; Spector, 1985).

The participating organizations were two maintenance production groups within the Department of the Navy and on the same naval base. Both these groups have a mix of full time federal civilian employees as well as contractors who share the work loads in crossed capacities. One group is a routine maintenance division (RMD) while the other is a non-routine maintenance (NRM). The setting of production within the Department of Defense is rigid and procedurally driven. As a result, there is adequate data collected in daily operations to support the historical, objective indicators for this model.

The objective indicators for employee engagement are leave usage throughout the last full fiscal year and organizational career measurement. Dedication and emotional connection to an organization promotes attendance and discourages absenteeism (Bin Shmailan, 2016). Additionally, job satisfaction ties strongly to demonstrated attendance. (Bin Shmailan, 2016). There are multiple types of leave available to government employees but the most common is personal, sickness, or unpaid. These are coded in the payroll system and will be evaluated in the model individually and as a summation of the three types. High uses of sick leave should indicate disengaged employees, but due to the variety available an evaluation should be concerned with total leave in comparison to coworkers. Additionally, to account for new hires or retirees within

the evaluated fiscal year the measure will be a percentage of all hours charged. This will also control for paid holidays that do not require personal leave usage.

Organizational career measurement is an objective check against organizational commitment by evaluating the time within the industry and time with employer against the age of the participant. The demographics section of the questionnaire buckets the time ranges in years for an approximate evaluation. While there is support for subjective organizational commitment and job satisfaction, these objective measures pair with each to ensure balance in

The measurement of KPIs for the larger impact model will be strictly objective measures. The choice of KPIs to represent a competitive advantage is subjective to the context of an organization, therefore comparison must not be further dependent on perspective. The use of historical data reconciles a perceptually effective suggestion system with relative performance. Furthermore, the use of goal-oriented metrics shared between different organizations enables the ability to identify which employee innovation systems and the respective factor effect combinations achieve the greatest performance of the chosen representation of the competitive advantage. An objective measure of competitive advantage will be used in order to compare organizational performance without the potential for participation bias.

To the competitive advantage as a result of employee innovation the metrics measured must consider the goal of implemented suggestions and the organizational context of the participant group. Baer & Frese measured the improvement of competitive advantage as a result of process innovations in 2003. The modeled relationships took into account ten years to observe the change in their chosen metric for company performance, return on assets. This study posed a problematic conclusion due to the time frame and chosen metric. There was no provided reasoning

for the choice of ten years other than a sufficient, standard time gap to be used across all case companies and theoretically allow for an observed change. Additionally, return on assets is a metric that hinges on the concept that process innovations leads to more savings therefore allowing more assets to be invested in other portfolios. The change in return on assets over a ten-year period is indirectly affected by process innovations and can be linked back to market behavior and managerial decisions regarding portfolio investments. Therefore, the metric to quantify competitive advantage must be a goal-oriented measurement related to the results from employee innovations.

When considering continuous improvement efforts, the key performance indicators (KPI) commonly used revolve around reduction in waste. This reduction in waste, much like LEAN oriented principles, is concerned with efficiency in the form of doing equal or better with less; less time, less expense, less effort (Chiarini, 2013). The resulting KPIs can be measured in the form of cost or time reduction for an operation (Chiarini, 2013). However, waste reduction is not the only part of competitive advantage that can be quantified. Improvements to performance such as increased profit, increased customer retention, company growth, or decrease in safety violations and accidents are all possible goals of improvement efforts for companies. The metric each organization focuses on to gauge performance is largely dependent on industry, size, economic situation, and numerous other factors that make picking one to compare all potential case samples difficult (Flamholtz & Hua, 2003). Additionally, improvement implies a change over time as seen in the Baer & Frese (2003) study. To measure a change in singular performance a longitudinal study of not only the KPI is required, but also of other indicators in the modeled system. This is due to the need of capturing change in the factorial relationship to explain the variation in

performance. A standard time from for the longitudinal study has not been defined and may be subject to debate based on an organization's history and the current state of the suggestion system. Therefore, this study will utilize group comparison of participant organizations that share goal-oriented measures of performance. As the competitive advantage between competitors is unique to the context of each organization, the KPIs used to compare participating groups will be determined on a case-by-case basis for common goal-oriented metrics between participating samples within this study. For example, for the service industry, customer satisfaction would be a common metric that minimizes the bias of size, type of service, or location. Utilizing participant group management in selection of the KPIs also provides the opportunity to remove confounding variables from the indicators.

Pilot Study

To help ensure the study achieves the desired goals, a pilot study was run to test the validity of a full-scale investigation. This was achieved by sampling the current work force of 50 front line production support employees and calculating the internal reliability of each factor between data samples for the instruments utilized. This pilot study has a purpose to provide quantitative support for choice of instruments and initial changes to the 1999 model. No larger organizational evaluation was addressed within this pilot study.

The Sample. A routine maintenance division (RMD), under the Department of the Navy (DON), has three supporting branches to production on a shop floor in logistics, planning, scheduling, quality, and training in addition to other administrative support roles. These are compliance driven roles to meet the needs of shop production. There are standards and manuals provided to guide quality and training requirements while logistics, scheduling, and quality are

driven by the procedures set by the base command and customer communications. Both are also limited by the tools provided and approved within the secured physical and virtual environments of work. The three branches and additional production support roles include 50 non-supervisory employees as potential participants for a pilot study sample

Data Collection & Analysis Plan. This study utilized Qualtrics for collecting and storing data during sampling. Qualtrics is an online tool that hosts questionnaires and codes responses for analysis. The survey items from Appendix B for each factor compiled into a questionnaire via Qualtrics along with necessary IRB consent forms to be distributed to participants through a shared link. This Qualtrics questionnaire also had questions on participant demographics, shown in Appendix B. Qualtrics stored all participants' answers in a database with each response pre-coded. Those items with reverse coding were recalculated manually after the conclusion of data collection.

This research will utilize SPSS AMOS for data analysis and model evaluation. The set of items for individual factors for each response were used to calculate the Cronbach alpha value for the respective instrument to be the measure of internal consistency. Generally, an instrument were determined as valid with a Cronbach alpha value of 0.7 or higher (Nunnally, 1994). There are cases where lower than 0.7 is acceptable, which were only be considered and addressed if needed.

Pilot Study Results. The survey link was issued via email to all eligible participants identified in the supporting branches and admin positions. Out of 35 received responses, a total of 31 were usable for analysis. A usable response included a completed consent form with fully completed questionnaire with the exception of demographic items. Demographic items were not used in analysis due to small sample size and therefore not necessary for a usable questionnaire.

While 30 is the minimum sample size required to perform an analysis of internal consistency, the minimum value for each factor's Cronbach alpha must be reassessed due to the small participant group. The internal consistency calculated for each set of items by factor is show in Table 12. Out of 14 factors, six fell below the initial needed value of 0.7 with two being of high concern.

The factors of interpersonal relationships, self-efficacy, supervisor support, and time pressure all had Cronbach alpha values below 0.7 but above 0.5. Upon further investigation, removing questionable items within each factor raised the internal consistency above the 0.7 threshold for three of four instruments as seen in Appendix C Table 27.

Table 12: Pilot Study Factor Internal Consistency

Factor Name	Cronbach Alpha
Motivation for Better Work	0.7
Complexity of Work	0.149**
Control of Work	-0.426**
Creative Self-Efficacy	0.792
Idea Generation	0.829
Interpersonal Relationships	0.5599*
Job Satisfaction	0.82
Motivation for Reward	0.808
Self-Efficacy	0.687*
System Responsiveness	0.747
Idea Submission	0.962
Supervisor Support	0.549*
Time Pressure	0.679*
Idea Utilization	0.961

*Slightly below acceptable threshold

**Far below acceptable threshold

There is a varying degree of theoretical support for removing the questionable items from each of the three instruments to ensure the internal consistency is an acceptable value summarized in Appendix C Table 28, excluding interpersonal relationships. However, the small sample size may explain the value below 0.7 but above 0.5. Therefore, all three instruments will be accepted with the intention to reassess internal consistency with the larger sample from the full study that follows the conclusion of the pilot analysis. In the case that the internal consistency does not raise above 0.7 with a larger sample, the respective factor will be analyzed using the questions determined to provide the optimized Cronbach alpha from Appendix C Table 27.

Interpersonal relationships originally made up of three items with an optimized Cronbach alpha of 0.62 using only two items. However, there is no theoretical support for removing any one of the three items from the measurement of this factor. With pilot Cronbach alpha value of 0.56, the sample size may partly explain the initial shortfall of an acceptable internal consistency. Additionally, the phrasing of the items were wordy and may have caused confusion with the participants. Following consultation with survey developers, this wording was simplified with rewritten questions for the full study. See Table 13.

Complexity of work and control of work were the two factors that had extremely low Cronbach alpha values of 0.149 and -0.426 respectively. Upon removal of questionable items, the optimized internal consistency left each factor with two items as seen in Table 27. While control of work's internal consistency raised above 0.7, complexity of work remained below 0.7. The theoretical support for removing the questionable items is shown in Table 28, but may ultimately be unnecessary. Review of feedback and questions from participants throughout the data collection period indicated that the wording of the items caused confusion and ultimately led to participants

providing contradictory responses. Furthermore, this instrument was created and validated almost 30 years ago which leads to the possibility that language has taken a different form with the newly sampled working class. The suggested revision of the seven items' verbiage and singular item elimination is shown below in Table 13. The last item of the job control was eliminated due to the sampling within a government environment. There is a high degree of compliance and standardization for work on the frontline and may cause confusion to participants considering this small locus of control. The reworded instruments will be accepted and used in the full study so long as the recalculated internal consistency of a larger sample meets acceptable values. If the results of the full study do not have an acceptable Cronbach alpha, then one or both of the factors cannot be used in testing hypotheses or answering the research questions.

Table 13: Reworded Questionnaire Items

Original	Change
Interpersonal Relationships	
3 items beginning: "My coworkers other than my supervisor ..."	3 items beginning: "My coworkers..."
Complexity of Work	
I can use my knowledge and skills in my work	I often use my knowledge and skills in my work.
I receive tasks that are extraordinarily and particularly difficult more than half the time	I often receive particularly difficult tasks in my job.

Original	Change
I must make very complicated decisions in my work, but other only have to make simple decisions	I often must make complicated decisions in my work.
I can learn new things in my work	I often learn new things in my work. .
Control of Work	
I can determine how I do my work	No Change
I can plan and arrange my work on my own	No Change
If you look at your job as a whole: how many of your own decisions does it allow you to make (5 point Likert scale of almost none to almost all)	I make most of my own decisions in my job (5 point Likert scale of strongly disagree to strongly agree).
How much can you participate in decisions with your superior?	Eliminated

As the internal consistency faced issues with a small pilot sample, so did the preliminary correlation table. To evaluate the correlations between factors, let alone effects and relationships, the internal consistency of the factor must be acceptable. Due to two of the factors being far below the acceptable threshold and concerns of four additional factors, a preliminary correlation table may lead to unsupported changes to the proposed model heading into the full study.

A final change for the data collection going into the full study was the distribution of questionnaires and collection of responses with a paper medium as opposed to the digital, Qualtrics hosted survey. This change was done by a management request of the RMD and the need to

separate the association of this study from perceived managerial oversight. While the management of the RMD supports the study and plans to use the results in practice going forward, there is a perceived lack of trust in the relationship between upper management and floor technicians. Additionally, there are technology limitations and production time constraints on each shift that would reduce the number of responses through a digital medium versus a paper medium.

As technology has increasingly advanced, the adaption of questionnaires from paper to computers and web platforms has provided many advantages to cost saving and response rates (Thomas, 2004). But there are multiple conflicting studies that conclude which medium participants preferred (Hardre, Crowson, Xie, & Ly, 2007; Touvier et al., 2010). While response rates vary under different conditions unique to each study, there is support in consistent validity of responses across both medium (Leung & Kember, 2005). Given the setting of this study, the web hosted questionnaire is not conducive to the sampled environment and the study would benefit from the use of paper-based surveys. Further details on the execution of a paper collection method is detailed in the full study methods section below.

All shifts in data collection methods, both survey medium and altered questionnaire items, will require an approved IRB edits form to continue into the larger study.

Full Study

The completion of the pilot study provided validated instruments and a preliminary evaluation of the proposed model with expansions. However, the sample size in the pilot study is smaller than what is needed to draw final conclusions about the proposed hypotheses. The number of participant groups used in the pilot study are too few and narrow in demographic to provide a holistic comparison of employee innovation systems and their success. Furthermore, the pilot

study only addresses the portion of the expanded model concerned with success of eliciting employee suggestions but not organizational implications or competitive advantage. For these reasons a larger, systematic study is warranted.

The Sample. The participant sample comes from a government agency within the Department of Defense United State Navy. In 2010 the Census Bureau reported just under 20% of the U.S. population was employed by the government at the federal, state, or local level (Hill, 2020). This does not include contractors that work in the same environments as civilian employees and often fulfill similar job roles. The government is an employer seeking to engage employees in a unique context. The traditional metrics concerned with monetary values, such as profit, are not applicable to these kinds of agencies due to the non-profit nature of work. The benefit of utilizing a non-private sector participant group is the ability to evaluate non-traditional KPIs to measure the competitive advantage.

The routine maintenance division (RMD) used in the pilot study also includes an additional 10 different work centers. Work centers are a division of labor for various production assembly and disassembly processes. The 10 work centers include an estimated 150 shop floor technicians as potential participants, classified as non-supervisory, frontline workers within the RMD. The frontline workers are comprised of both government civilian employees and contractor employees that perform the same set of work based on assigned work center. Therefore, there are multiple ways the sample of shop technicians can be divided up for the purposes of comparative group analysis when KPIs are brought into the model analysis.

A secondary division that performs non-routine maintenance (NRM) is an additional production group eligible to participate in the full study within the NAVSEA organization. This

secondary division performs repairs on hardware inspected and issued as damaged by the technicians within the RMD in addition to other customers. The NRM has an estimated 150 non-supervisory frontline employees eligible for participation in the study. The NRM shares the medium of work and location but a different production function than the RMD.

The culture within both participant groups is strongly defined by their formal structure. The RMD experiences a higher need for procedural compliance with little room for work arounds unless preapproved by supporting roles. The NRM is not as defined by procedures due to the varying condition of repair items, but is subject to the same standard of quality for those repairs. The rigid nature of compliance with varying degrees of autonomy contributes to a culture of fear and submission to limitations. Experimentation risks consequence if there is a lack of defined autonomy in job description.

The full study will utilize the rest of the production staff within the RMD and NRM which is an estimated total of 300 of eligible participants. With the full model containing 7 latent variables, 22 observed variables (5 chosen as KPIs by management to be expanded on), a maximum sample of 300, at a power of 0.8 and alpha risk of 0.05, the smallest measurable effect is 0.24. To achieve a minimum of smallest measurable effect size of 0.3 with the same power, alpha risk, and model structure, a minimum sample size of 180 will be required.

The effect size of factor relationships will be the determinant of rejecting or failing to reject any of the hypotheses. A power of 0.8 is commonly used to ensure small effect sizes are captured without overly large data requirements (J. Cohen, 1988; Kyriazos, 2018). Capturing small effect sizes is important in order to understand which relationships do not significantly contribute to the measured response variables. A smallest effect size of 0.1 would be ideal, but smallest effect size

of 0.3 is defined as medium and acceptable (J. Cohen, 1988). The elimination of insignificant effects is necessary for a model to accurately reflect current employee innovation systems. Hypothesis testing of the expanded model will determine the final reflection of current, measured employee innovation systems. Furthermore, the conclusion of the set of hypotheses will determine which organizational factors contribute to successful employee innovation and which may hinder or not contribute to within the suggestion system.

Data Collection. Consistent with the changes noted in the pilot study results, an approved IRB form was submitted and approved prior to continuing data collection. All approved IRB materials, including consent forms, final questionnaire items, and additional protection protocols, can be found in Appendix D. The support for partial rewording came from feedback from participants on factors with low internal consistency and the age of the instruments. Additionally, support for shift to a paper-based questionnaire came from desires of management and the needs of the sampled environment. With the switch to the paper-based instrument, the protections for participant identity were appropriately adjusted. This included retaining the signed consent form with wording altered for the medium, the signed consent form will be separated from the response packet upon submission, as well as storing securing consent forms and response packets. Each packet had a unique number to serve as a coded identifier for each participant to enable data entry matching between employee response, supervisor response, and KPI metrics.

Between September 1st, 2020 and January 31st, 2021 the surveys were distributed to work groups and collected at weekly safety meeting and branch meetings. The responses were collected and manually entered into Microsoft Excel by each packet's unique identifier. Once all participant data was entered into the repository for a participating group, the supervisor of work center was

provided the questionnaire for their supervisees. The supervisor responses were entered into the same Microsoft Excel sheet matched by unique identifier on consent forms. There was no repository key of the participants and their unique identifier.

The study returned 197 completed surveys, with 190 usable responses. The unusable responses either lacked a completed consent, did not contain a completed questionnaire, or were completed by an employee in managerial capacity. Once all data collection of the two divisions was concluded, data was entered into the repository, the response packets were disposed of, and consent forms retained and secured. With the psychometric data collected, the objective data was the next to be collected.

Data to support the indicator for leave usage was collected from the payroll system for logged hours for all supported coded activities. These activity codes included regular work, over time, holiday leave, personal leave, sick leave, leave without pay, and additional codes for abnormal situations. The individual participant leave usage is the percentage of time off over total hours logged. The analysis will test the model's fit with the indicator considering percentage of sick leave alone as well as percentage of total leave.

On the other side of charged time is the amount of overtime worked. Overtime can be an indicator of engagement from putting in longer hours in perseverance for completing work, aiding teammates in their work load, and critically thinking about the coming work load (Golden & Wiens-Tuers, 2005). While government production cannot force employees to use overtime, there are measures that can be taken to require instances of mandatory overtime when necessary. Therefore, overtime could also serve as an indicator of burnout if employees are cornered into working longer hours (Rabenu & Aharoni-Goldenberg, 2017). How this indicator interacts with

other engagement indicators and can be a sign as to which employee mentality overtime is fueling. This indicator will be the percentage of charged overtime over total number of hours logged.

The third objective indicator for employee engagement, employer career, utilized the demographic information of the employee participants. The demographic information bucketed durations in the industry and with the current employer. The score for each participant was calculated per Equation 1 by substituting the scores for each demographic range.

$$\frac{\text{time with current employer}}{\text{time in industry}}$$

Equation 1: Employer Career

To measure the competitive advantage of each comparative group sampled within the expanded model shown in Figure 10, management of the participant groups were consulted for KPIs measurable at the independent participant level. These KPIs were determined through a workshop by the researcher with management in order to define their perceived competitive advantage that may be directly impacted by with successful employee engagement through innovation. Management did not want to pick indicators that would require more items added to the questionnaire going forward. Additionally, management supported the collection of unbiased metrics from databases already within the production system. The following 5 KPIs were chosen as the final indicators for competitive advantage to be used in the model:

1. Promotion Progression/Potential – a competency matrix defines the requirements for the production technicians to advance in pay grade. Promotion levels are based on number of areas qualified to work in order to promote cross training and utilization within the facility.

This information is collected through the training and process control databases currently in use by the production system. Employees with higher engagement should be more proactive and advance quicker to the next ladder of promotion (Bakker & Albrecht, 2018; Frese, Fay, Hilburger, Leng, & Tag, 1997). The score for this indicator was calculated by the total time active in the production software divided by number of job sheets qualified which will include the number of requalifications. This metrics reflects a relative time per job sheet to qualify and would follow that more highly engaged employees have less time between qualification. Additionally, this will capture unengaged employees who have had a longer tenure but did not added skills to their certifications and only maintained current work area level of knowledge.

2. Outlier Count – standard process times and their variance are collected in the automated process control software and serve as a baseline for planning. This metric takes every process performed by each participant in the last fiscal year and count for how many of their actual process times fell as outliers to the standard process times. The averages and standard deviations for deciding outliers were also be taken from the same fiscal year. Lower variance in individual performance indicates productivity as a result of higher engagement in work (Bakker & Albrecht, 2018; Lasrado, Arif, & Rizvi, 2014). The score for outlier count, to control for new hires and turnover, will be a percentage of total number of job sheets performed.
3. Quality – Research has connected engaged employees to higher rates of quality of work (Andrew & Sofian, 2012). Poor quality is reflected in products that do not meet final inspection criteria and result in rework. While rework can be caused for a variety of reasons

including material, method, or environment, this metric will be concerned with rework sourced due to personnel error. The data for rework is kept in the production software system. The score for this indicator is the number of reworks categorized as personnel error with in the last fiscal year over the total number of jobs completed to control for time of hire.

4. Output – the process control software monitors at an individual technician level the steps clicked through job sheets, processes performed, processes observed, and many other activities that contribute to the output of the production system. This metric was calculated by using the summing standard processing times for all job sheets performed by each employee then divided by the total working time charged within the last fiscal year. This metric scale output to utilization of employees during recorded productive times. This metric relates to the overall mission of the production facilities, but also aligns with the concept that more engaged employees are more productive (Lasrado et al., 2014).
5. Corrective Actions – While rework is an indicator of lacking engagement within quality, corrective actions cast a much wider net within government operations to capture findings within safety, procedural compliance, and operations. Corrective actions often are pinpointed by an individual but are typically assigned to a responsible group. This metric was pulled from the corrective action database for the two participant groups and matched to individuals based on their work group at the time of the finding. Due to the nature of the metric, there will be multi-collinearity shared with the demographic of work center or branch. This is compensated for by not including work center or branch as part of the group

comparison analysis and rather focusing on the other demographics such as RMD and NRM or civilian and contractor.

Every KPI will be reflected as an individual indicator of the latent competitive advantage. Each metric was collected from the last completed fiscal year for a full representation. The researcher manually calculated each individual indicator for each participant and entered the values into the data repository in the method consistent with identity protection. The full detail of the model to be tested in the full study can be found in Figure 11.

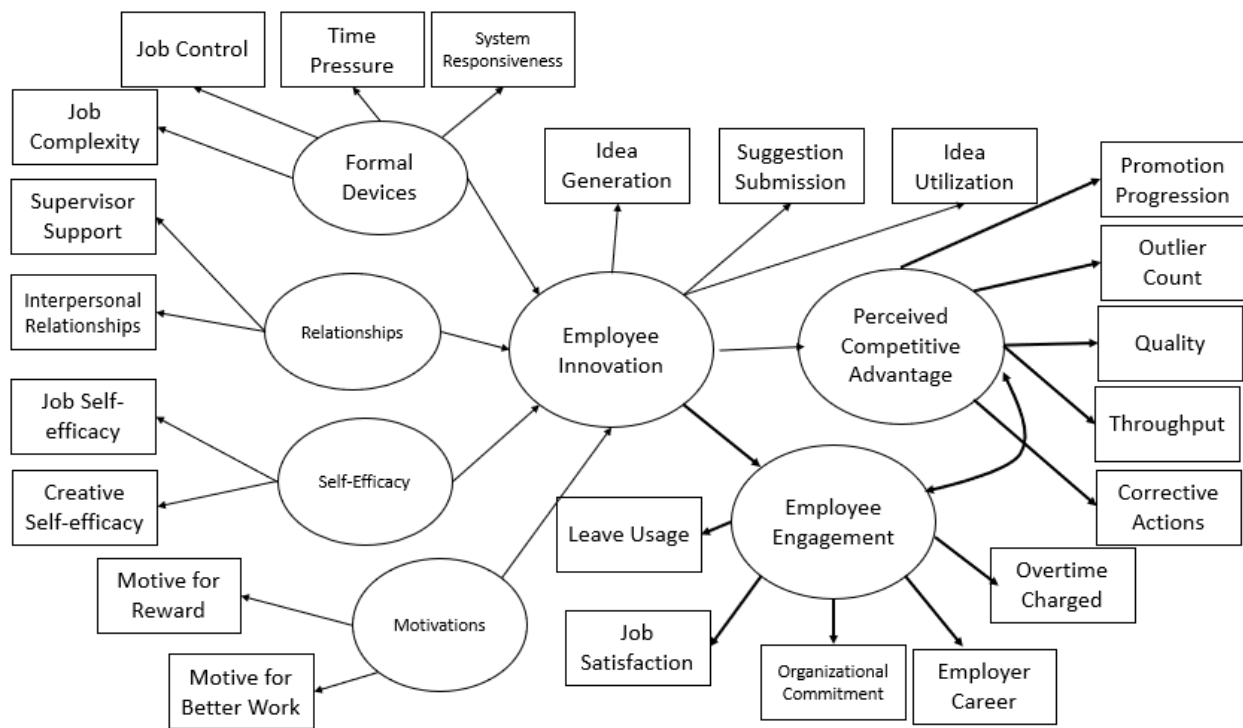


Figure 11: Full Study Model

CHAPTER FOUR

RESULTS & ANALYSIS

Questionnaire Results

The two participant groups returned 197 survey packets with 190 usable responses. The 7 unusable responses lacked a completed consent form, were not a completed questionnaire, or completed by an employee with a managerial role. Of these 190 usable responses, 127 were from the RMD and 63 were from the NRM yielding 88% response rate and 48% response rate respectively from the two groups.

The internal consistency of the instruments from the full study with a larger sample size is reported in Table 14. There were 5 factors with values below 0.7 but above 0.6 and 2 factors below 0.6. Of those 7 factors, only 2 shared issues within the pilot study: complexity of work and time pressure. The final mitigations for factors with questionable internal consistency is summarized in Table 14 and the resulting model for analysis is shown in Figure 12.

While the rule of thumb for internal consistency is an acceptable Cronbach alpha of 0.7 or higher, there are some that argue with the rigidity of this threshold and propose caveats for additional evaluation. There is much criticism of Cronbach alpha as a measure in part due to the popular reliance on the value as a stand-alone assessment of the homogeneity within an instrument (Cronbach, 1951; Schmitt, 1996). Cronbach alpha is a value driven heavily by the number of items within the measure and should be supplemented with additional information such as inter-item correlations (Janssens, Wijnen, De Pelsmacker, & Kenhove, 2008; Schmitt, 1996).

Table 14: Internal Consistency of Larger Study

	Cronbach Alpha	# of items
Affective Commitment	0.82	6
Continuous Commitment	0.84	6
Normative Commitment	0.86	6
Complexity*	0.607	4
Control	0.77	3
Creative Self-Efficacy*	0.6	3
Idea Generation*	0.66	6
Interpersonal Relationships	0.77	3
Job Satisfaction	0.83	4
Job Self-Efficacy	0.71	5
Motivation to Improve Work*	0.63	3
Motivation for Reward**	0.499	5
Submitting Idea	0.96	13
System Responsiveness*	0.67	8
Supervisor Support	0.89	5
Time Pressure**	0.431	5
Implementation	0.96	3

*Cronbach Alpha below 0.7 and above 0.6

** Cronbach Alpha below 0.6

Research has shown that an acceptable inter-item correlation threshold is 0.3 and any negative correlations suggest an issue with the construct (Janssens et al., 2008; Schmitt, 1996). This is especially helpful in understanding and justifying the removal of items from an instrument analysis if the Cronbach alpha is below the acceptable rule of thumb. However, in the case of Cronbach alpha below 0.7, inter-item correlations can justify the acceptability of lower internal consistency measurements. While above 0.7 would be preferred and is deemed acceptable, above 0.6 is deemed questionable with 0.5 being the threshold for unacceptable (L. Cohen, Manion, & Morrison, 2017; George & Mallery, 2011; Janssens et al., 2008). With this consideration in mind, closer examination of these 7 factors is necessary.

The 5 factors within the range of questionable of internal validity are complexity, creative self-efficacy, idea generation, motivation to improve work, and system responsiveness as defined by George & Mallery (2011) and Janssens et al. (2008). Removal of any single question greatly decreases the total number of items within any of the 5 questioned constructs, possibly causing issue with the integrity of the measurement. Therefore, removal of an item should only be considered when necessary. The inter-item correlations of the 5 indicators are shown in Appendix E.

For the factor of complexity, the highest correlating items are 1 with 2 and 3 with 4. The removal of any one item does not result in a significant increase in internal consistency and is confounded by the clean division of paired items within the instrument. Upon analysis of the items, the subject matter of complexity may break into two additional constructs: challenging opportunity and task difficulty. Items 1 and 2, shown in Table 29, reflect the ability to use skills or garner knowledge while items 3 and 4 discuss work as an obstacle. It is recommended to divide the factor of complexity into two factors (skills on the job and job challenges, respectively), both to be retained as indicators for the formal devices latent factor.

Idea generation shows strong correlations between all items except for item 5. However, removal of this item does not result in an increased internal consistency. Item 1 also lacks minimum correlation with item 2, but again the removal of this does not increase the internal consistency. Furthermore, analysis of the items does not reflect a breakage in the construct between the two instruments combined to measure this factor (previously combined M. Frese et al. (1999) and Coelho et al. (2011)). While the Cronbach alpha is still questionable, almost all inter-item correlations are above the 0.3 minimum and the removal of key items below 0.3 does not change

this internal consistency. Therefore, idea generation will be retained as measured but inspected upon model analysis for fit issues.

Both creative self-efficacy and motivation to improve work only have 3 items each and the strong correlations between items hinged on one lower correlating pair. The removal of any 1 item from either instrument does not achieve a Cronbach alpha of 0.7 nor is the removal supported by theory. Since there is no break in the construct apart from a single pair of items with lower correlations, the low internal consistency may be a result of too few items. These both will be retained as is at their questionable threshold and inspect upon model analysis for fit issues.

System responsiveness, the last construct within the questionable threshold, shows 2 factors with negative inter-item correlations. Regardless of how many strong, positive correlations may accompany any item, negative correlations are a sign of an issue with the construct. Both items 2 and 8 have either negative correlations or weak, positive correlations and should be removed from the instrument. Item 2 addresses the use of an idea post rejection and item 8 broadly captures the current system not meeting a miscellaneous choice of expectations. The removal of these two in context to the remaining 6 items which take into account the speed and presence of feedback, both formally and informally, does not harm the integrity of system responsiveness. This provides a new Cronbach alpha value of 0.78.

For the two instruments below the questionable threshold, motivation for reward and time pressure, the inter-item correlations are shown in Appendix E. The factor motivation for reward was not of concern in the pilot study with an internal consistency of 0.808. However, the inter-item correlations show weak correlations of all items paired with item 1. Upon further inspection of the wording of the item compared to the others, the broad concept of reward is addressed but

the main difference is that item 1 addresses frequency while the other items address value. Removal of item 1 from this construct produces a new Cronbach alpha of 0.68 which is within the questionable threshold and holds up to the minimum remaining inter-item correlations. Therefore, the first item in motivation for reward shall be removed concept of frequency is already addressed in the construct of system responsiveness and its absence improves the internal consistency of this indicator.

Time pressure is another construct that is the combination of 2 different instruments in the original publication (Baer & Oldham, 2006). Item 5 has negative inter-item correlations and must be removed. This item can be removed without issue as the definition of this factor was to be the absence of time to innovate to a participant's assumption that free time outside of regular work tasks isn't already earmarked for another activity. In contrast, the removed item ask about explicit time available to innovate.. Item 5 measures the inverse of this which is not necessarily corrected for when reverse coded. The removal of item 5 increases the Cronbach alpha to 0.6 within the questionable threshold. Additionally, item 4 lacks strong correlations with items 1 and 2, while the trio of 1, 2, and 3 all meet the minimum threshold. Item 4 does not address time at all but rather where ideas are important. The removal of item 4 in addition to item 5 results in a Cronbach alpha of 0.61 which has the construct remain in the questionable range for internal validity, potentially due to only 3 items in the instrument. This construct will be retained without items 4 and 5 at the questionable threshold and inspect upon model analysis for fit issues.

Table 15: Instrument Internal Consistency Mitigation

Instrument	Mitigation	Cronbach Alpha
Complexity	Split into two factors	0.61 (skills) & 0.77 (challenges)
Idea Generation	Retained as is	0.66
Motivation to Improve Work	Retain as is	0.63
Creative Self-Efficacy	Retain as is	0.6
System Responsiveness	Remove items 2 & 8	0.78
Motivation for Reward	Remove item 1	0.68
Time Pressure	Remove items 4 & 5	0.61

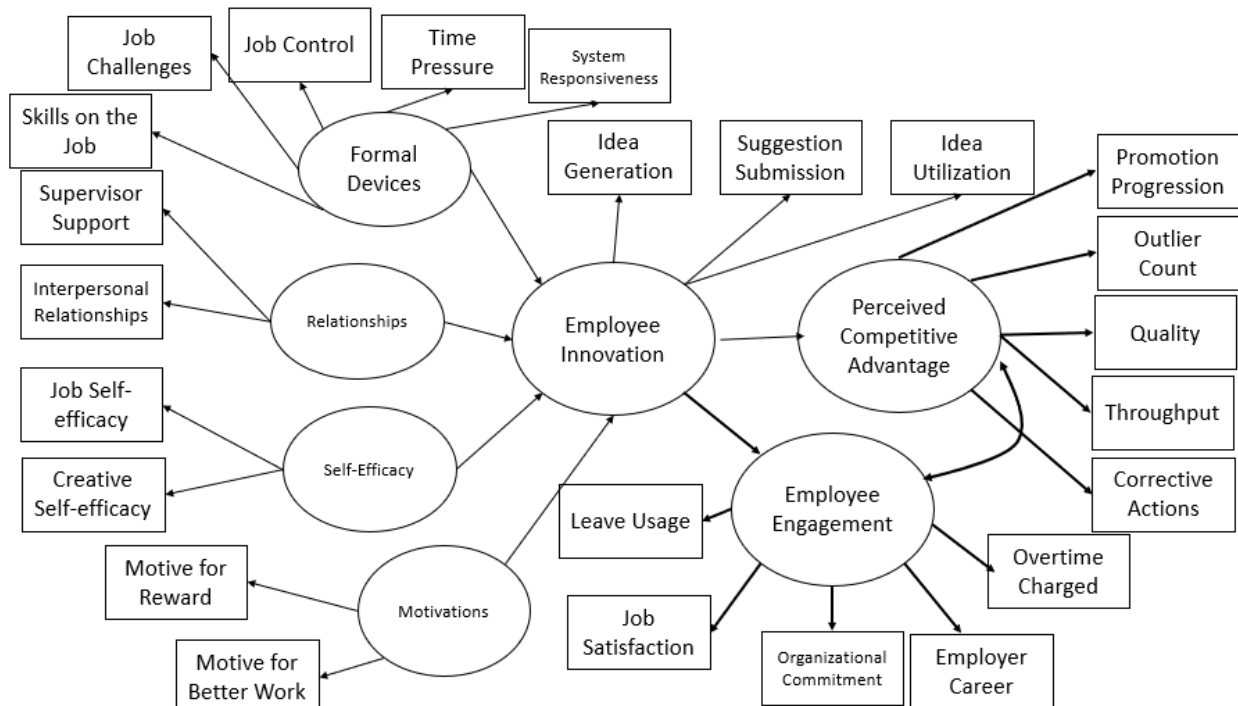


Figure 12: Mitigated Model

Model Analysis

Each participant serves as an individual case point in the analysis of the expand model in SPSS AMOS. The index score of the subjective measures are the average of the corresponding instrument items retained from the factor's questionnaire while the score of the objective measures is the result of calculation detailed in the methods section. Initial analysis will include model fit. The metrics concerned for model fit are χ^2 , root mean square error of approximation (RMSEA), and comparative fix index (CFI) as these are common measures for structural equation models (Kyriazos, 2018). Desirable fit for an individual company's data set in the expanded model will yield a low χ^2 (represented as $\chi^2/\text{degrees of freedom} < 5$ for reasonable fit), an RMSEA no larger than 0.1 but preferably lower than 0.05, and a CFI equal to or greater than 0.90 (Hooper, Coughlan, & Mullen, 2008; Kline, 2015). The model in Figure 12 was set up in SPSS AMOS with the following relationships fixed to a regression weight of 1 to provide an identified latent model shown in **Error! Reference source not found..**

Table 16: Fixed Indicator Regression Weights to Latent Variable

Latent Factor	Indicator
Formal Devices	System Responsiveness
Relationships	Interpersonal Relationships
Self-Efficacy	Job Self-Efficacy
Motivation	Motivation for Reward
Innovation	Idea Utilization
Employee Engagement	Career
Perceived Competitiveness	Outliers

Initial results of the starting model produced an unacceptable fit. Without meeting thresholds for fit indices, any conclusions drawn from estimates are problematic and should not be used to make conclusions. In order to address model shortcomings, there is a need to modify the

model based on analysis and theoretical relationships and interpreted results from the AMOS analysis. The summary of fit for the following iterations and the summary of the iteration process is shown in Table 17.

The iterations of the model were based on various sources of analysis within the results provided by AMOS output including inter-indicator correlation, modification indices, and indirect effects. These iterations only considered one source of change per new model and used both SEM best practices and employee innovation literature to support any alterations.

Table 17: Iterative Model Fit Index Summary

Model	CMIN/DF	CFI	RMSEA	Alteration Analysis Source	Alterations
Initial	3.825	0.465	0.122	Inter-item Correlations	Remove competitiveness and indicators, decrease engagement indicators
A	6.175	0.569	0.165	Modification Indices	Consolidate motivation indicators with self-efficacy, form intrinsic attribute latent factor Correlate formal devices, relationships, and intrinsic attributes
B	3.869	0.766	0.123	Indirect Relationships	Remove direct effect form innovation to engagement, added direct effects from formal devices, relationships, and intrinsic attributes on to engagement
C	3.426	0.806	0.113	Sample Size Limitations	Split the model into two simplified models: first how innovation affects engagement and competitiveness (to add in indicators individually rather than as a latent construct) and second how systematic factor affect innovation.
D	1.709	0.928	0.061		
E	3.305	0.852	0.110	Modification Indices	Control moderates idea generation, challenges moderates formal devices, intrinsic attributes, and relationships
E*	2.119	0.933	0.077		

The initial model's effect estimates could not be used to draw conclusions of the model due to poor fit. The estimates indicated there were weak relationships among the indicators for both competitiveness and engagement as many had p-values of 0.9 or greater. Further investigation into the inter-indicator correlations shown in Appendix F Table 38 and Table 39 for competitiveness and engagement, respectively. There are no strong correlations between any competitive indicators and therefore should be removed altogether from the next iteration of the model. The lack of strong correlations between competitive indicators implies that while each may be a metric of interest, together they are a poor representation of the latent perceived competitiveness within the organizations. Therefore, the combined use of these metrics is not suggested within these organizations to gauge the competitive advantage.

The only strong correlating pair of indicators for effectiveness was commitment and job satisfaction, with the exception of the three indicators representing different calculations of leave used. The two indicators commitment and job satisfaction were retained for the next iteration while all others were removed. These alterations to competitiveness and engagement hinders the ability to answer research question 1 and will be addressed more thoroughly once a model of acceptable fit is achieved.

An additional correlation between engagement and innovation was added to Model A to identify the model, but returned a model with unacceptable fit. The next source of potential alterations is the modification indices found in Appendix G Table 42 and Table 43. There are several correlations with large corresponding improvements to chi-squared and CFI including to correlate the latent factors of formal devices, self-efficacy, and relationships. These correlations are supported in the systematic context that the latent constructs do not exist independently within

a work environment (A. E. Marx, 1995; Andrew E. Marx, 2008). Additionally, this adds to the flexibility and specification of the model should a latent factor not share a significant direct relationship since the correlation then further informs on the latent construct's role in the innovation system.

A second set of strong modification indices is the addition of a direct relationship and correlation between self-efficacy and motivation to improve work and a direct relationship between job self-efficacy and motivation to improve work. The emphasis on effects and correlations between these variables is supported both in previous literature and this study's research questions as both are intrinsic attributes that have been defined with two-way relationships in various studies and definitions (M. Frese et al., 1999; Kelly, 2018) . Additionally, while a latent variable in SEM requires a minimum of two indicators with one relationship fixed to specify the model, more indicators is always preferred (Byrne, 2001). The use of only two indicators for both motivation and self-efficacy in this study may be driving a higher correlation between their respective indicators. For purposes of improving the model fit, self-efficacy and motivation will be consolidated into a single latent construct for intrinsic attributes. This allows the model to still answer research question 3 with consolidated hypotheses, but does lose the distinction between self-efficacy and motivation.

While there were also further direct relationships with latent factors and motivation to improve work suggested, these three clustered within self-efficacy. A similar eclectic collection of modifications is seen in Appendix G Table 43 with supervisor support. There are less shared latent and indicator indices for modifications surrounding supervisor support. Therefore, no modifications were made to supervisor support relationships.

Model B incorporated the changes made from modification indices of Model A, and produced an unacceptable fit. A review of the indirect relationships, in Appendix H Table 46, shows large effects between engagement indicators and the latent factors for self-efficacy, relationships, and formal devices similar in scale to the innovation indicators. While the model has tested the single directional relationship of innovation on engagement up until now, these indirect effects could indicate the latent factors affecting innovation, may affect engagement differently. Breaking this relationship may provide support for systematic factors that achieve one latent construct but not the other, offering greater insight into hypothesis 1 should the model achieve acceptable level of fit.

Model C, the next iteration, removed the direct relationship between innovation and engagement and added the direct effect onto engagement and produced a model with unacceptable fit. There were no modification indices above a chi-squared change threshold of 25 that could be supported by literature and there were no indirect effects not already captured in previous iterations. The underlying issue of the model may be the complexity. The sample is large enough to meet moderate effect size requirements at a power of 0.8, but more data would be needed to gain smaller effect estimates and continue guiding adjustments to the model (Byrne, 2001; Kline, 2015). While the use of latent factors should have compensated somewhat for complexity by way of flexibility, there are few available modifications to the next iteration of this model that are supported by the literature and preserve the integrity of the existing latent factors and their indicators as seen in Appendix I.

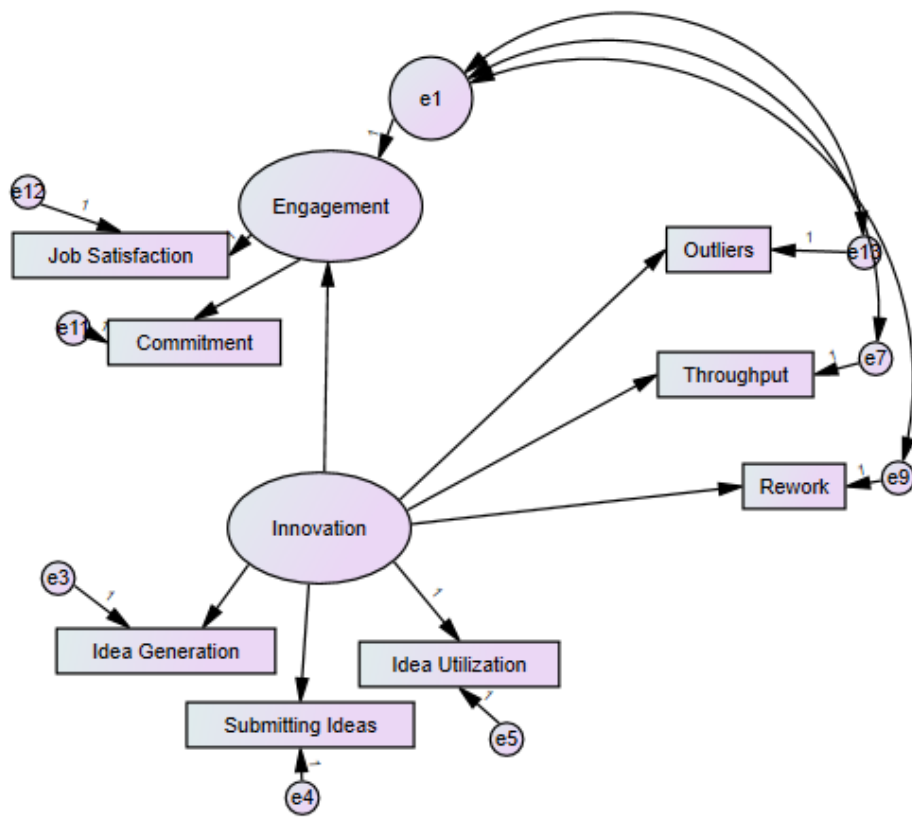


Figure 13: Model D

The next iteration from Model C splits into two simplified models. The first simplified model, Model D in Figure 13, encompasses Research Question 1 by analyzing the relationship between innovation, employee engagement, and perceived competitiveness. As stated before, the indicators for the latent factor perceived competitiveness do not share strong correlations. Therefore, three indicators that represent process performance (throughput, rework, and outliers) were used as outputs for innovation with covariances of the observed variables error term and engagement's error term to best depict the three hypotheses associated with Research Question 1. An important note is that perceived competitiveness is not measured by one indicator and the use of 3 uncorrelated, independent metrics in this model is strictly to evaluate innovation's and

engagement's impact on organization performance. This model also retained the earlier decision to restrict engagement indicators to job satisfaction and commitment. The minimum sample size needed for Model D, with a minimum effect size of 0.22, power of 0.8, and alpha of 0.05 is 181 responses.

The second simplified model, Model E in Appendix J Figure 16, encompasses Research Questions 2 and 3 for all the systematic factors that affect innovation. This model retained the earlier decision to consolidate motivation into the self-efficacy latent factor for a more wholistic intrinsic-attribute latent variable. Additionally, motivation for reward was removed from the model as it showed no significance or strong correlation with the other three indicators as shown in Table 18. The minimum sample size needed for Model E, with a minimum effect size of 0.27, power of 0.8, and alpha of 0.05 is 175 responses.

Table 18: Intrinsic Attribute Indicator Correlations

	Motivation for Reward	Motivation to Improve Work	Job Self Efficacy	Creative Self Efficacy
Motivation for Reward	1	-.072	-.191**	.050
Motivation to Improve Work	-.072	1	.497**	.339**
Job Self Efficacy	-.191**	.497**	1	.598**
Creative Self Efficacy	.050	.339**	.598**	1

While Model D produced acceptable fit indices, Model E did not with several modification indices greater than 10. Included in the modification indices was the direct effect of control on idea generation and challenges on innovation and all innovation indicators as seen in Appendix J Table 52.

Adding an effect for control onto idea generation could be supported in context of a government operation. The rule of operations within the government is procedural compliance meaning an employee's immediate locus of control is arguably of higher influence than typical private industry regarding ability and willingness for deviating from the current standard.

The addition of an effect of challenges onto any of the innovation indicators and/or the innovation latent variable is of greater interest with respect to the developing model. Where challenges have shown strong correlation with other formal device indicators, the presence of formal obstacles in the work place may drive not only the generation of a solution, the imperative to submit the idea, and appropriate utilization of the suggestion, individually, but at every step of the process. However, these challenges in the government context would be a result of the formal system. To include a relationship between challenges and the latent factor innovation, while still using challenges as an indicator for formal devices may cause an issue. For this reason, challenges will now be treated as an independent mediator between latent variables formal device, relationships, and intrinsic attributes for innovation.

This new model, Model E*, now includes effects from formal devices, relationships, and intrinsic attributes on challenges as well as challenges on innovation as seen in Figure 14. This iteration of the model produced acceptable fit indices as seen in the summary Table 17. The final estimates for direct relationships and covariances to be used to evaluate research questions and hypothesis can be found in Table 19 and Table 20 for Model D and Table 21 and Table 22 for model E*.

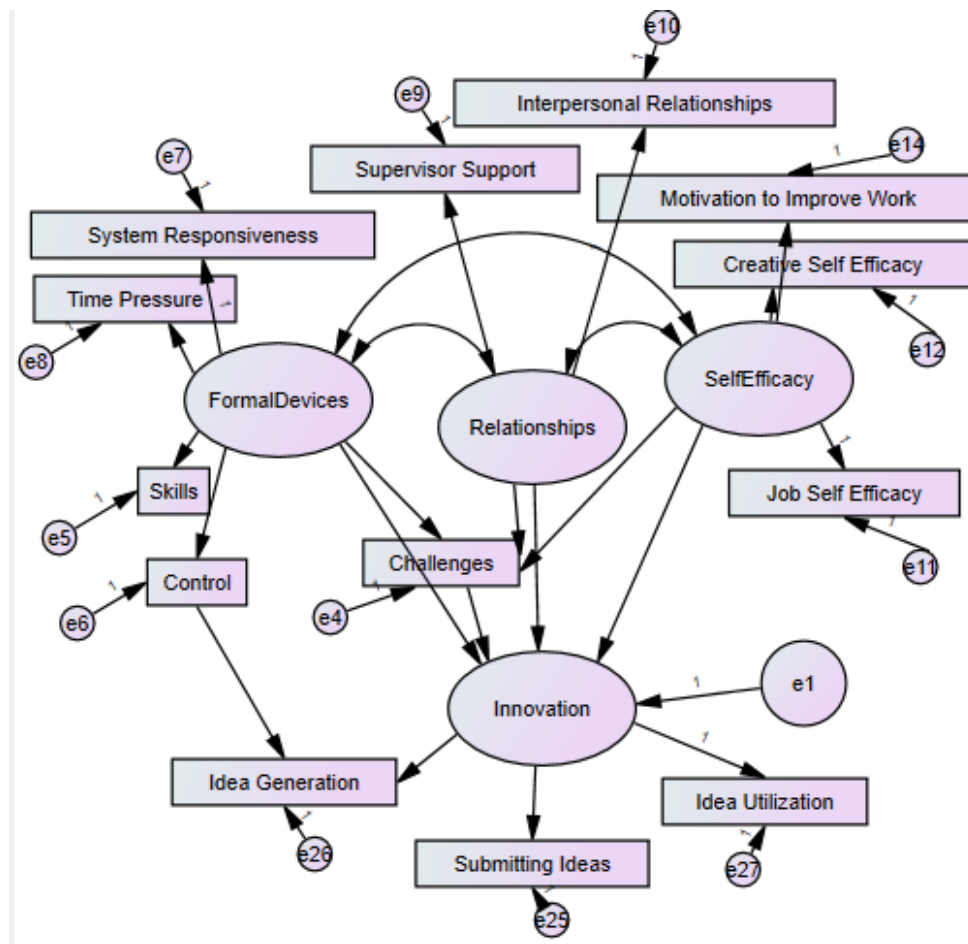


Figure 14: Model E*

Table 19: Model D Direct Effect Estimates

			Estimate	S.E.	C.R.	P
Engagement	<---	Innovation	1.077	.541	1.991	.047
Job Satisfaction	<---	Engagement	1.000			
Commitment	<---	Engagement	.295	.191	1.548	.122
Idea Utilization	<---	Innovation	1.000			
Submitting Ideas	<---	Innovation	2.570	1.115	2.306	.021
Idea Generation	<---	Innovation	2.703	1.245	2.171	.030
Rework	<---	Innovation	-2.130	2.337	-.912	.362
Throughput	<---	Innovation	-5.327	35.294	-.151	.880
Outliers	<---	Innovation	-4.598	2.589	-1.776	.076

Table 20: Model D Covariances

			Estimate	S.E.	C.R.	P
Outliers	<-->	Engagement	.271	.259	1.046	.295
Throughput	<-->	Engagement	-2.461	5.274	-.467	.641
Rework	<-->	Engagement	.168	.323	.519	.603

Table 21: Model E* Direct Effect Estimates

			Estimate	S.E.	C.R.	P
Challenges	<---	Intrinsic Attributes	.701	.341	2.057	.040
Challenges	<---	Relationships	-.537	.609	-.882	.378
Challenge	<---	Formal Devices	.753	.593	1.270	.204
Innovation	<---	Intrinsic Attributes	.719	.259	2.771	.006
Innovation	<---	Formal Devices	-.071	.151	-.472	.637
Control	<---	Formal Devices	.970	.127	7.644	***
Innovation	<---	Relationships	-.146	.165	-.888	.374
Innovation	<---	Challenges	.061	.029	2.082	.037
Idea Generation	<---	Innovation	1.380	.467	2.956	.003
Submitting Ideas	<---	Innovation	2.497	.833	2.996	.003
Idea Utilization	<---	Innovation	1.000			
Time Pressure	<---	Formal Devices	-.518	.092	-5.630	***
System Responsiveness	<---	Formal Devices	1.000			
Skills	<---	Formal Devices	.950	.103	9.202	***
Job Self-Efficacy	<---	Intrinsic Attributes	1.001	.089	11.184	***
Creative Self-Efficacy	<---	Intrinsic Attributes	1.000			
Idea Generation	<---	Control	.264	.034	7.729	***
Motivation to Improve Work	<---	Intrinsic Attributes	.770	.113	6.820	***
Supervisor Support	<---	Relationships	1.000			
Interpersonal Relationships	<---	Relationships	.687	.086	7.965	***

Table 22: Model E* Covariances

			Estimate	S.E.	C.R.	P
Intrinsic Attributes	<-->	Formal Devices	.155	.026	5.879	***
Formal Devices	<-->	Relationships	.292	.041	7.182	***
Intrinsic Attributes	<-->	Relationships	.205	.033	6.218	***

The defined models now have an acceptable level of fit and the analysis can move to determining if groups within the data moderate the outcomes. Multi-group analysis of this model enables testing of the model structure as moderated by categorical characteristics of the sample. While this does not directly relate to a research question, it does provide additional insight to applicability of the model structure across various government contexts. Common group differences within the government workplace are different types of work as well as the type of employee.

The first group moderation analysis is the contrast between the two production activities as they share location and similar production activities but operate differently on a fundamental level. One group does routine maintenance with high procedural compliance required while the other group fixes items not repairable within routine maintenance and operates with fewer procedural constraints. Another multi-group comparison of interest is the differences between civilians and contractors. Civilian employees are directly employed by the government while contractors are hired by a third-party entity and fill work within the government at a lower cost.

Testing the model between these groups determines if the different groups act as a moderator for the various direct effects and covariances in Model D and E*. If the type of work were a moderator of model effect, then differences in path estimates would be significant between the groups. From a practical standpoint, this would change the applicability of findings across other government contexts if type of work or type of employee moderated effects within the models. Additionally, from a theoretical approach a moderating group may also affect the conclusions drawn from the research questions in this study.

To test for multi-group moderation in model analysis, the first comparison were the two production activities. Using the multi-group analysis function in SPSS AMOS for Model D, the model was analyzed using structure weights for setting the model (Byrne, 2001). The chi-squared difference test returned a negative value and a p-value of 1, indicating that the unconstrained model cannot be identified. Therefore, multi-group analysis for moderation of production group in Model D is inconclusive (Byrne, 2001). The same process was applied to Model E*, resulting in non-significant moderation of model effects between production groups with an alpha of 0.05 as shown in Table 23.

Table 23: Production Group Moderation Test

Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Model D	7	-23.802	1.000	-.108	-.126	-.272	-.364
Model E*	16	22.401	.131	.021	.023	-.007	-.008

The same process was applied to the group analysis of civilian and contractor employees. The results of the chi-squared difference test for both Model D and Model E* are shown in Table 24 and report no significant moderation of the model with respect to type of employee with an alpha of 0.05.

Table 24: Civilian and Contractor Moderation Test

Model	DF	CMIN	P	NFI Delta-1	IFI Delta-2	RFI rho-1	TLI rho2
Model D	7	13.147	.069	.059	.069	.013	.017
Model E*	16	12.549	.705	.011	.013	-.020	-.023

While there are other methods of dividing groups in this analysis, they each have smaller sample sizes per group and are not as consistently present throughout other areas of government work. These two types of groups are highly representative of sample populations within the government and demonstrate the model shows no differences in type of work or type of employee.

A final piece of analysis for this study came to be because the effect estimates from Model D showed no significant relationships between the latent variables and the three KPIs which left little information to support a concluding answer for Research Question 1. Additionally, engagement and innovation are measured here at a latent level while perceived competitiveness is represented by a series of stand-alone metrics at a component level. A pairwise comparison for indicator items and KPIs was used to further supplement the discussion of Research Question 1.

The questionnaire items for idea generation, submitting ideas, implementation, organizational commitment, and job satisfaction were correlated with the 5 KPIs. The resulting matrices from SPSS software are shown in Appendix K. These tables denote what correlations were significant with an alpha of 0.05 and thus may inform component level relationships for engagement, innovation, and competitiveness. The resulting correlations supplement the discussion of Research Question 1 in Chapter Five.

CHAPTER FIVE

DISCUSSION

Introduction

The iterative analysis on the expanded model and subsequent group analysis has produced a statistically significant system connecting employee innovation to employee engagement and individual performance metrics. These measured connections answer Research Question 1 and close the gap in understanding if employee innovation can be utilized for effective engagement and provide the same benefits. The process of simplifying the expanded model based on the statistically significant effect built on the result of Research Question 1 to answer Research Questions 2 and 3 by establishing how employee innovation can be achieved in an organization. This systematic analysis of employee innovation will serve to inform the decision to invest organizational resources in employee suggestion systems.

Research Question 1: Does employee innovation achieve the effects of employee engagement?

The first research question is addressed using the analysis of Model D. While this simplified model does not utilize a holistic, latent variable for perceived competitive advantage, the model is able to answer the question and evaluate the accompanying hypotheses.

From the factor estimates in Table 19, the indicators for innovation are significant for latent variable innovation with an alpha of 0.05. The indicators for engagement, however, are only significant with an alpha of 0.1 which is acceptable for this analysis but at a higher risk.

H1: Employee innovation positively affects employee engagement at any point in the suggestion process.

The estimate for the direct effect of innovation on employee engagement is positive and significant with an alpha of 0.05. Therefore, employee innovation does positively affect employee engagement within these government organizations. This is an important relationship to establish as much of the historical research poses innovation as synonymous with engagement. The separation of these latent construct and significant relationship supports the use of innovation as a method to attain engagement.

H2: Employee innovation positively affects a perceived competitive advantage at any point in the suggestion process.

A latent variable for competitive advantage was not included in Model D due to the initial indicators sharing only weak correlations. Therefore, the choice to include three observed variables from these indicators as outputs between innovation and engagement holds two purposes. The first purpose is to test if the effects of innovation and covariances of engagement shared significance on the providing same competitive metrics. The second purpose is to perform a secondary evaluation of these performance metrics as gauges for standalone measure of competitiveness in an organizational setting where traditional KPIs are not appropriate. Rework, outliers, and outliers were selected because each directly impact the mission of both participating groups: to meet demand in production. Rework, outliers, and throughput all tie to the concept of meeting demand by producing efficiently.

Employee innovation and employee engagement shared no overlapping significant direct effects on or covariances with any of the three metrics. The direct effect of employee engagement

on outliers is the only significant estimate with an alpha of 0.1 as seen in Table 19. Even though one of the three metrics has a significant direct effect with innovation, the absence of additional significance with the other metrics implies innovation does not affect performance, in this case. Therefore, employee innovation, as measured in this study, does not directly affect the chosen performance metrics within these government organizations.

H3: Employee engagement and perceived competitive advantage are positively correlated.

Due to the absence of a singular latent variable for competitive advantage, the error terms of the individual metrics were covaried with the error term of engagement to evaluate this hypothesis. None of the covariances were significant with an alpha of 0.10 as seen in Table 20. This is supported by Hypothesis 1's direct relationship between innovation and engagement and hypothesis 2's subsequent finding that innovation had no effect on competitive metrics.

Additionally, while both Hypothesis 2 and Hypothesis 3 both found that innovation and engagement had no significant relationships with the chosen metrics, this analysis is inconclusive as to the equity of impact of both at a latent level onto competitiveness. In order to attain further insight at a component level, indicator instrument items of engagement and innovation were correlated with the 5 KPIs for competitiveness. The correlation matrices for idea generation, idea submission, idea implementation, job satisfaction, and organizational commitment are shown in Appendix K. The summary of the significant correlations is shown in Table 25 detailing how many items from each instrument had significance with the respective KPI.

Table 25: Indicator Item - KPI Correlation Summary

	Outliers	Throughput	Certs	Rework	CAPA
Implementation (3 items)		Creativity & adaption (2)			
Idea Generation (5 items)	Experimenting with ideas (2)		Mental work for thinking up ideas (3)		
Organizational Commitment (18 items)	Belonging to the organization (4)	Intrinsic emotional attachment and consequences of leaving (6)	Emotional attachment to organization (3)		

Submitting idea and job satisfaction had no significant item correlations with KPIs. Those with significant correlations in implementation and idea generation did share overlapping KPIs with those from organizational commitment. While at a overall, latent level innovation and engagement did not impact any of the KPIs, let alone a holistic measure of competitiveness, at a component level both share significant correlations. This summary supports that innovation at the component level for idea generation and engagement at the component level of organizational commitment both have a relationship with lower outlier counts and higher certification frequencies. Additionally, innovation from a component level of idea implementation and engagement from a component level of organizational commitment have a relationship with higher throughput rates.

Due to the nature of the competitive metrics at a latent level lacking significance, it is difficult to answer this first research question definitively. These pairwise correlation tables supplement the discussion of this research question by providing support for relationships at a

component level. The equity of the impact of innovation and engagement is still unknown in this study, but the pairwise correlations support further investigation into additional metrics and component level comparisons. Therefore, while innovation has an impact on engagement, neither impact competitiveness at an overall latent level but may share similarities in effects at a component level.

Research Question 2: What organizational factors impact employee innovation?

This research question is concerned with the impact of latent formal devices and latent relationships on employee innovation within Model E*. All indicators for all latent variables were significant per Table 21 with an alpha of 0.05. The assessment of the following hypotheses will include the direct effects of both formal devices and relationships on the latent variable of innovation as well as the observed variable challenges.

Hypothesis 4: Formal devices positively affect employee innovation.

The results for these latent variable effects are found in Table 21 **Error! Reference source not found..** The direct effect for formal devices on innovation has a p-value of 0.637 and therefore is not significant. Additionally, the direct effect of relationships on challenges has a p-value of 0.204 which is also not significant.

Hypothesis 5: Formal and informal relationships positively affect employee innovation

The results for these latent variable effects are found in Table 21 **Error! Reference source not found..** The direct effect for relationships on innovation has a p-value of 0.374 and therefore is not significant. Additionally, the direct effect of relationships on challenges has a p-value of 0.378 which is also not significant.

While neither latent factor had a significant relationship with innovation or the factor for challenges that impact innovation, both did have significant covariances with self-efficacy at an alpha value of 0.001 as seen in Table 20. Furthermore, the mediation of control for formal devices onto idea generation was significant as well as challenges direct relationship with innovation as seen in Table 19. Therefore, while organizational factors may not have a significant direct relationship with innovation, they are significant to the structure within the system and to constructing the environment in which suggestion systems exist. However, the answer to the second research question is that organizational factors do not directly impact employee innovation but may have mediated and mediating effects. Further discussion on the indirect impact of organizational factors on innovation are discussed in additional insights at the end of this chapter.

Research Question 3: RQ3: What impact do personally intrinsic factors of individual employees have an impact on employee innovation?

This research question is concerned with the impact of latent self-efficacy and latent motivations on employee innovation within Model E*. Motivation for reward was removed from the model due to weak correlations with other indicators. As this simplified model combined motivation to improve work into self-efficacy, the revised Hypotheses 6 and 7 are shown below:

Hypothesis 6: Employee intrinsic attributes positively affect employee innovation.

The results for these indicators and latent variable effects are found in Table 21 **Error! Reference source not found..** All indicators for intrinsic attributes were significant for the latent variable with an alpha of 0.05. Additionally, intrinsic attributes have a direct effect on employee innovation and challenges with a p-value 0.006 and 0.04, respectively. This supports that employee personal attributes have a significant direct impact on employee innovation with an alpha of 0.05.

Additional mediating and mediated effects of intrinsic attributes are discussed in additional insights.

Additional Insights

The multi-group analysis revealed no significance in group moderation for type of work or type of employee. This indicates the model is applicable across other areas of work within the government without initial adjustments. However, this may be due to the available sample size becoming smaller when divided into two groups. The models, while simplified, would still require minimum samples sizes in order to measure small effect size differences between the groups. Therefore, group as a moderating variable in the context of type of work or type of employee for government organizations is inconclusive within this study.

The findings for research questions 2 and 3 support the presence of intrinsic attributes as a mediating factor between those factors within an organization's control. The mediation occurs with significant covariances between intrinsic attributes and the two latent variables for formal devices and relationships seen in Table 22 and the significant effect of intrinsic attributes on innovation seen in Table 21. **Error! Reference source not found..** These mediation effects are highlighted in the significant relationships Model E* in Figure 15. Additionally, the significant relationship between intrinsic attributes on challenges and challenges on innovation support the observed variable as a mediator for intrinsic attributes on innovation. Furthermore, control is a significant mediating variable for idea generation for other formal devices.

While formal devices as a whole may not have a direct impact on innovation, control directly affects idea generation and challenges, previously an indicator for formal devices, has a direct effect on innovation. These mediating variables are important to the understanding and construction of a suggestion system.

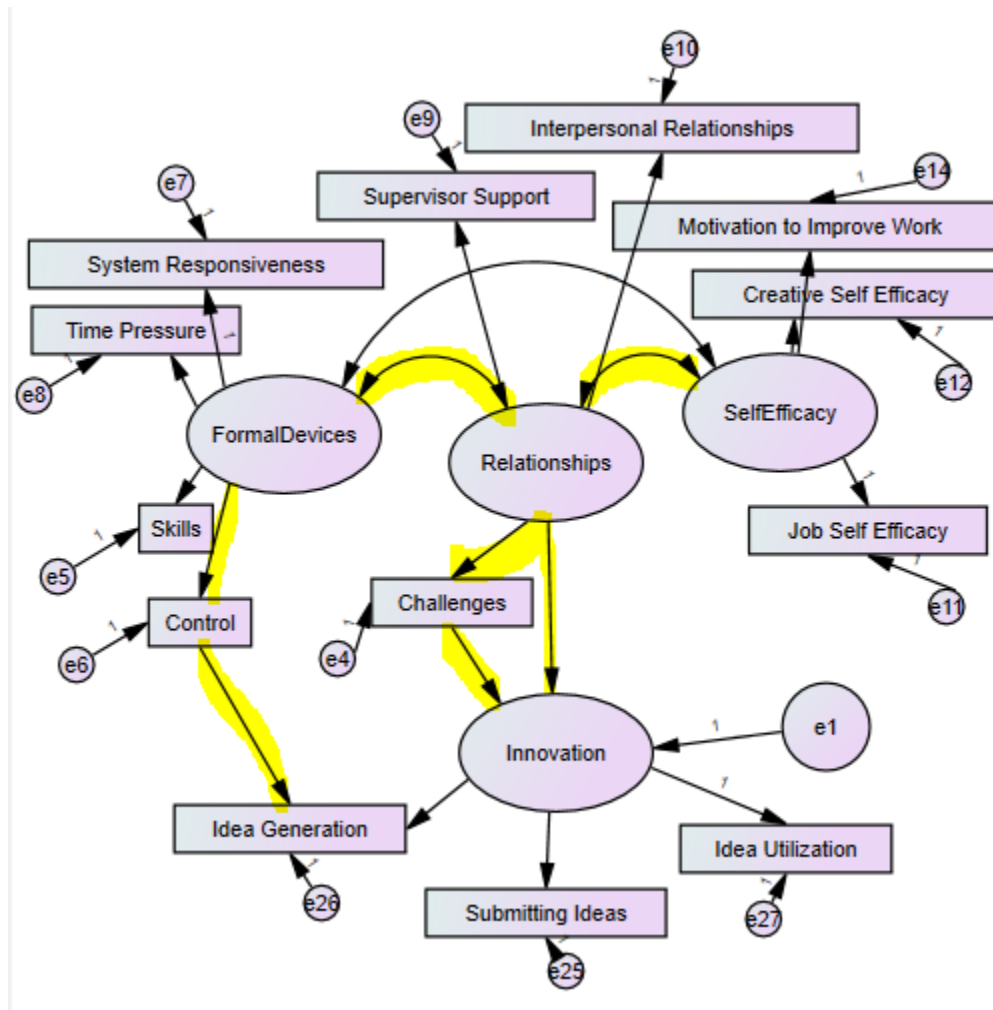


Figure 15: Significant and Mediating Paths Model E*

This insight, while not directly related to the three research questions, supplements decades of research that have shown what factors exist in the system of employee innovation. The

mediating relationships preserve the conclusions of previous research as to the presence and importance of formal devices and relationships, but not in the ways initially conceived. The presence of these mediating variables supports a more holistic structure for achieving employee innovation. As previous research has shown through regression that the various factors are significant in the presence of suggestion systems, this study demonstrates that the intrinsic attributes are the avenue in which organizational factors succeed in achieving employee innovation. This was partially theorized in Frese et. al.'s (1999) general model (Figure 6) but did not hold in the final model (Figure 7).

CHAPTER SIX

CONCLUSIONS & RECOMMENDATIONS

Conclusions

This study built upon an important connection upon the past decades of research. The results of the research questions provide quantitative and systematic support for the presence of factors and their impact in relation to employee innovation. Additionally, this study adds to the discussion of suggestion systems being a form of employee engagement to achieve a greater competitive advantage.

The first contribution of this research to the topic of employee engagement and innovation is the use of a government sample. While the size of the government workforce is large, few studies in the United States leverage them as a participant group. The aversion to using government entities is the level of securities and permissions associated with access to these groups in addition to any clearance to obtain historical data. Additionally, the public sector operates differently on a fundamental from the private sector to the extent the definition of competitiveness is not easily interchangeable. As public sector provides community services and work, traditional metrics such as profit as not always appropriate. By using a government participant group, this study had demonstrated the ability to measure suggestion systems within these operations defined by rigid formal structures.

While innovation has a positive effect on employee engagement, both impact the chosen competitive metrics differently and in non-significant levels. Innovation has a stronger effect on performance metrics than engagement alone. This indicates that while methods of bottom-up

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communication are important to achieving employee engagement, there are other factors contributing to the level of engagement and the latent variable's impact on other metrics. This study also suggests that employee engagement and innovation have non-significant impact on performance metrics in this context. The chosen competitive metrics for this study served to answer Research Question 1 but ultimately did not strongly correlate to provide an understanding for the latent construct of perceived competitiveness. Other metrics in the participating organizations may be better candidates for future consideration, and these metrics in other organizations may not lack the strong correlations. The impact on competitive advantage at a latent level is inconclusive due to performance metrics having multiple issues throughout the analysis such as with weak inter indicator correlations. However, on a component level, engaged employees with higher organizational commitment who experience higher implemented ideas in innovation promote higher throughput. Additionally, engaged employees with higher organizational commitment who experience greater number of generated ideas in innovation promote higher frequency of certifications and a lower frequency of process time outliers. Regardless of the impact to the method of measuring perceived competitive advantage in this study, innovation has a significant effect on employee engagement and therefore is a valid method for building engagement within an organization.

This study demonstrated the presence of all factors in suggestion systems previously discussed in research but provided a new paradigm for how these variables interact in order to achieve employee innovation. While in the government context, motivation for reward was not a significant factor, all other intrinsic attributes were an important mediating factor for organizational factors on employee innovation. Additionally, challenges as a formal device, was a

mediating factor for intrinsic attributes onto innovation. This means that while organizational factors such as formal and informal relationships, system responsiveness, time pressure, control of work, and ability to use skills are all important to encouraging employee innovation, the presence of these factors do not directly impact the success of a suggestion system. These are mediated by intrinsic attributes that, if satisfied, and concentrated on the challenges on the job, achieve innovation. Lastly, this study found a greater emphasis on control of work in relation to idea generation than in previous studies. Previous research has shown greater autonomy positively correlates with greater innovation, but this isolates the effect to the first step in the suggestion process. This is crucial in consideration of the government context where there are greater number of formal mechanisms to define the work environment than in private industry.

Study Limitations

The appeal of focusing on the government context is not without its drawbacks. Much of the historical research on employee engagement and suggestion systems takes place in private industry as well as international companies. This is not to say the findings of the previous research cannot be applied to government organizations, but the reverse may not be true. Public sector within the United States is defined by the vast number of formal mechanisms that structures any type of work. Additionally, the public sector lacks the traditional definition of performance due to certain KPI metrics, like profit, being inappropriate for the type of work conducted.

A limitation of this research is the findings are applicable within the government, production context only. Further research would be necessary to test the validity of the model applied to intellectual and service work as well as any additional industry in private sector. Another limitation within the context of government operations is this study only sampled civilian and

contractor employees. Additionally, active military and reserves may be other participant groups to be considered as the terms of their employment are vastly different from the other two. This is a view for future research as well since there are few overlapping job environments where all types of employees share locations, type of work, and similar work force make up. In this study, the RMD is made up of both civilians and contractors working side by side. Similar, RMD facilities have work forces of solely military, contractors, or civilians. These variations pose limitations to these findings until a large enough sample size is acquired to measure group moderation effects on these models.

Another limitation of this model is the requirement to break the original model into two simplified models for testing. While the evaluation of the hypotheses and research questions was still systematic through SEM analysis, the holistic view of factors affecting innovation that subsequently affects engagement and competitiveness is lost in the split. The original model had a large enough sample size to meet the power requirements, but the complexity of the model would require more data to measure smaller effect sizes for proper identification of a model that would meet the fit indices. This is also limited by the weakly correlated choice of perceived competitiveness metrics which resulted in the removal of a whole latent construct from the model.

The answer to Research Question 1 is limited to what was demonstrated in Model D. Had the original model met fit index requirements and been analyzed, there would be greater insight to what else in the employee innovation system contributes to engagement and if those relationships impacted engagement's effect on competitive metrics. The limitations of sample size and choice of competitive metrics resulted in simplifying the model and reducing the ability to answer Research Question 1.

A theoretical limitation of the model throughout the whole study is the inability to distinguish other sources of employee engagement. The model is meant to measure the direct impact of innovation on engagement but does not continue to account for what else may impact engagement within the work environment. Had the model remained in the original complex structure, theoretically there would be measured effects from the latent factors of formal devices, relationships, self-efficacy, and motivations on engagement as well. However, this model does not take into account the potential presence of other forms of engagement and if these are driving the positive relationship between engagement and innovation. There may have been education, training, mentorship, and other forms of engagement present independent of a suggestion system. While innovation has an impact on engagement within this model, further consideration of what is unmeasured is outside of the purpose of this study.

Similarly, the conclusions of this study are limited to the indicators measured and included in the model. This study used historical literature to encompass a holistic definition of employee innovation systems and the comprising factors. However, there is always the possibility of other formal devices, relationships, intrinsic attributes, or facets of innovation that were not defined in this model independently of the specified structure.

Lastly, a limitation that has unknown effects was the COVID-19 pandemic. The initial pandemic lock downs began half-way through the fiscal year evaluated for performance metrics. Furthermore, the questionnaires were collected after 6 months and 9 months of pandemic related health precaution mandates. While neither group stop working as most of industry was shutting down, the shift and impact of this time frame is near impossible to isolate in the data. The support for treatment of the data without this consideration is the correlation of job satisfaction with

commitment and the consistent average of performance metrics from prior fiscal years. An employee could show high continued commitment while having low job satisfaction strictly for the sake of job security during a period of economic strife (Markovits, Boer, & Dick, 2013; Markovits, Boer, Gerbers, & Dick, 2017). However, this potential case is refuted by the sample's positive correlation of job satisfaction and commitment. As for performance metrics taken during a time frame before and then during a pandemic, these KPIs remained consistent with previous 3 fiscal years. While there is no dispute that the pandemic had an impact on industry and society, there was no direct change in the chosen performance metrics as a result. This may be further evidence to support issues with the choice of KPIs for this study, but the consistency provides some confidence in evaluating the data without factoring in such a large event. Nevertheless, practice in this field going forward should consider the new terrain as a post-pandemic work environment is only another instance of change management at work within organizations.

Recommendations

The recommendations that arise from this study contribute to both the continuous growth of the theoretical topic of employee innovation and engagement as well as the practical use of the findings from this sample and the model.

Theoretical Implications. The contributions of this study to the line of research in employee innovation and engagement is rooted in the approach of structural equation modeling. Previous qualitative research has enumerated the factors present and contributing to the system of employee innovation. Additional quantitative studies verified the presence of different combination of these factors based supporting research at the time. Several of these quantitative studies, using multiple regression, determined which of these factors has significant impacts on innovation. This study

builds on several pieces of these quantitative studies and looks to inform future approaches to analysis within this topic.

Beginning with the structure of the model and presence of factors, this study attempted to be further inclusive of systematic variables and indicators. The use of latent variables aided in creating a more holistic model, including providing additional indicators for innovation beyond just idea generation. Employee innovation is not achieved unless the generated idea is at least submitted and it is not effective until the contribution is utilized. Therefore, all of these steps are important and combining them as indicators to the latent construct for innovation ensures a positive effect in relation to employee innovation addresses the entire process. This concept also applies to the use of latent variables throughout the model as measuring single indicators effects on one another can create further complex models and cases of high multi-collinearity.

The use of latent variables in SEM provides an additional advantage over multiple regression in the form of mediating variables. Prior studies have shown significant one-way impacts on innovation, but may be missing the piece discovered in Research Questions 2 and 3. With intrinsic attributes and formal work challenges mediating the effects of other factors, this puts more emphasis on the indirect effect not captured in previous studies. Therefore, this study contributes to the study of innovation and engagement the need to approach modeling the system with SEM in order to capture potential mediating effects of factors, even if the encouraged use of latent variables is discarded.

Another implication to the study of suggestion systems is the importance of intrinsic attributes and organizational factors in achieving innovation. While the interpretation of mediating factors will be discussed in the practical implications, the theoretical implication is in the set of

factors that did or did not have significant impact on innovation. Previous literature reviews have shown large focus on relationships and formal devices as center points to encouraging employee contributions; potentially because these are points of the work environment within greater control of management (Kelly, 2018). However, this study shows that the benefits of organizational factors are only realized in the presence of satisfied intrinsic attributes and recognized formal challenges. Few studies emphasize the role of self-efficacy while most treat motivation as a response to chosen reward schemes (Kelly, 2018). The findings of this study support the further continued inclusive additions of factors in a suggestion system model, regardless of amount of anecdotal evidence supporting the presence and impact on innovation. The implication of this study is directed at the importance of direct and indirect effects and the ability to capture the difference.

Practical Implications. This research directly applies to the work environment within government operations with a mix of civilian and contractor employees performing both routine and spontaneous maintenance production. However, these findings may also hold weight in other industries of the private sector or other types of work within the government. Management seeking to attain employee engagement can use suggestion systems as a method or program of choice.

While an avenue for bottom-up communication must be available, either formal suggestion system or informal means, these should be used to satisfy intrinsic attributes such as self-efficacy and motivations rather than encourage contributions directly. Successful employee innovation is achieved by meeting the motivations of the employees and encouraging capability in both their job performance and creativity related to their work. While this study did not find motivation for reward to be significant in this population, it should still be evaluated when considering other populations. This sample had high correlation of the intangible, intrinsic type of reward fueling

the motivation to improve work rather than a tangible, extrinsic reward. Therefore, in a government context, encouraging intrinsic attributes through organizational factors allows for employee innovation to flow into the suggestion system. Furthermore, the intrinsic attributes should be focused on the formal challenges of work as an opportunity rather than an obstacle to gain meaningful contributions.

To use organizational factors to support intrinsic attributes such as self-efficacy and motivation, there must be support from both the supervisor and peers in work and critical thinking of daily challenges. The system for bottom-up communication must be timely and provide clear feedback to build trust in the system and the employee's self. The structure of work should not only limit the amount of time employees feel overwhelmed with too much to do but also provide them enough autonomy to coordinate their work and time. This allows critical thinking time and relevance to address problems and create solutions.

While this study did not find an impact on chosen competitive metrics from innovation or engagement, decades of research still support engagement as a driver for positive change in KPIs. Management should choose performance metrics carefully and test their correlation prior to setting a baseline and pursuing changes for increased engagement. If the metrics are not strongly correlated, then the concept of perceived competitiveness will appear disjointed as the metrics respond differently regardless of the engagement approach used. While use of certain KPIs may be previously reported despite weak correlations, this is a good exercise in discovering which metrics hold greater value and provide substantial support for data driven decisions.

Future Work

The conclusions, limitations, and implications of this study provide much direction for the next steps in this area of research. Future research on the topic of systematic employee innovation should seek to expand the participant population to various industries in the private sector, active and reserve military, as well as other types of work within the public sector. These future studies should also seek to gain a sample size greater than 300 to support the analysis of the original, more complex model. This would aid in providing further insight to innovation's role in achieving employee engagement. Additionally, the use of a larger sample size will allow for testing for multi-group moderation within the model. Furthermore, the use of perceived competitiveness indicators should be reassessed for the sampled groups and chosen based on strong correlations. Additional engagement indicators should also be considered to provide additional support in measuring the latent construct. Future research should also look to expanding the model and working with latent variables to further define the impact to employee innovation and engagement.

Additional research should seek to measure a holistic impact of innovation on engagement with the consideration of other methods of engaging employees present. While there may be few instances of isolated methods of engagement, modeling of an organization's efforts in pursuit of frontline critical thinking would contribute to the conversation as to the best methods for achieving engagement.

Ultimately, future work should focus on validating if the presence of intrinsic attributes such as motivations and self-efficacy continue to hold as mediating variables between organizational factors and innovation in addition to formal challenges of work mediating intrinsic attributes effect on innovation.

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APPENDICES

APPENDIX A

MODEL EXPANSIONS AND COMPARISON TO FRESE ET. AL. 1999

The three response variables from the 1999 study were having ideas, writing and submitting ideas (to be shortened to submitting ideas for the proposed study), and rewarded ideas. These three-response variables measure success of employee innovation at different points in the process. The relationships modeled in the 1999 general model reflect the sequence of an employee having the creativity to form an idea, the employee formally or informally communicating that idea, and the idea either being implemented and the employee rewarded or the idea rejected (M. Frese et al., 1999). The relationship between submitting ideas and the rewarded ideas is theorized as a two-way effect. The more ideas submitted the more chances for one to be rewarded and continuously having ideas rewarded or rejected may affect the frequency an employee submits ideas (M. Frese et al., 1999). The three response variables represent different points of measured engagement in the suggestion system process and therefore are indicators of employee innovation. The sequential relationship between the three response variables will not be retained due to the categorization as an indicator for the latent innovation construct. However, the sequential and effective relationship may reappear during model fitting through the analysis stage of this study.

While the expanded model will retain the original three response variables as indicators, the method of measurement will be adjusted for both submitting ideas and rewarded ideas to allow for a broader range of participants in this study while maintaining the integrity of the factor in the following ways. The factors for submitting ideas and rewarded ideas were originally measured as the reported number of ideas submitted by each participating employee and how many of those were implemented and rewarded (M. Frese et al., 1999). While this measurement method is objective and accurate, the potential representation in this method is limiting. This method of measurement requires that a company already have a formal suggestion system in place that also

keeps track of submissions and rewards. There are many companies that do not keep track of individual employee numbers while still using a formal system and even more who do not rely on a formal system at all for their bottom-up communication (Kelly, 2018). Many companies rely heavily on informal mechanisms such as open culture and peer to peer relationships to carry ideas from thought origination to implementation (Kelly, 2018). Companies who already formally measure and track the number of submissions and idea implementation are actively seeking to engage their employees and may provide a very limited variation among organizational samples. Therefore, the original method of measurement would severely limit the types of organizations represented due to restricted capability of providing objective data.

Since this study is using the expanded model to capture the spectrum of success in employee innovation, the data sample should represent both companies who do and do not currently seek to publicly highly engage their employees. Rather than requiring historical data for the factors of submitting ideas and rewarded ideas, the use of psychometric questionnaire items would ensure the larger eligibility of participants needed for sample representation. The method of measurement used for submitting ideas will reflect self-reported, communicated creativity. While there are concerns for inflated values when working with self-reported metrics for creativity, if an external measurement of success is used in conjunction, any bias should be mediated (Ng & Feldman, 2012; Reiter-Palmon et al., 2012). Therefore, rewarded ideas will need to be measured by supervisors through evaluation of creative performance for each employee participant.

The next improvement to the Frese et. al. (1999) model will be the consolidation of the factors of proactiveness, aspiration, and self-efficacy into one inclusive self-efficacy factor. The multi-factor representation of self-efficacy in the 1999 general model can oversaturate the model

and result in other factors appearing less significant due to the repeated effect from highly correlated factors. Additionally, the over representation of self-efficacy orients the model as employee-initiated innovation, decreasing the understanding of how an organization contributes to innovation directly.

The factor of proactiveness is the combination of subjective initiative and higher order need strength while the factor of aspiration is the combination of control aspirations and interest in work innovation. The operational definition for each of these four concepts used in Frese et. al.'s model represents additional aspects in Bandura's original definition of self-efficacy beyond the explicit self-efficacy factor from the 1999 study as demonstrated in the literature review. These facets over-representing self-efficacy create a gap in understanding what organizations can do to contribute directly to employee innovation. This is a problem because organizations have minimal control over the intrinsic attributes of their employees. This gap will be closed by combining all facets of self-efficacy into one factor.

All aforementioned facets of self-efficacy will be represented by the singular latent factor shown in Figure 10 but will require at least two observed variables as indicators (Kline, 2015). As discussed, proactiveness, aspiration, and self-efficacy use five instruments to represent the same factor as measured by Frese et. al.(1999) thus increasing complexity and data requirements of the model while risking high intercorrelation. These observed variables will be replaced by two factors that reduce the data requirements at a lower risk of high intercorrelation while still representing the facets of self-efficacy. The first observable factor will be standard self-efficacy as represented by Frese et. al. 1996 which evaluates proactiveness, aspiration, and perceived self-competence in one's position at work. This factor only represents the perceived abilities of an individual to

overcome challenges and perform tasks. The second factor will be creative self-efficacy as defined and measured by Tierney and Farmer in 2002. This factor supplements the first factor by addressing the perceived abilities of the individual to also come up with ideas and suggestions. Therefore all pieces of proactiveness, aspiration, and self-efficacy as represented in both regular activities and innovation.

Frese et. al.'s original model combined the factors for job control and job complexity into one factor for job content. They were combined due to the suspected high intercorrelation between these factors. While the literature supported this decision at the time of publication, research has since concluded that control and complexity have different effects on the creativity of having ideas (Coelho & Augusto, 2010; Harris & Natarajarathinam, 2015). Autonomy at work has continued to show higher levels of creativity within employees and therefore an increased number of innovations on the job by promoting ownership and pride (Harris & Natarajarathinam, 2015) (Konrad, 2006). Reduced oversight and greater autonomy can produce twice as many submitted ideas (Bassett-Jones & Lloyd, 2005). However, increased job complexity results in lower creativity due to the amount of focus and resources required to fulfill regular work tasks (Coelho & Augusto, 2010). The gap created by retaining the combined factor control and complexity is missing the possible opposite effect observed in modern research. Missing this contradicting effect between control and complexity can cause the issue of a non-significant effect of the combined factor on the response variables. In this work, this gap will be closed by separating the two factors and measuring them separately. Both job control and job complexity are pieces of the infrastructure built within an organization for each position and therefore, are both indicators of formal structure as shown in Figure 10.

None of the supervisor support effects were found significant in the best fitting model in the 1999 study, which is contradictory to both the literature used in development of Frese et. al.'s general model in Figure 6 and literature since publication (M. Frese et al., 1999; Kelly, 2018). However, the 1999 study does not provide any explanatory comment on why this may have occurred within the data. The only inclusion of supervisor support's effect on employee innovation was adding a significant relationship with rewarded suggestions at the expense of model fit (M. Frese et al., 1999). The gap of this missing significant relationship creates an inability to reconcile decades of research supporting with the opposite conclusion. This gap causes concern for possible misattributing effects of this organizational structure on employee innovation and, therefore, unwarranted focus on non-significant factors.

Supervisor support is one of three factors from the original model that deal with organizational influence rather than personal characteristics of employee and therefore should be retained given the purpose of this secondary study. Furthermore, the effect of supervisor support was determined as significant with an effect on rewarded suggestions in Figure 7 and recent literature supports additional effect on idea generation and submission. Innovative leadership encourages creativity and promotes a culture of trust and partnership between manager and employee (Boyd, 2017; Yates, 2011). Additionally, the use of supervisor support beyond just the writing and submitting portion of the process and into the ability to have ideas allows for the innovation process to be collaborative and increase the likelihood of the submitted idea being implemented (Kelly & Schell, 2017a; Pilly, 2016). The proposed study will retain supervisor support in the expanded model as one indicator of the latent factor of relationships within an

employee innovation system. Confirming the level of significance of this factor on employee innovation with the modern sample will close this gap.

System responsiveness was defined in the 1999 study as the perceived trustworthiness and efficiency of a suggestion system by employees. However, system responsiveness had no significant effects within the best fitting model in Figure 7. Frese et. al. reasoned the need for system responsiveness as “a person will be more likely to submit a suggestion if she or he believes that the organization treats suggestion adequately, fairly, and understands and implements the suggestions where possible.” (M. Frese et al., 1999). Similar to supervisor support, the non-significance of this factor without explanation creates a gap in the conclusion of the 1999 study and supporting literature. The need for trust is a consistent theme in recent literature when discussing successful employee suggestion systems. This gap continues to pose the concern of focusing organizational efforts on irrelevant factors in the pursuit of improving employee innovation. Trust in the system for submitting and evaluating is crucial for employees to participate in the process (Fairbank et al., 2003; Kelly & Schell, 2017a). The first concept included in studies of when employees are allowed to design the suggestion system is transparency of the process (Fairbank et al., 2003; Konrad, 2006). Feedback is another way to instill trust in the system; allows for the company’s response to a suggestion to be a conversation and explanation rather than a dead end in the chain on bottom-up communication (Coelho & Augusto, 2010; Pilly, 2016). Retaining system responsiveness in the expanded model will close this gap by confirming either the presence or absence of the effect on the response variables in the modern study as an indicator of formal structures as shown in Figure 10.

Motive for reward and motive for better work are two factors that directly address the difference between extrinsic and intrinsic motivation. The presence of both types of motivations are important for having ideas and then eventually submitting those ideas. The best fitting model in Figure 7 found this true for motive for better work, but motive for reward was non-significant. Extrinsic rewards can lead to an increase in contributed ideas (Bartol & Srivastava, 2002). Intrinsic may motivate the idea while the submission may be motivated by extrinsic; both types are important (Bassford & Martin, 1996; Carrier, 1998). There is a gap between modern studies confirming the presence of both types of motivation and the limited significant relationships measured within the 1999 study. The concern of the significance of measured relationships in the best fitting model is the continued discrepancy with compiled conclusions from literature and therefore inconclusive understanding of what factors are actually important in affecting employee innovation. This gap can be closed by including both motivations as indicators of the latent factor of motivations that effect employee innovation. Motivations are another aspect of personal attributes of personnel. This form of inclusion of both factors will retain the integrity and need for both types of motivation in the employee innovation process.

As important as the organizational factors that encourage successful employee innovation are, understanding what is preventing ideas from being submitted is equally crucial. This concept was embodied by the original factor for suggestion inhibitors in the 1999 general model. The instrument consisted of five items that covered an array of potential deterrents for employees to submit their ideas. While the 1999 suggestion inhibitor factor was well included in considering the entire system, the same factor should not be included in the expanded model for this study. The presence of a significant effect from the suggestion inhibitor factor onto writing and submitting

only indicates there are obstacles in the organization that dissuade sharing ideas but not what those obstacles are as there are five different reasons covered in the instrument. The gap created by one factor inclusive of an eclectic source of inhibitors is the inability to isolate the strongest sources of innovation deterrents. Additionally, as seen in Table 26, each item addressing different inhibitors are included elsewhere in the expanded model. A significantly negative relationship between any factor and a response variable will also clearly designate what organizational factor acts as an inhibitor. Furthermore, the proposed study suspects time pressure and job complexity are inhibitor and which are not included in the 1999 potential inhibitors addressed in the instrument items in Table 26. For these reasons, the factor of suggestion inhibitor will not be included in the expanded model and close the gap of ambiguity in sources responsible for discouraging innovation.

Table 26:Corresponding Factors to Suggestion Inhibitor Items

Suggestion Inhibitor Item (M. Frese et al., 1999)	Factor where Specific Inhibitor is Addressed
Continuous rejection of suggestions	Rewarded suggestions
Small problems don't require a huge system	Job control
If I have the power to change it myself I do	Job control
There is no public recognition	Motivation for reward
If the company is doing badly, they will not listen to my ideas.	Supervisor support

The 1999 general model was inclusive of factors strongly present in studies pertaining to employee innovation at the time of publication, the past twenty years has had additional factors emerge as strong themes within qualitative studies of employee suggestion systems. There is a gap between the 1999 general model and the compiled factors and themes within historical research since publication. The consequence of not including all represented factors within the study is the

inaccurate depiction of an employee innovation system and decrease explanation of variance. The issue with this gap is remedied by the inclusion of factors in the proposed studies to create a fully representative expanded model. One of these factors to be included is the presence of interpersonal relationships. The concept of support from these interpersonal relationships at work follows the same logic as support from supervisor but utilizes the equality of peer-to-peer exchange rather than encouragement from authority. Interpersonal relationships focuses on the collaborative aspect of the employee innovation process.

Collaborative efforts encourage further development of ideas and suggestions (Boyd, 2017; Yates, 2011). Collaboration between peers promotes employee innovation as part of everyday work and encourages critical thinking about opportunities for improvement during regular tasks (Kelly & Schell, 2017a; Pilly, 2016). The presence of strong peer-to-peer relationships should positively affect employee innovation. Therefore, these interpersonal relationships will be included as a second indicator for the latent factor of relationships in the expanded model in Figure 10.

Another factor that was not included in the original model but is present in recent qualitative studies of employee innovation is time to innovate. Allowing time to innovate encourages and supports idea generation and promotes trust in management as well as the designed system (Boyd, 2017; Pilly, 2016; Xin Li, 2016). Allowing time dedicated to employee innovation supports the belief that the objective achieving improvements is true. Making innovation part of the everyday work encourages employees to utilize creativity as a skill and be aware at all times throughout regular work for opportunities (Kelly & Schell, 2017a). Time to innovate is determined

by the infrastructure of each position within an organizational and therefore is an indicator of the latent factor of formal devices with an effect on employee innovation.

While the expanded model will include the concept of time to innovate as a factor in this study, the orientation will be evaluating the lack of time to innovate. The presence of extra time at work outside of regular tasks may be present but not exclusively utilized by employees for innovative purposes or may go unnoticed altogether (Beckmann, Cornelissen, & Kräkel, 2017; Cahn, 1999; Nandhakumar & Jones, 2001; Pilly, 2016; Xin Li, 2016). To avoid the evaluation of presence of time from being mediated by any employee's personal initiative, the factor will be oriented as an inhibitor by measuring the time pressure within a job. This will ensure that employee consider the lack of extra time they have to put specifically towards innovations rather than presence of extra time used at individual discretion.

The changes proposed will close a gap left between the two possible conclusions of Frese et. al. (1999) by modeling factors representative of employee innovation systems depicted in modern and historical research. This expanded model when measured can provide a systematic understanding of the different factors that promote or inhibit employee innovation within an organization in the current modern industry context and generational shift. While this expanded model provides a quantitative expansion on the understanding of what successful suggestion system is composed of, there is no link as to how or if successful employee innovation contributes to a company's competitive advantage. The gap between defining the system of employee innovation and employee innovation's effect on organizational performance is due to lack of studies connecting individual innovation to the larger context of their organization.

APPENDIX B

PILOT STUDY QUESTIONNAIRE ITEMS

Self-Efficacy

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Frese et. al. (1996)

1. When I am confronted with a new task, I am often afraid of not being able to handle it.
(reverse coded)
2. I like to make suggestions on how to improve the work process.
3. I judge my abilities to be high.
4. If I wanted to achieve something, I can overcome setbacks without giving up my goal.
5. When I want to reach a goal I am usually able to succeed.

Tierney & Farmer (2002)

6. I feel that I am good at generating novel ideas.
7. I have confidence in my ability to solve problems creatively.
8. I have a knack for further developing the ideas of others.

Job Complexity

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Semmer (1984)

9. I must make very complicated decisions in my work, but others only have to make simple decisions.
10. I can use my knowledge and skills in my work.
11. I receive tasks that are extraordinary and particularly difficult more than half the time.
12. I can learn new things in my work.

Job Control

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Semmer (1984)

13. I can determine how I do my work.
14. I can plan and arrange my work on my own.

15. If you look at your job as a whole: how many own decisions does it allow you to make?
 - a. A great deal
 - b. A lot
 - c. A moderate amount
 - d. A little
 - e. None at all
16. How much can you participate in decisions with your superior?
 - a. A great deal
 - b. A lot
 - c. A moderate amount
 - d. A little
 - e. None at all

Motivation for Reward

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Frese et. al. (1999)

17. I would send in more suggestions if they would be rewarded more often.
18. I would send in more suggestions if the rewards would be higher.
19. When I send in a suggestion, I do it for the reward.
20. The reward is most important for me when I send in a suggestion.
21. I think recognition is an important motivation to send in suggestions.

Motivation to Improve Work

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Frese et. al (1999) with altered wording

22. I would send in a suggestion if I'm bother by something in my work. (previously: I send in a suggestion whenever I'm bother by something in my work.)
23. I would send in a suggestion if my job could be done easier. (previously: I send in a suggestion when my job can be done easier.)
24. I would send in a suggestion if the work situation was unsafe. (I send in a suggestion when the work situation is unsafe.)

Supervisor Support

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Frese et. al. (1999)

- 25. My supervisor encourages me to give suggestions.
- 26. Giving suggestions is appreciated by my supervisor.

Madjar et. al. (2002)

- 27. My supervisor discusses with me my work-related ideas in order to improve them.
- 28. My supervisor gives me useful feedback about my ideas concerning the workplace.
- 29. My supervisor is always ready to support me if I introduce an unpopular idea or solution at work.

System Responsiveness

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Frese et. al. (1999)

- 30. My suggestions are executed most of the time.
- 31. I think there's a big chance a suggestion will be executed.
- 32. I think the treatment of suggestions leaves much to be desired. (reverse coded)
- 33. I give few suggestions because it takes a long time before you get an answer. (reverse coded)
- 34. Rejected suggestions are sometimes used anyhow.
- 35. When I give a suggestion it is taken seriously.
- 36. I can see by the answer that they understood my suggestion well.
- 37. I can understand the answers to my suggestions.

Time Pressure

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Baer & Oldham (2006)

- 38. I don't have much time for thinking up wild ideas, I'm too busy just getting my job done.

39. Why is everyone always talking about new ideas? I've got more work than I know what to do with.
40. Ideas are only important if they impact major projects.
41. If everyone is providing ideas, then no one gets any work done.
42. New ideas and hunches require exploration before their value can be demonstrated to others. Innovative organizations give people the freedom to use some of their time to explore new ideas and hunches without having to ask permission. What percentage of your time at work can you safely divert from your assigned tasks to explore new ideas you believe have promise?
 - a. 0-2%
 - b. 3-5%
 - c. 6-10%
 - d. 11-20%
 - e. 21-40%
 - f. 41-100%

Interpersonal Relationships/Support

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Madjar et. al. (2002)

43. My coworkers other than my supervisor are almost always supportive when I come up with a new idea about my job.
44. My coworkers other than my supervisor give me useful feedback about my ideas concerning the workplace.
45. My coworkers other than my supervisor are always ready to support me if I introduce an unpopular idea or solution at work.

Idea Generation/Having Ideas

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Frese et. al. (1999)

46. I try to be as creative as I can in my job.
47. I experiment with new approaches in performing my job.

Coelho et. al. (2011)

- 48. On the job I am inventive in overcoming barriers.
- 49. I often have ideas.
- 50. I am busy a lot with thinking of ideas.

Idea Elicitation/Submitting Ideas

Rate how strongly you identify the following characteristics in yourself, 5 being “Describes me extremely well” and 1 being “Does not describe me.”

Zhou & George (2001)

- 51. Suggests new ways to achieve goals or objectives.
- 52. Comes up with new and practical ideas to improve performance.
- 53. Search out new technologies, processes, techniques, and/or product ideas.
- 54. Suggests new ways to increase quality.
- 55. Is a good source of creative ideas.
- 56. Is not afraid to take risks.
- 57. Promotes and champions ideas to others.
- 58. Exhibits creativity on the job when given the opportunity.
- 59. Develops adequate plans and schedules for implementation of new ideas.
- 60. Often has new and innovative ideas.
- 61. Comes up with creative solutions to problems.
- 62. Suggests new ways of performing work tasks.
- 63. Often has a fresh approach to problems.

Job Satisfaction

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Spector (1997)

- 64. I sometimes feel my job is meaningless. (reverse coded)
- 65. I like doing the things I do at work.
- 66. My job is enjoyable.
- 67. I feel a sense of pride in doing my job.

Rewarded Ideas (completed by the supervisor of employee participant)

Please rate each aspect of the employee’s suggestions listed below on a scale of 1 (not at all) to 5 (almost all).

Madjar, Oldham, & Pratt (2002)

1. How creative is this person's work? Creativity refers to the extent to which the employee develops ideas, methods, or products that are both original and useful to the organization.
2. How original and practical is this person's work? Original and practical work refers to developing ideas, methods, or products that are both totally unique and especially useful to the organization.
3. How adaptive and practical is this person's work? Adaptive and practical work refers to using existing information or materials to develop ideas, methods, or products that are useful to the organization.

APPENDIX C

PILOT STUDY INSTRUMENT ITEM RE-EVALUATION

Table 27: Instrument Internal Consistency Adjustment

Factor Name	Total # of Questions	Cronbach Alpha As Is	Suggested Changes	New Cronbach Alpha	Final # of Questions
Complexity of Work	4	0.149	Middle 2 questions only	0.5464	2
Control of Work	3	-0.426	First 2 questions only	0.785	2
Interpersonal Relationships	3	0.5599	Combination of 2 of 3 questions results in highest CA at 0.62 (Q 1 & 3)	0.62	2
Self-Efficacy	5	0.687	Excluding question #4	0.727	4
Supervisor Support	6	0.549	Exclude Q 6	0.892	5
Time Pressure	5	0.679	Exclude Q 5 for CA 0.671; reason to further exclude Q 2 for a CA of 0.589; Retain only Q 1 & 3	0.756	2

Table 28: Reasoning for Item Removal

Factor	Question Suggested for Exclusion	Removal Reasoning
Interpersonal Relationships	My coworkers other than my supervisor are always ready to support me if I introduce an unpopular idea or solution at work.	Boosts internal consistency marginally; no theoretical support for removal
Self-Efficacy	When I am confronted with a new task, I am often afraid of not being able to handle it.	Boosts internal consistency marginally; no theoretical support for removal
Supervisor Support	How much can you participate in decisions with your superior?	Supervisors can support new ideas without including employees in regular/all other decisions
Time Pressure	Ideas are only important if they impact major projects.	Not related to time available, only speaks to the value of possibly spending time on ideas
Time Pressure	If everyone is providing ideas, then no one gets any work done.	Addresses a perceived group time pressure on a personal level rather than a personal time pressure within regular work

Factor	Question Suggested for Exclusion	Removal Reasoning
Time Pressure	What percentage of your time at work can you safely divert from your assigned tasks to explore new ideas you believe have promise?	This has to be reverse coded and goes against the reasoning to measure lack of time rather than what employees do with perceived free time.

APPENDIX D

INTERAL REVIEW BOARD APPROVAL EDITS AND MATERIALS FOR FULL STUDY

A. IRB Minor Edits Form

**Montana State University
Institutional Review Board
Request for Minor Modifications/Amendments**

Instructions: E-mail completed form and all revised and/or new study documents to:
cherylj@montana.edu

Note: The project's IRB-approved Research Protocol must be kept current and followed throughout the life of the project with yearly renewals. Protocols approved in the Exempt category do not require yearly renewals. All study documents are subject to review.

1. **IRB approval number:** KKC110419-EX
2. **Project Title:** Effective Employee Innovation
3. **Principal Investigator:** Katie Kelly Clennan
Contact information (phone/e-mail): katiekelly.msu@gmail.com
Address (where you want approval letter sent):
 1125 Bethel Rd
 Box# 202
 Port Orchard, WA 98366
4. **Requesting modification/amendment to:**
 - ✓ Research protocol
 - ✓ Consent form
 - ☐ Recruitment materials
 - ✓ Survey instrument, interview questions
 - ☐ Research personnel
 - ☐ Other, please explain:

5. **Describe the modification being requested:**

Note: with each requested change, provide a detailed description of where within the study documents (e.g. Research protocol, survey instrument, etc.) the changes are reflected (e.g., section, question #, etc.).

Research protocol – this study is being shift from digital questionnaire to paper-based survey per case company management's request. The data sample post-pilot study will be with product work groups that does not have ready access to computer-based questionnaire. This is due to both production activities offline and the limitations of a government secured network. Management would like to distribute the paper-based survey

at weekly safety meetings to allow for participant accessibility and provide time outside of production activities to participate. This would alter section III of the study's application for Request for Designation of Research as Exempt from the Requirement of Institutional Review Board Review.

Changes to the same document in section VI parts B and C. The same identifying information will be collected including name and demographics (separately). The additional measures to be put into place to protect the participants' identities will be an appropriate revisions to the consent form, all consent forms and questionnaire packets having a matching unique identifier, separation of the consent form from the questionnaire responses upon collection, and shredding questionnaire responses after data entry. The consent forms will be retained for matching unique identifiers to individual participants for additional data sources such as key performance metrics and the supervisor portion of questionnaire responses. The consent forms will remain secured with the researcher in a locked file cabinet when not in use. There will not be a key-decipher matching participants to unique identifiers written and retained; all matching will be done manually as needed. Management, other participants, and other employee will still not have access to the responses. Only the research personnel will have the ability to view the questionnaire responses and raw data.

Consent form – sections 1 (methods), 3 (rights and alternatives), and 4 (confidentiality) were altered to include information on measures taken to ensure confidentiality.

Survey Instrument – The pilot study resulted in several instruments having too low of internal consistency. Additionally, there was feedback on the outdated wording of some items. All instrument changes are reflected in the attached questionnaire document. To clarify the instrument items, the following wording was altered for three instruments:

Original	Change
Interpersonal Relationships	
3 items beginning: "My coworkers other than my supervisor ..."	3 items beginning: "My coworkers..."
Complexity of Work	
I can use my knowledge and skills in my work	I often use my knowledge and skills in my work.
I receive tasks that are extraordinarily and particularly difficult more than half the time	I often receive particularly difficult tasks in my job.

Original	Change
I must make very complicated decisions in my work, but other only have to make simple decisions	I often must make complicated decisions in my work.
I can learn new things in my work	I often learn new things in my work. .
Control of Work	
I can determine how I do my work	No Change
I can plan and arrange my work on my own	No Change
If you look at your job as a whole: how many of your own decisions does it allow you to make (5 point likert scale of almost none to almost all)	I make most of my own decisions in my job (5 point likert scale of strongly disagree to strongly agree).

Additionally, the demographic questions asking about division, branch, supervisor, and job title have been removed as knowing the work code will provide all this information. The demographic questions of contractor/civilian/military/veteran have been added to analyze the additional complexity of the workforce. Lastly, demographic information was removed from the supervisor questionnaire as it is not pertinent to the metrics of interest.

6. Have these requested changes been initiated?

- ☒ No
☐ Yes

7. How will the proposed modification(s) affect study participants?

Note: Federal regulations require IRB approval prior to changing a research procedure or deviating from IRB approved documents unless it is in the best interest of or for the safety of study participants.

The participants will be presented a paper packet of the questionnaire rather than a link to the questionnaire. At the safety meeting the researcher will review the consent form with the group with management absent and emphasize the voluntary nature of participation. The participants will be instructed to separate their consent form from their questionnaire packet prior to returning it to the researcher. Since management is allowing for safety meetings to be when production workers are able to participate, their time is limited to the length of the meeting (30 minutes to 1

hour depending on the work code). The participants will be made aware of this and instructed to turn in the questionnaire regardless of completion level at the end of the time allotted. The questionnaire should not take longer than 15 minutes, but they will be provided the entire length of the meeting to avoid additional time pressure.

B. Employee Consent Form

Participant Consent Form for Participation in Human Research at Montana State University - Employee Innovation Survey

1. Procedure and Methodology

You are being asked to participate in a research study of employee perceptions of employee innovation within your organization. The survey contains 70 questions and should take about 10 to 20 minutes to complete. Your participation contributes to the research of perceptions of employee innovation. You were identified as a possible participant due to your employment with a company who has volunteered to participate in the study. Participation is voluntary and you can choose not to answer any questions you do not want to provide answers for and/or you can stop at any time. You will be asked a set of questionnaires about your company's working environment and personal perceptions relating to innovation on the job.

Questions about you are only to understand the composition of the sample and will not be associated with your answers to the remaining topics within the questionnaire. Any identifying information such as your name will only be used for ensuring consent and matching responses. Upon completion of this questionnaire, your consent form will be separate from your responses. All identifying information will be removed prior to analysis and not be shared with your employer. Your answers will be recorded for future coding and data analysis purposes.

2. Risks and Benefits

While all data collected will be deidentified and participants will not be shared with your employer, the risk to you is that the study could identify practices in your workplace that your employer wishes to change. The changes may also be a benefit to you, there are no direct benefits from the study to you.

3. Rights and Alternatives

If you decline to participate there is no consequence. In order to decline in participation of this study, notify the investigator, do not sign the consent form, and do not complete the survey questionnaire. There is no funding nor cost to participant in this project. Should you desire not to answer one or more questions you may continue complete the rest of the survey; lack of answer for one question will not determine your ability to participate in this study.

4. Confidentiality

All personal information or opinions linking you to this study and the results will be eliminated. Your name and information recorded with these answers are for consent and response matching purposes only. There is an external measure of your individual innovation at work which will be matched to your answers via unique identifier. There will be no written record available to

associate your name or any additional personal information. Your responses will be one set of responses within the larger data sample of all employees participating in your company, therefore your information will never be associated with the company data.

Only the researcher will have access to view your responses and consent form. Your responses will be shredded upon data entry and your consent form will be retained for record of ethical practice. No group or individual from management, other participating groups, participating peers, or other employees will be allowed access to consent forms and responses.

5. Decline to Participate

If you decline to participate, you may select the decline consent option. You may choose not to answer any identifying questions.

6. Questions

If you should have questions about the research, you can contact Katie Kelly by email at katiekelly.msu@gmail.com or by phone at 702-985-1994. If you have any additional questions about the rights of human participants, please contact the Chair of Institutional Review Board, Mark Quinn, at 406-994-4707 or mquinn@montana.edu.

7. Authorization

I have read the above and understand the discomforts, inconvenience, and risk of this study. I, _____ (name of participant), electronically agree to participate in this research. I understand that I may later refuse to participate and that I may withdraw from the study at any time. I have received a copy of this consent form for my own records.

C. Supervisor Consent Form

Participant Consent Form for Participation in Human Research at Montana State University - Manager

Employee Innovation Survey

1. Procedure and Methodology

You are being asked to participate in a research study of employee perceptions of employee innovation within your organization. This survey contains 4 questions for each of your direct supervisees and should take a total of about 10 to 20 minutes to complete. Your participation contributes to the research of perceptions of employee innovation. You were identified as a possible participant due to your employment with a company who has volunteered to participate in the study. Participation is voluntary and you can choose not to answer any questions you do not want to provide answers for and/or you can stop at any time. You will be asked a set of questions about your immediate subordinates and their performance of innovation

Questions about you are only to understand the composition of the sample and will not be associated with your answers to the remaining topics within the questionnaire. Any identifying information such as your name will only be used for ensuring consent and matching responses. Upon completion of this questionnaire, your consent form will be separate from your responses. All identifying information will be removed prior to analysis and not be shared with your employer. Your answers will be recorded for future coding and data analysis purposes.

2. Risks and Benefits

While all data collected will be deidentified and participants will not be shared with your employer, the risk to you is that the study could identify practices in your workplace that your employer wishes to change. The changes may also be a benefit to you, there are no direct benefits from the study to you.

3. Rights and Alternatives

If you decline to participate there is no consequence. In order to decline in participation of this study, notify the investigator, do not sign the consent form, and do not complete the survey questionnaire. There is no funding nor cost to participant in this project. Should you desire not to answer one or more questions you may continue complete the rest of the survey; lack of answer for one question will not determine your ability to participate in this study.

4. Confidentiality

All personal information or opinions linking you to this study and the results will be eliminated. Your name and information recorded with these answers are for consent and response matching purposes only. There is an external measure of your individual innovation at work which will be matched to your answers via unique identifier. There will be no written record available to associate your name or any additional personal information. Your responses will be one set of responses within the larger data sample of all employees participating in your company, therefore your information will never be associated with the company data.

Only the researcher will have access to view your responses and consent form. Your responses will be shredded upon data entry and your consent form will be retained for record of ethical practice. No group or individual from management, other participating groups, participating peers, or other employees will be allowed access to consent forms and responses.

5. Decline to Participate

If you decline to participate, you may select the decline consent option. You may chose not to answer any identifying questions.

6. Questions

If you should have questions about the research, you can contact Katie Kelly by email at katiekelly.msu@gmail.com or by phone at 702-985-1994. If you have any additional questions about the rights of human participants, please contact the Chair of Institutional Review Board, Mark Quinn, at 406-994-4707 or mquinn@montana.edu.

7. Authorization

I have read the above and understand the discomforts, inconvenience, and risk of this study. I, _____ (name of participant), electronically agree to participate in this research. I understand that I may later refuse to participate and that I may withdraw from the study at any time. I have received a copy of this consent form for my own records.

D. Questionnaire

Job Self-Efficacy

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Previously Validated Frese et. al. (1996)

1. When I am confronted with a new task, I am often afraid of not being able to handle it.
(reverse coded)
2. I like to make suggestions on how to improve the work process.
3. I judge my abilities to be high.
4. If I wanted to achieve something, I can overcome setbacks without giving up my goal.
5. When I want to reach a goal I am usually able to succeed.

Creative Self-Efficacy

Previously validated Tierney & Farmer (2002)

6. I feel that I am good at generating novel ideas.
7. I have confidence in my ability to solve problems creatively.
8. I have a knack for further developing the ideas of others.

Job Complexity

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Previously validated Semmer (1984) with altered wording

9. I often make complicated decisions in my work.
10. I often use my knowledge and skills in my work.
11. I often receive particularly difficult tasks in my job.
12. I often learn new things in my work.

Job Control

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Previously validated Semmer (1984) with altered wording

13. I can determine how I do my work.
14. I can plan and arrange my work on my own.
15. I make most of my own decisions in my job.

Motivation for Reward

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Previously validated Frese et. al. (1999)

16. I would send in more suggestions if they would be rewarded more often.
17. I would send in more suggestions if the rewards would be higher.
18. When I send in a suggestion, I do it for the reward.
19. The reward is most important for me when I send in a suggestion.
20. I think recognition is an important motivation to send in suggestions.

Motivation to Improve Work

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Previously validated Frese et. al (1999) with altered wording

21. I would send in a suggestion if I'm bother by something in my work.
22. I would send in a suggestion if my job could be done easier.
23. I would send in a suggestion if the work situation was unsafe.

Supervisor Support

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Previously validated Frese et. al. (1999)

24. My supervisor encourages me to give suggestions.
25. Giving suggestions is appreciated by my supervisor.

Previously validated Madjar et. al. (2002)

26. My supervisor discusses with me my work-related ideas in order to improve them.
27. My supervisor gives me useful feedback about my ideas concerning the workplace.

28. My supervisor is always ready to support me if I introduce an unpopular idea or solution at work.

System Responsiveness

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Previously validated Frese et. al. (1999)

- 29. My suggestions are executed most of the time.
- 30. I think there's a big chance a suggestion will be executed.
- 31. I think the treatment of suggestions leaves much to be desired. (reverse coded)
- 32. I give few suggestions because it takes a long time before you get an answer. (reverse coded)
- 33. Rejected suggestions are sometimes used anyhow.
- 34. When I give a suggestion, it is taken seriously.
- 35. I can see by the answer that they understood my suggestion well.
- 36. I can understand the answers to my suggestions.

Time Pressure

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Previously validated Baer & Oldham (2006)

- 37. I don't have much time for thinking up wild ideas, I'm too busy just getting my job done.
- 38. Why is everyone always talking about new ideas? I've got more work than I know what to do with.
- 39. Ideas are only important if they impact major projects.
- 40. If everyone is providing ideas, then no one gets any work done.
- 41. New ideas and hunches require exploration before their value can be demonstrated to others. Innovative organizations give people the freedom to use some of their time to explore new ideas and hunches without having to ask permission. What percentage of your time at work can you safely divert from your assigned tasks to explore new ideas you believe have promise?
 - a. 0-2%
 - b. 3-5%
 - c. 6-10%
 - d. 11-20%
 - e. 21-40%

f. 41-100%

Interpersonal Relationships/Support

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Previously validated Madjar et. al. (2002)

- 42. My coworkers are almost always supportive when I come up with a new idea about my job.
- 43. My coworkers give me useful feedback about my ideas concerning the workplace.
- 44. My coworkers are always ready to support me if I introduce an unpopular idea or solution at work.

Idea Generation/Having Ideas

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Previously validated Frese et. al. (1999)

- 45. I try to be as creative as I can in my job.
- 46. I experiment with new approaches in performing my job.

Previously validated Coelho et. al. (2011)

- 47. On the job I am inventive in overcoming barriers.
- 48. I often have ideas.
- 49. I am busy a lot with thinking of ideas.

Idea Elicitation/Submitting Ideas

Rate how strongly you identify the following characteristics in yourself, 5 being “Describes me extremely well” and 1 being “Does not describe me.”

Previously validated Zhou & George (2001)

- 50. Suggests new ways to achieve goals or objectives.
- 51. Comes up with new and practical ideas to improve performance.
- 52. Search out new technologies, processes, techniques, and/or product ideas.
- 53. Suggests new ways to increase quality.

- 54. Is a good source of creative ideas.
- 55. Is not afraid to take risks.
- 56. Promotes and champions ideas to others.
- 57. Exhibits creativity on the job when given the opportunity.
- 58. Develops adequate plans and schedules for implementation of new ideas.
- 59. Often has new and innovative ideas.
- 60. Comes up with creative solutions to problems.
- 61. Suggests new ways of performing work tasks.
- 62. Often has a fresh approach to problems.

Job Satisfaction

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Previously validated Spector (1997)

- 63. I sometimes feel my job is meaningless. (reverse coded)
- 64. I like doing the things I do at work.
- 65. My job is enjoyable.
- 66. I feel a sense of pride in doing my job.

Affective Commitment

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Previously validated by Alan & Meyer (1990)

- 67. I would be very happy to spend the rest of my career in this organization.
- 68. I really feel as if this organization's problems are my own.
- 69. I do not feel like "part of my family" at this organization. (R)
- 70. I do not feel "emotionally attached" to this organization. (R)
- 71. This organization has a great deal of personal meaning for me.
- 72. I do not feel a strong sense of belonging to this organization. (R)

Continuance Commitment

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Previously validated by Alan & Meyer (1990)

- 73. It would be very hard for me to leave my job at this organization right now even if I wanted to.
- 74. Too much of my life would be disrupted if I leave my organization.
- 75. Right now, staying with my job at this organization is a matter of a necessity as much as a desire.
- 76. I believe I have too few options to consider leaving this organization.
- 77. One of the few negative consequence of leaving my job at this organization would be the scarcity of available alternatives elsewhere.
- 78. Once of the major reasons I continue to work for this organization is that leaving would require considerable personal sacrifice.

Normative Commitment

Rate how strongly you agree (being a 5) or disagree (being a 1) with the following statements.

Previously validated by Alan & Meyer (1990)

- 79. I do not feel any obligation to remain with my organization (R)
- 80. Even if it were to my advantage, I do not feel it would be right to leave.
- 81. I would feel guilty if I left this organization now.
- 82. This organization deserves my loyalty.
- 83. I would not leave my organization right now because of my sense of obligation to it.
- 84. I owe a great deal to this organization.

Demographics

- 1. What code do you currently work in?
- 2. What is your age?
 - a. 18-24
 - b. 25-34
 - c. 35-44
 - d. 45-54
 - e. 55-64
 - f. 65-74
 - g. 85 or older
- 3. How long have you been employed by your current employer?
 - a. Less than 1 year
 - b. 1-2 years
 - c. 3-5 years

- d. 5-10 years
 - e. 10-20 years
 - f. 20+ years
4. How many years of experience do you have in your current positions (combined between past employers and current)?
- a. Less than 1 year
 - b. 1-2 years
 - c. 3-5 years
 - d. 5-10 years
 - e. 10-20 years
 - f. 20+ years
5. Select any of the following that currently apply to you:
- a. Civilian
 - b. Contractor
 - c. Veteran
 - d. Active Military

Free Comment

85. If you have any detail you'd like to add about employee innovation, feel free to share all thoughts in the comment box below!

Questionnaire Items for Supervisor for each participating Employee

Rewarded Ideas

Please rate each aspect of the employee's suggestions listed below on a scale of 1 (not at all) to 5 (almost all).

Previously validated Madjar, Oldham, & Pratt (2002)

1. How creative is this person's work? Creativity refers to the extent to which the employee develops ideas, methods, or products that are both original and useful to the organization.
2. How original and practical is this person's work? Original and practical work refers to developing ideas, methods, or products that are both totally unique and especially useful to the organization.
3. How adaptive and practical is this person's work? Adaptive and practical work refers to using existing information or materials to develop ideas, methods, or products that are useful to the organization.

Free Comment

4. If you have any detail you'd like to add about employee innovation, feel free to share all thoughts in the comment box below.

APPENDIX E

INTER-ITEM CORRELATION FOR QUESTIONNABLE INSTRUMENTS

Table 29: Complexity Inter-Item Correlation

ITEM	1	2	3	4
I often use my knowledge and skills in my work.	1.0			
I often learn new things in my work.	0.38	1.0		
I often receive particularly difficult tasks in my job.	0.14	0.05	1.0	
I often make complicated decisions in my work.	0.21	0.26	0.63	1.0

Table 30: Idea Generation Inter-Item Correlation

Item	1	2	3	4	5
I often have ideas.	1.00				
I experiment with new approaches in performing my job.	0.14	1.00			
On the job I am inventive in overcoming barriers.	0.45	0.40	1.00		
I try to be as creative as I can in my job.	0.30	0.35	0.38	1.00	
I am busy a lot with thinking of ideas.	0.25	0.12	0.21	0.24	1.00

Table 31: System Responsiveness Inter-Item Correlation

Item	1	2	3	4	5	6	7	8
I can see by the answer that they understood my suggestion well.	1.00							
Rejected suggestions are sometimes used anyhow.	0.11	1.00						
I think there's a big chance a suggestion will be executed.	0.41	0.15	1.00					
I can understand the answers to my suggestions.	0.43	0.07	0.37	1.00				
When I give a suggestion it is taken seriously.	0.37	0.15	0.50	0.32	1.00			
My suggestions are executed most of the time.	0.28	0.16	0.47	0.20	0.61	1.00		
I give few suggestions because it takes a long time before you get an answer.	0.32	-0.06	0.42	0.16	0.34	0.40	1.00	
I think the treatment of suggestions leaves much to be desired.	0.00	0.00	0.05	0.00	-0.11	-0.06	-0.06	1.00

Table 32: Creative Self-Efficacy Inter-Item Correlation

Item	1	2	3
I have confidence in my ability to solve problems creatively.	1.00		
I have a knack for further developing the ideas of others.	0.31	1.00	
I feel that I am good at generating novel ideas.	0.23	0.47	1.00

Table 33: Motivation to Improve Work Inter-Item Correlation

Item	1	2	3
I would send in a suggestion if the work situation was unsafe.	1.00		
I would send in a suggestion if my job could be done easier.	0.37	1.00	
I would send in a suggestion if I'm bother by something in my work.	0.26	0.47	1.00

Table 34: Motivation for Reward Inter-Item Correlation

Item	1	2	3	4	5
I would send in more suggestions if they would be rewarded more often.	1.00				
The reward is most important for me when I send in a suggestion.	0.11	1.00			
I would send in more suggestions if the rewards would be higher.	0.24	0.44	1.00		
When I send in a suggestion, I do it for the reward.	0.14	0.40	0.48	1.00	
I think recognition is an important motivation to send in suggestions.	0.03	0.29	0.34	0.21	1.00

Table 35: Time Pressure Inter-Item Correlation

Item	1	2	3	4	5
If everyone is providing ideas, then no one gets any work done.	1.00				
I don't have much time for thinking up wild ideas, I'm too busy just getting my job done.	0.32	1.00			
Why is everyone always talking about new ideas? I've got more work than I know what to do with.	0.32	0.41	1.00		
Ideas are only important if they impact major projects.	0.32	0.05	0.20	1.00	
What percentage of your time at work can you safely divert from your assigned tasks to explore new ideas you believe have promise?	-0.08	-0.10	-0.10	0.11	1.00

APPENDIX F

INITIAL MODEL ASSESSMENT

Table 36: Initial Model Direct Effects Estimates

			Estimate	S.E.	C.R.	P
Innovation	<---	Formal Devices	.054	.035	1.548	.122
Innovation	<---	Relationships	.021	.028	.745	.456
Innovation	<---	Motivation	.314	.365	.860	.390
Innovation	<---	Self-Efficacy	.377	.203	1.856	.063
Engagement	<---	Innovation	-.083	.169	-.490	.624
Competitiveness	<---	Innovation	-5.563	3.626	-1.534	.125
Challenges	<---	Formal Devices	.633	.152	4.148	***
Skills	<---	Formal Devices	1.018	.133	7.673	***
Control	<---	Formal Devices	.984	.148	6.630	***
System Responsiveness	<---	Formal Devices	1.000			
Time Pressure	<---	Formal Devices	-.533	.103	-5.177	***
Supervisor Support	<---	Relationships	.378	.415	.910	.363
Interpersonal Relationships	<---	Relationships	1.000			
Job Self-Efficacy	<---	Self-Efficacy	1.000			
Creative Self-Efficacy	<---	Self-Efficacy	1.094	.108	10.153	***
Motivation for Reward	<---	Motivation	1.000			
Motivation to Improve Work	<---	Motivation	-.480	.310	-1.550	.121
Idea Utilization	<---	Innovation	1.000			
Idea Generation	<---	Innovation	2.824	1.512	1.868	.062
Submitting Ideas	<---	Innovation	3.511	1.883	1.864	.062
Job Satisfaction	<---	Engagement	-.003	.357	-.008	.993
Career	<---	Engagement	1.000			
Commitment	<---	Engagement	.004	.421	.008	.993
OT	<---	Engagement	.000	.023	.008	.993
Sick Leave	<---	Engagement	.000	.024	.008	.993
Throughput	<---	Competitiveness	.025	1.722	.015	.988
Certs	<---	Competitiveness	-.131	8.858	-.015	.988
Outliers	<---	Competitiveness	1.000			
Rework	<---	Competitiveness	.002	.117	.015	.988
CAPA	<---	Competitiveness	-.002	.134	-.015	.988

Table 37: Initial Model Covariances

	Estimate	S.E.	C.R.	P
Engagement <--> Competitiveness	.049	.109	.452	.651

Table 38: Competitiveness Indicator Correlation Table

	CAPA	Rework	Certs	Throughput	Outliers
CAPA	1	.291**	.236**	-.010	-.054
Rework	.291**	1	-.059	-.018	.127
Certs	.236**	-.059	1	-.029	-.294**
Throughput	-.010	-.018	-.029	1	.103
Outliers	-.054	.127	-.294**	.103	1

Table 39: Engagement Indicator Correlation Table

	Commitment	Career	Job Satisfaction	Total Leave	Sick Leave	Annual Leave	OT
Commitment	1	.090	.451**	-.009	-.082	.006	-.029
Career	.090	1	-.068	.151*	.194**	.016	.111
Job Satisfaction	.451**	-.068	1	-.011	-.152*	.077	.054
Total Leave	-.009	.151*	-.011	1	.491**	.755**	-.004
Sick Leave	-.082	.194**	-.152*	.491**	1	-.096	.089
Annual Leave	.006	.016	.077	.755**	-.096	1	-.093
OT	-.029	.111	.054	-.004	.089	-.093	1

APPENDIX G

MODEL A ANALYSIS

Table 40: Model A Direct Effect Estimates

			Estimate	S.E.	C.R.	P
Innovation	<---	Formal Devices	.229	.119	1.915	.055
Innovation	<---	Relationships	.034	.029	1.189	.234
Innovation	<---	Motivation	.176	.233	.756	.450
Innovation	<---	Self-Efficacy	.241	.126	1.914	.056
Engagement	<---	Innovation	.991	.594	1.668	.095
Challenges	<---	Formal Devices	.830	.160	5.177	***
Skills	<---	Formal Devices	1.112	.128	8.693	***
Control	<---	Formal Devices	1.108	.152	7.279	***
System Responsiveness	<---	Formal Devices	1.000			
Time Pressure	<---	Formal Devices	-.563	.107	-5.243	***
Supervisor Support	<---	Relationships	1.096	.724	1.515	.130
Interpersonal Relationships	<---	Relationships	1.000			
Job Self-Efficacy	<---	Self-Efficacy	1.000			
Creative Self-Efficacy	<---	Self-Efficacy	.983	.110	8.954	***
Motivation for Reward	<---	Motivation	1.000			
Motivation to Improve Work	<---	Motivation	-.393	.379	-1.037	.300
Idea Utilization	<---	Innovation	1.000			
Idea Generation	<---	Innovation	2.551	1.309	1.949	.051
Submitting Ideas	<---	Innovation	2.836	1.465	1.935	.053
Job Satisfaction	<---	Engagement	2.826	.765	3.695	***
Commitment	<---	Engagement	1.000			

Table 41: Model A Covariances

		Estimate	S.E.	C.R.	P
Engagement <-->	Competitiveness	-.024	.015	-1.640	.101

Table 42: Model A Covariance Modification Indices

			M.I.	Par Change
Relationships	<-->	Self-Efficacy	45.093	.145
Formal Devices	<-->	Self-Efficacy	45.767	.128
Formal Devices	<-->	Relationships	72.776	.195
Motivation to Improve Work	<-->	Self-Efficacy	37.536	.151
Motivation to Improve Work	<-->	Relationships	38.574	.185
Supervisor Support	<-->	Formal Devices	32.627	.144

Table 43: Model A Direct Effect Modification Indices

			M.I.	Par Change
Motivation to Improve Work	<---	Self-Efficacy	37.536	.754
Motivation to Improve Work	<---	Relationships	38.574	.761
Motivation to Improve Work	<---	Innovation	47.325	2.111
Motivation to Improve Work	<---	Job Self-Efficacy	44.114	.573
Motivation to Improve Work	<---	Interpersonal Relationships	25.750	.366
Motivation to Improve Work	<---	Supervisor Support	32.926	.371
Supervisor Support	<---	Formal Devices	32.627	.638
Supervisor Support	<---	Engagement	31.661	1.001
Supervisor Support	<---	Job Satisfaction	32.064	.361
Supervisor Support	<---	Job Self-Efficacy	27.213	.437
Supervisor Support	<---	System Responsiveness	43.999	.502
System Responsiveness	<---	Supervisor Support	27.910	.240

APPENDIX H

MODEL B ANALYSIS

Table 44: Model B Direct Effect Estimates

			Estimate	S.E.	C.R.	P
Innovation	<---	Formal Devices	.511	.282	1.810	.070
Innovation	<---	Relationships	-.351	.294	-1.194	.233
Innovation	<---	Intrinsic Attributes	.225	.114	1.979	.048
Engagement	<---	Innovation	.938	.438	2.140	.032
Challenges	<---	Formal Devices	.817	.148	5.537	***
Skills	<---	Formal Devices	1.044	.111	9.370	***
Control	<---	Formal Devices	1.130	.136	8.289	***
System Responsiveness	<---	Formal Devices	1.000			
Time Pressure	<---	Formal Devices	-.541	.099	-5.478	***
Supervisor Support	<---	Relationships	1.415	.176	8.019	***
Interpersonal Relationships	<---	Relationships	1.000			
Job Self-Efficacy	<---	S Intrinsic Attributes	1.000			
Creative Self-Efficacy	<---	Intrinsic Attributes	.837	.085	9.849	***
Idea Utilization	<---	Innovation	1.000			
Idea Generation	<---	Innovation	2.228	.856	2.603	.009
Submitting Ideas	<---	Innovation	2.456	.952	2.580	.010
Job Satisfaction	<---	Engagement	3.092	.725	4.263	***
Commitment	<---	Engagement	1.000			
Motivation for Reward	<---	Intrinsic Attributes	-.166	.111	-1.491	.136
Motivation to Improve Work	<---	Intrinsic Attributes	.779	.105	7.435	***

Table 45: Model B Covariances

			Estimate	S.E.	C.R.	P
Relationships	<-->	Intrinsic Attributes	.158	.028	5.660	***
Formal Devices	<-->	Intrinsic Attributes	.162	.027	6.085	***
Formal Devices	<-->	Relationships	.189	.032	5.960	***
Engagement	<-->	Competitiveness	-.034	.016	-2.058	.040

Table 46: Model B Unstandardized Indirect Effects

	Intrinsic Attributes	Relationships	Formal Devices	Innovation Engagement	
Innovation	.000	.000	.000	.000	.000
Engagement	.211	-.329	.479	.000	.000
Motivation to Improve Work	.000	.000	.000	.000	.000
Motivation for Reward Commitment	.000	.000	.000	.000	.000
Job Satisfaction	.211	-.329	.479	.938	.000
Submitting Ideas	.653	-1.018	1.481	2.900	.000
Idea Generation	.553	-.862	1.254	.000	.000
Idea Utilization	.501	-.782	1.138	.000	.000
Creative Self-Efficacy	.225	-.351	.511	.000	.000
Job Self-Efficacy	.000	.000	.000	.000	.000
Interpersonal Relationships	.000	.000	.000	.000	.000
Supervisor Support	.000	.000	.000	.000	.000
Time Pressure	.000	.000	.000	.000	.000
System Responsiveness	.000	.000	.000	.000	.000
Control	.000	.000	.000	.000	.000
Skills	.000	.000	.000	.000	.000
Challenges	.000	.000	.000	.000	.000

APPENDIX I

MODEL C ANALYSIS

Table 47: Model C Direct Effect Estimates

			Estimate	S.E.	C.R.	P
Innovation	<---	Formal Devices	.116	.150	.771	.441
Innovation	<---	Relationships	-.271	.227	-1.190	.234
Innovation	<---	Intrinsic Attributes	.613	.244	2.510	.012
Engagement	<---	Formal Devices	1.009	.311	3.244	.001
Engagement	<---	Relationships	-.349	.347	-1.004	.316
Engagement	<---	Intrinsic Attributes	-.214	.126	-1.702	.089
Challenges	<---	Formal Devices	.738	.140	5.259	***
Skills	<---	Formal Devices	1.049	.102	10.261	***
Control	<---	Formal Devices	.974	.129	7.556	***
System Responsiveness	<---	Formal Devices	1.000			
Time Pressure	<---	Formal Devices	-.552	.093	-5.914	***
Supervisor Support	<---	Relationships	1.454	.184	7.882	***
Interpersonal Relationships	<---	Relationships	1.000			
Job Self-Efficacy	<---	Intrinsic Attributes	1.000			
Creative Self-Efficacy	<---	Intrinsic Attributes	1.002	.090	11.101	***
Idea Utilization	<---	Innovation	1.000			
Idea Generation	<---	Innovation	1.990	.748	2.661	.008
Submitting Ideas	<---	Innovation	2.661	.999	2.663	.008
Job Satisfaction	<---	Engagement	2.050	.312	6.562	***
Commitment	<---	Engagement	1.000			
Motivation for Reward	<---	Intrinsic Attributes	-.050	.118	-.419	.675
Motivation to Improve Work	<---	Intrinsic Attributes	.761	.114	6.690	***

Table 48: Model C Covariances

			Estimate	S.E.	C.R.	P
Relationships	<-->	Intrinsic Attributes	.141	.026	5.409	***
Formal Devices	<-->	Intrinsic Attributes	.155	.026	5.978	***
Formal Devices	<-->	Relationships	.190	.032	5.932	***
Engagement	<-->	Competitiveness	-.006	.006	-.933	.351

Table 49: Model C Direct Effect Modification Indices

			M.I.	Par Change
Idea Generation	<---	Control	29.996	.195

APPENDIX J

MODEL E ANALYSIS

Table 50: Model E Direct Effect Estimates

		Estimate	S.E.	C.R.	P
Innovation	<--- Formal Devices	.133	.164	.811	.417
Innovation	<--- Relationships	-.298	.256	-1.163	.245
Innovation	<--- Intrinsic Attributes	.610	.250	2.443	.015
Challenges	<--- Formal Devices	.646	.142	4.534	***
Skills	<--- Formal Devices	.961	.107	8.989	***
Control	<--- Formal Devices	1.030	.131	7.888	***
System Responsiveness	<--- Formal Devices	1.000			
Time Pressure	<--- Formal Devices	-.522	.095	-5.511	***
Supervisor Support	<--- Relationships	1.438	.180	7.972	***
Interpersonal Relationships	<--- Relationships	1.000			
Job Self-Efficacy	<--- Intrinsic Attributes	1.000			
Creative Self-Efficacy	<--- Intrinsic Attributes	1.006	.091	11.096	***
Idea Utilization	<--- Innovation	1.000			
Idea Generation	<--- Innovation	2.021	.779	2.595	.009
Submitting Ideas	<--- Innovation	2.750	1.058	2.599	.009
Motivation to Improve Work	<--- Intrinsic Attributes	.760	<u>.114</u>	6.666	***

Table 51: Model E Covariances

	Estimate	S.E.	C.R.	P	Label
Relationships <--> Intrinsic Attributes	.142	.026	5.436	***	par_12
Formal Devices <--> Intrinsic Attributes	.157	.026	5.954	***	par_13
Formal Devices <--> Relationships	.199	.033	6.028	***	par_14

Table 52: Model E Direct Effect Modification Indices

	M.I.	Par Change
Motivation to Improve Work <--- Supervisor Support	5.284	.132
Motivation to Improve Work <--- Time Pressure	5.667	-.166
Submitting Ideas <--- Formal Devices	5.192	-.199
Submitting Ideas <--- System Responsiveness	5.310	-.151
Submitting Ideas <--- Skills	8.469	-.164
Idea Generation <--- Formal Devices	6.317	.170
Idea Generation <--- Interpersonal Relationships	9.508	.144
Idea Generation <--- Control	31.680	.202
Idea Generation <--- Challenges	10.116	.108
Job Self-Efficacy <--- Motivation to Improve Work	6.894	.111

		M.I.	Par Change
Job Self-Efficacy	<--- Time Pressure	9.235	-.138
Time Pressure	<--- Job Self-Efficacy	5.761	-.177
System Responsiveness	<--- Submitting Ideas	5.269	-.091
Control	<--- Idea Generation	20.331	.401
Challenges	<--- Intrinsic Attributes	5.596	.365
Challenges	<--- Innovation	8.879	.900
Challenges	<--- Submitting Ideas	13.116	.290
Challenges	<--- Idea Generation	12.812	.380
Challenges	<--- Idea Utilization	9.707	.1

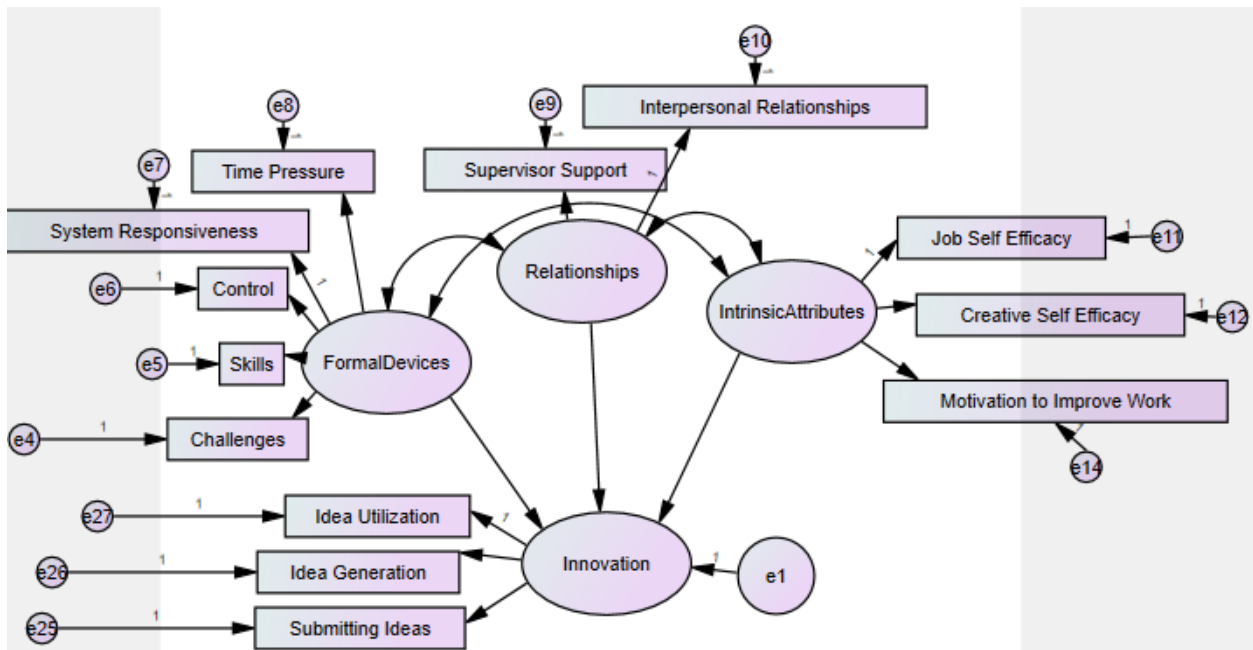


Figure 16: Model E

APPENDIX K

KPI – INDICATOR ITEM PAIRWISE CORRELATIONS

Note for the following tables:

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 53: Idea Generation Item Pairwise Correlation

	Outliers	Throughput	Certs	Rework	CAPA
I often have ideas.	-0.052	0.047	-.204**	-0.068	0.045
I experiment with new approaches in performing my job.	-.259**	-0.043	-0.003	-0.071	-0.076
On the job I am inventive in overcoming barriers.	-0.113	-0.007	-.177*	0.007	-0.126
I try to be as creative as I can in my job.	-.173*	-0.109	-0.056	0.006	0.099
I am busy a lot with thinking of ideas.	-0.012	0.068	-.177*	-0.084	-.179*

Table 54: Submitting Ideas Item Pairwise Correlation

	Outliers	Throughput	Certs	Rework	CAPA
Suggests new ways to achieve goals or objectives.	-0.138	-0.047	-0.023	-0.078	0.058
Comes up with new and practical ideas to improve performance.	-0.055	0.019	-0.084	-0.031	0.075
Search out new technologies, processes, techniques, and/or product ideas.	-0.051	0.013	-0.120	-0.005	-0.034
Suggests new ways to increase quality.	-0.081	0.015	-0.086	0.005	-0.015
Is a good source of creative ideas.	-.158*	-0.030	-0.081	-0.025	0.001
Is not afraid to take risks.	-0.102	0.135	-0.050	-0.032	-0.044
Promotes and champions ideas to others.	-0.080	-0.036	-0.057	-0.041	0.038
Exhibits creativity on the job when given the opportunity.	-0.084	0.004	-0.021	-0.043	0.060
Develops adequate plans and schedules for implementation of new ideas.	-0.088	0.028	-0.011	-0.034	-0.040

	Outliers	Throughput	Certs	Rework	CAPA
Often has new and innovative ideas.	-0.074	0.023	-.143*	-0.048	0.005
Comes up with creative solutions to problems.	-0.036	0.001	-0.097	-0.015	-0.004
Suggests new ways of performing work tasks.	-0.109	0.019	-0.012	-0.033	0.075
Often has a fresh approach to problems.	-0.067	-0.012	-0.098	-0.042	0.049

Table 55: Implementation Item Pairwise Correlation

	Outliers	Throughput	Certs	Rework	CAPA
How creative is this person's work? Creativity refers to the extent to which the employee develops ideas, methods, or products that are both original and useful to the organization.	0.134	.175*	-0.062	-0.098	0.097
How original and practical is this person's work? Original and practical work refers to developing ideas, methods, or products that are both totally unique and especially useful to the organization.	0.055	0.137	-0.026	-0.089	0.126
How adaptive and practical is this person's work? Adaptive and practical work refers to using existing information or materials to develop ideas, methods, or products that are useful to the organization.	0.060	.149*	-0.023	-0.110	0.123

Table 56: Organizational Commitment Item Pairwise Correlation

	Outliers	Throughput	Certs	Rework	CAPA
I would be very happy to spend the rest of my career in this organization.	-0.055	-0.057	0.005	0.069	-0.005
I really feel as if this organization's problems are my own.	-.184*	-0.142	-0.039	-0.056	-0.070
This organization has a great deal of personal meaning for me.	-0.069	-.153*	.148*	0.073	0.088
I do not feel a strong sense of belonging to this organization.	-0.081	-0.105	0.088	-0.069	-0.065

	Outliers	Throughput	Certs	Rework	CAPA
I do not feel “emotionally attached” to this organization.	-.180*	-.145*	.168*	0.042	0.131
I do not feel like “part of my family” at this organization.	-0.068	-0.066	0.105	-0.014	-0.071
It would be very hard for me to leave my job at this organization right now even if I wanted to.	-0.029	0.101	0.088	-0.006	-0.012
Too much of my life would be disrupted if I leave my organization.	-0.028	0.063	-0.001	0.097	-0.027
I believe I have too few options to consider leaving this organization.	0.038	.143*	-0.023	-0.057	-0.082
One of the major reasons I continue to work for this organization is that leaving would require considerable personal sacrifice.	-0.005	.175*	-0.022	0.099	-0.070
Right now, staying with my job at this organization is a matter of a necessity as much as a desire.	0.032	0.059	-0.063	0.093	0.016
One of the few negative consequence of leaving my job at this organization would be the scarcity of available alternatives elsewhere.	0.066	.190**	0.078	0.049	0.047
This organization deserves my loyalty.	-0.050	-0.102	-0.026	.159*	-0.009
Even if it were to my advantage, I do not feel it would be right to leave.	-.172*	-0.137	0.066	0.120	0.125
I would not leave my organization right now because of my sense of obligation to it.	-0.062	-0.126	0.093	0.099	0.108
I owe a great deal to this organization.	-.193**	-0.132	0.006	.159*	0.118
I would feel guilty if I left this organization now.	-0.134	-.188**	.190**	-0.052	0.055

Table 57: Job Satisfaction Item Pairwise Correlation

	Outliers	Throughput	Certs	Rework	CAPA
I sometimes feel my job is meaningless.	0.066	0.012	-0.018	0.054	-0.089
I like doing the things I do at work.	-0.017	-0.030	0.040	0.042	-0.026
My job is enjoyable.	0.027	0.014	-0.046	0.133	-0.053
I feel a sense of pride in doing my job.	-0.052	-0.091	0.005	-0.095	-0.126