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IDENTIFYING INNOVATIVE WORK BEHAVIORS:
AN INQUIRY USING CRITICAL INCIDENT TECHNIQUE

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ABSTRACT

Innovation is a driving force in economic activity and often considered essential for organizational health and growth; therefore, a better understanding of the employee behaviors that supervisors most frequently associate with employee innovativeness, innovative work behaviors, has the potential to be very beneficial. Although much has been written about it, most previous work has focused on behavior categories or dimensions without seeking to observe or understand how innovative work behavior is manifested in the workplace.

Critical incident technique is a well-established and extensively applied method of inquiry for determining effective work role behaviors, but it has not previously been applied well to the study of innovative work behavior. This study applied critical incident technique to collect first hand behavior observations in the places where innovative work behavior occurs. A better understanding of the discrete behaviors associated with workplace innovation can assist Human Resources Development practitioners and educators in administering innovation focused training and development initiatives.

The research presented in this dissertation indicates that what supervisors within organizations with a stated innovation orientation perceive as effective innovative work behavior can be summarized as four primary behaviors: generating ideas, recognizing problems or opportunities, acquiring ideas from sources external to the employee's immediate work organization, and promoting ideas to others within the work organization.

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CHAPTER 1

Introduction

Innovation at Work

In recent years much has been written in both academic and popular media on the topic of innovation (Garcia & Calantone, 2002; Rogers, 2003). In 1990, King noted, “For the researcher making first contact with the literature on innovation, the most daunting feature of it is not its size – though it is undoubtedly very large – but its sheer diversity” (p. 15). The size and diversity of that corpus has only continued to grow. Innovation in general is significant to Technology Management due to its impact on the economy and on preparing future employees. Innovative work behavior in particular is significant to Human Performance Technology because of its potential role as a foundation for performance needs analysis in training and development programs. In 2005, Dismukes conducted a literature review of articles dealing with innovation in organizations. He characterized organizational innovation strategies as either general, or selective. Dismukes provides a graphic representation that speaks to the volume of literature on innovation, and its increasing rate of production (Figure 1). The figure depicts the trend lines for number of publications by year in each of Dismukes’ strategy categories; it particularly illustrates the increase in rate of production over time.

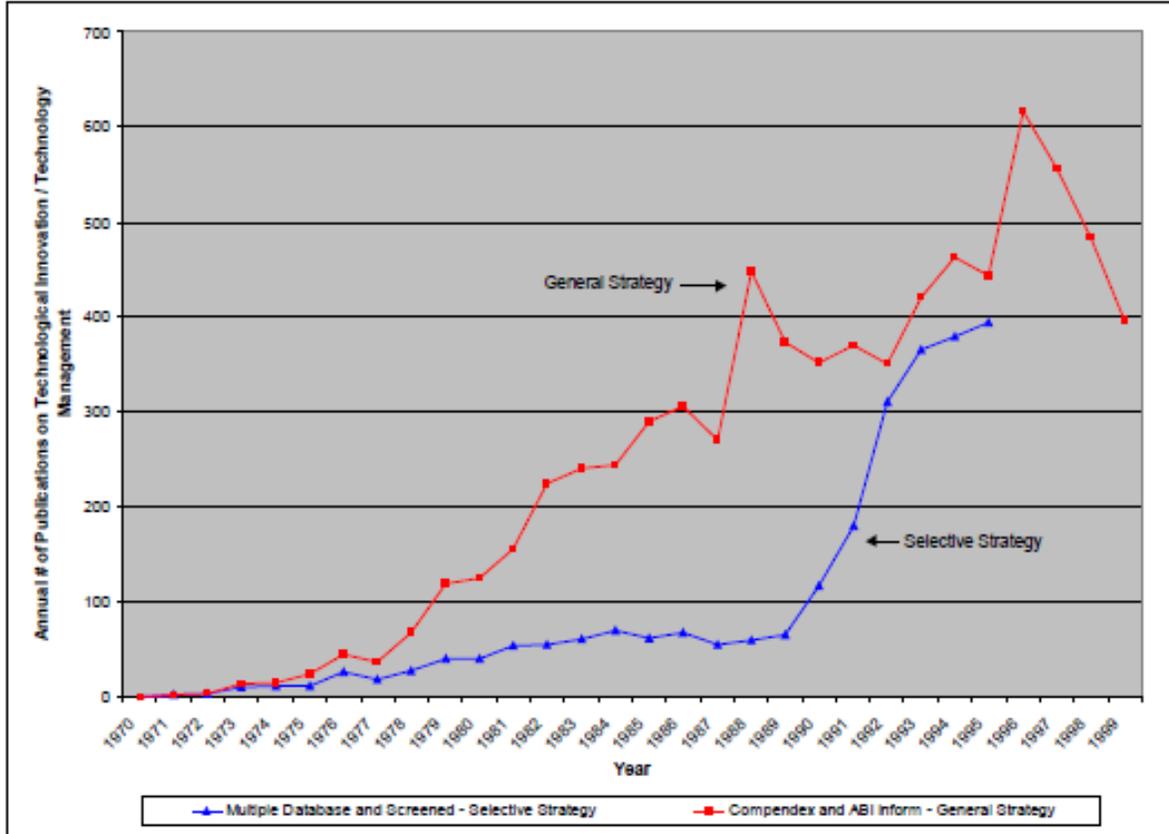


Figure 1. Innovation publication growth rate by general and selective strategies (Dismukes, 2005, p. 24).

One area of study within the various fields of inquiry dealing with innovation is innovative work behavior. This field of study seeks to answer questions about the behaviors that people exhibit in work environments when and where innovation occurs. This study collects and analyzes observation of that behavior, as opposed to approaching innovation at the individual level from a more psychological or personality trait-based perspective. The distinction is an important one because this study is fundamentally observation-based to determine what behaviors occur in work situations where innovation happens, in contrast to a trait or attribute-based approach.

Currently, the most frequently cited authors in this field are West and Farr (1989, 1990), Scott and Bruce (1994a, 1994b), and Janssen (2000). West and Farr have contributed the most commonly applied definition of innovative work behavior, and a conceptual model of how it is operationalized in the workplace that forms the foundation for many other studies (Anderson, De Dreu & Nijstad, 2004; Anderson & West, 1998; Van der Vegt & Janssen, 2003; Yuan & Woodman, 2010). Anderson, De Dreu, and Nijstad (2004) referred to West and Farr's (1989, 1990) definition as, "generally accepted" (p. 148) in the field. Scott and Bruce, and Janssen have contributed instruments that seek to measure innovative work behavior so that its correlations to other variables can be explored. These instruments have been adopted and applied by several researchers for a variety of studies (Carmeli, Meitar & Weisberg, 2006; Chao, Lin, Cheng & Tseng, 2011; De Jong, 2007; De Leede, Kraan, Den Hengst & Van Hooff, 2008; Hsiao, Chang & Chen, 2011; Mukherjee & Ray, 2009; Nagarajan, Flood, Slattery & Sardesai, 2005; Suli, 2008; Van der Vegt & Janssen, 2003).

A point of continuing discussion in the scholarly literature regards the "dimensionality," or how many separate behavioral functions work in concert to produce the phenomenon that has come to be identified as innovative work behavior. West and Farr (1989) do not use the terms dimensions, or dimensionality, but they do state that innovative work behavior is more than generating new ideas; the ideas have to be realized, they have to be beneficial, and they have to occur in a work environment. From this perspective, West and Farr's definition can be seen as two dimensions: creating ideas, and realizing ideas.

Scott and Bruce (1994a) do not introduce the terms dimension or dimensionality either, but cite West and Farr as the conceptual foundation for their instrument. Scott and Bruce are not completely clear on the dimensionality aspect. Their instrument has six items, and in some

portions of their work they seem to infer a two dimensional model, and in other portions a three dimensional model. The content of the items in the instrument do not fully clarify Scott and Bruce's position. West and Farr (1989, 1990) and Scott and Bruce (1994a, 1994b) are both frequently cited as foundational to the study of innovative work behavior, and several authors' arguments for dimensional models draw on their work (Carmeli, Meitar & Weisberg, 2006; De Jong, 2007; De Jong & Den Hartog, 2010; Hsiao, Chang & Chen, 2011; Kleysen & Street, 2001; Messman & Mulder, 2012), but the discussion of dimensionality only becomes explicit in the work of Janssen (2000) and later authors.

Janssen (2000) states, "Based on West and Farr (1989), innovative work behavior is defined here as the intentional creation, introduction and application of new ideas" (p. 288). Also, "Following Scott and Bruce (1994), we conceive innovative work behavior consisting of a set of three different behavioural [*sic*] tasks: idea generation, idea promotion, and idea realization" (p. 288). Janssen clearly conceives of three categories, or dimensions.

More contemporary authors, for example De Jong and Den Hartog (2010), and Messman and Mulder (2012) have developed and tested their own instruments that conceptualize innovative work behavior in four and five dimensions respectively. In the cases of De Jong and Den Hartog, and Messman and Mulder, both studies indicated that fewer than the conceived of dimensions were empirically supported. Other researchers, who have examined the empirical support for dimensionality have found similar results (Carmeli, Meitar & Weisberg, 2006; De Jong, 2007; De Jong & Den Hartog, 2010; Hsiao, Chang & Chen, 2011; Kleysen & Street, 2001; Messman & Mulder, 2012). The most common finding is that the empirical evidence best supports monodimensionality.

Problem Statement

There is an inherent issue in most of these approaches to innovative work behavior in that they seek to classify or categorize behavior into various dimensional schemes without seeking to know and understand what behaviors people actually exhibit when and where innovation happens. In a portion of their study, Messman and Mulder (2012) apply a variation on critical incident technique. The technique, as described by Flanagan (1954) involves asking respondents to report on observed behaviors that the observers deem either effective or ineffective, within very specific contexts and definitions. This technique allows researchers to inductively determine the critical behavior set required to be effective within the particular contexts and definitions.

Messman and Mulder (2012) asked some respondents to self-report on their own behavior by responding to a set of behavior statements on a six point Likert-type scale. Messman and Mulder asked respondents about observed behavior that could be characterized as innovative, but they limited the subjects' available responses to the set of behavior statements, thereby limiting the scope of the inquiry. In essence, Messman and Mulder defeated the purpose of critical incident technique as originally envisioned by Flanagan, in that Messman and Mulder supplied the behaviors to the respondents, instead of the other way around.

There is an opportunity to contribute to the body of knowledge by applying critical incident technique to determine in more specific detail what behaviors people actually exhibit when and where innovation happens. Understanding the specific behaviors that supervisors perceive as effective for innovating in work environments has the potential to eventually form the foundation of educational and Human Resource Development interventions that develop and promote those behaviors.

Statement of Purpose

The purpose of this study is to apply critical incident technique to the study of innovative work behavior, and in so doing identify the behaviors most frequently cited by supervisors within organizations with a stated innovation orientation as demonstrating employee innovativeness. Identifying discreet behaviors that supervisors perceive as demonstrating innovativeness narrows the gap between the categorizations or dimensions of behavior theorized and investigated by previous researchers and concrete examples of what behaviors people exhibit in their work environment while innovating.

Research Question

The aspect of this study that most significantly distinguishes it from previous work is that in most previous inquiries the investigators presented their subjects with a finite set of possible responses from that to choose, this study sought to constrain subject responses only to extent necessary to obtain usable data; therefore, it would have been counterproductive to attempt to account for every conceivable variable that could influence employee innovative work behavior.

The research question that guided this study is:

What behaviors do supervisors within organizations with a stated innovation orientation perceive as effective innovative work behavior?

Procedures

This study was conducted from a realist (post-positivist) perspective (Guba & Lincoln, 1994) and shares elements common to other qualitative inquiries. To explore the research question an online survey instrument was used to collect critical incidents (Flanagan, 1954) from a purposive convenience sample (Teddlie & Yu, 2007) of workplace supervisors' direct observations that illustrate effective employee innovative work behavior. Snowball sampling (Goodman, 1961) procedures were followed to maximize opportunities to reach respondents, thereby increasing results transferability (Butterfield, Borgen, Amundson & Maglio, 2005; FitzGerald, Seale, Kerins & McElvaney, 2008; Flanagan, 1954).

Following Hamlin and Sage (2011), and Hamlin, Sawyer, and Sage (2011), data coding was accomplished in two phases: open coding, and axial coding, in accordance with the coding procedural checklist (Appendix A). Open and axial coding were used to identify the critical incidents reported in each survey response and initially assigned descriptive short titles. Through a constant comparative process critical incidents that contained elements of sameness, similarity, or congruence were grouped together by discrete behaviors reported. These behaviorally sorted critical incident groups were assigned descriptive short titles and definitions that were derived from the content of the survey responses and became the behavior statements. The relative significance of behavior statements to each other was assessed through critical incident to behavior statement loading analysis (Hamlin, Sawyer & Sage, 2011).

Analysis identified the behaviors reported by respondents that were most frequently cited as demonstrative of employee innovativeness. In determining this the analysis also produced: a list of behavior statements with definitions determined through open and axial coding, an assessment of the relative significance of behavior statements to each other based on

critical incident to behavior statement loading analysis, a statistical description of the respondent population derived from the demographic items in the survey instrument, and enabled the discussion, conclusions, and recommendations in Chapter Five.

Assumptions

For the purposes of this study, the following assumptions were made:

- Respondents reported truthfully and accurately.
- Respondents applied the definition of innovation provided in the instrument.
- Respondents complied with the instructions in the survey instrument and report employee behaviors that they perceive as innovative within the context of the definition provided.
- Respondents are capable of recognizing and accurately reporting innovative employee behavior within the context of the definition provided.
- Innovative work behavior is possible in any and all work situations.
- Respondents' performance evaluations of others are significant to the organization where the supervisor/supervisee relationship exists.

Limitations

This study was limited by several factors; those limitations pertain primarily to the study's purpose, population, sample, instrument, and analysis. This study focused specifically on workplace behaviors that supervisors characterize as innovative. There are a number of other questions pertaining to innovation in the workplace that may have varying degrees of effect on individual innovative work behavior. For example, the situational context that

innovative work behavior is exhibited in, work roles of individuals engaging in the behavior, potential correlations between organization type and behavior frequency, intensity, and type, to name a few. This limitation was accepted as a precondition to achieving adequate specificity of inquiry for meaningful findings to answer the study's research question.

This study was also limited by the nature of the respondents. The two variables common to all respondents included in the study were self-identification as a supervisor, specifically someone who is responsible for evaluating the performance of others as part of their routine work requirements, and holding that position within an organization with a stated innovation orientation. It is possible that a more comprehensive view might be achievable with critical incidents reported from supervisors, co-workers, and subordinates all referencing the same individuals (e.g., 360 degree reporting). This limitation is acceptable because it is the supervisors who already observe, evaluate, and report on employee behavior as a part of the workplace relationship, and because the logistical requirements to obtain 360 degree critical incident reporting would have the practical effect of limiting the size of the total reporting population sample or 'n,' with a corresponding reduction in transferability.

The sampling methodology also imposes some limitations. The sample was a purposive convenience sample based on work role, accessibility, and likelihood of participation; as such it is not specific to any one organization or class of organizations. The study used snowball sampling to reach as many potential respondents as possible, so not all respondents received communication directly from the research team. Only the initial potential respondent tier received correspondence directly from the research team, subsequent respondent tiers, in accordance with established snowball sampling procedures, received their contacts from respondents in preceding tiers. The response rate is unknown because the investigators do not

know the total number of individuals afforded an opportunity to participate. This limitation is acceptable because the sampling methodology maximizes opportunity for respondent participation. Larger sample size correlates to greater transferability when using critical incident technique (Butterfield, et al, 2005; FitzGerald et al, 2008; Flanagan, 1954).

There are both conceptual and mechanical limitations to the data collection instrument. The data collection instrument posed a single open-ended question that asked respondents to report observed behaviors in reference to the guidelines provided. The instrument format was intended to elicit responses descriptive of relevant behavior, but the investigation was not able to address matters such as behavior frequency, task proficiency, or organizational level outcomes, based on level of detail included or not included by respondents. Responses were reflective of the behaviors significant in the minds of the respondents, as perceived through memory. Mechanically, the instrument was limited by the 5000 character capacity of the response box provided for respondents to enter their response. Five thousand characters is roughly equivalent to one full page, single-spaced, in 12 point font, with standard margins, as type-written in English. An anecdotal survey of studies employing critical incident technique methodology showed reported responses rarely exceeded 1500 characters. It is possible that a respondent may have wanted to submit a response of greater than 5000 characters and was unable to do so because of the instrument's limitations, but there was no evidence of this occurring in any of the survey response data.

The analytical procedures applied in this study also imposed some limitations. This study employed three human qualitative data coders. All qualitative analysis introduces some margin for human error. However, the analysis procedures followed have been effectively applied by other researchers (Hamlin & Sage, 2011; Hamlin, Sawyer & Sage, 2011) and the

efficacy of the foundational qualitative procedures followed have been studied and found reliable by others (Denzin, 2012; Harris, Pryor & Adams, 1997; Urquhart, 2001). While the potential for human error in the analytical techniques imposed some limitations on the reliability of the analysis, those limitations are within acceptable limits because the likelihood of occurrence was reduced through the use of multi-coder triangulation.

Definitions of Key Terms

Some terms of reference used in this study have more established definitions in the research literature than others. The most important key terms are defined below with specific reference to the definition's source in the literature and/or its application in this study. Terms are listed in the order that they first appear in this document.

Innovation. For purposes of this study, innovation is defined as intentionally creating or acquiring new ideas, introducing them, and applying them for a beneficial purpose. This definition is adapted from West and Farr (1989, 1990), and Janssen (2000), and is reflected in the definition provided in the data collection instrument. The specific wording in the instrument contextualizes the definition to a work environment, the research focus of the study.

Innovative work behavior (IWB). “Innovative work behavior is defined here as the intentional creation, introduction and application of new ideas within a work role, group or organization, in order to benefit role performance, the group, or the organization” (Janssen, 2000, p. 288). Janssen states that he bases his definition on West and Farr's (1989), but Janssen's definition is somewhat more concise than West and Farr's. Janssen restricts the beneficial aspects of the behavior to the organization and requires intentionality, stating, “This definition restricts innovative behaviour [*sic*] to intentional efforts to provide beneficially novel

outcomes” (Janssen, 2000, p. 288). West and Farr’s definition specifically encompassed benefits to society in general, in addition to the organization or some internal subset of it. Janssen’s definition is adopted for this study because it is more concise and more specific to the work environment. Janssen’s definition has also been applied by other researchers (Carmeli, Meitar & Weisberg, 2006; Chao, Lin, Cheng & Tseng, 2011; De Jong, 2007; De Leede, Kraan, Den Hengst & Van Hooff, 2008; Hsiao, Chang & Chen, 2011; Mukherjee & Ray, 2009; Nagarajan, Flood, Slattery & Sardesai, 2005; Suli, 2008; Van der Vegt & Janssen, 2003).

Critical incident technique. “The critical incident technique consists of a set of procedures for collecting direct observations of human behavior in such a way as to facilitate their potential usefulness in solving practical problems” (Flanagan, 1954, p. 327).

Critical incident. As applied in this study, an incident is any observable human activity that is sufficiently complete in itself to permit inferences and predictions to be made about the person performing the act. To be critical, an incident must occur in a situation where the purpose or intent of the act seems fairly clear to the observer and where its consequences are sufficiently definite to leave little doubt concerning its effects. (Flanagan, 1954, p. 327)

Behavior statement. Flanagan (1954) defines five phases of the critical incident technique, phase four is analysis. One of the products of this phase, as applied by Hamlin and Sage (2011), and Hamlin, Sawyer, and Sage (2011), is a set of behavior statements. Behavior statements are the product of inductive analysis to group critical incidents together that convey the same meaning. As Hamlin, Sawyer, and Sage (2011) write,

When such convergence and commonality of meaning were found, the critical incidents were grouped accordingly. The critical incident groups were then subjected to analysis and interpretation, so that behavioural [*sic*] statements

could be devised, that reflected the meaning held in common with all the constituent critical incidents of each group. (p.222)

Supervisor. There are many sub-tasks associated with the role of supervisor; the one most relevant to the present study is employee performance evaluation and reporting. For purposes of inclusion in the study population, respondents self-identified as a supervisor, one who evaluates the performance of others as a part of their routine work responsibilities, through an affirmative answer to question #2 on the survey instrument (see Appendix B).

Workplace. For purposes of this study, a workplace is defined by the existence of a supervisor/supervisee relationship between at least two people where the supervisor is responsible to evaluate the performance of supervisee. The work involved may be predominantly cognitive in nature, predominantly manual in nature, or any combination thereof. The work may be predominantly service or predominantly product oriented, and it may be voluntary employment or employment for any form of compensation. The workplace is not restricted to a set physical space but may also be the distributed communications media that the supervisor and supervisee carry out their relationship of evaluator and evaluated through.

Summary

Innovation is a topic of great scholarly and popular interest. One particular field of inquiry within the broader study of innovation is innovative work behavior. Although much has been written about it, previous work has largely focused on behavior categories or dimensions without seeking to observe or understand how innovative work behavior is manifested in the workplace. This study addressed this gap in the body of knowledge by applying critical incident technique to collect first hand behavior observations in the places

where innovative work behavior occurs. Analysis of the observations collected shows discrete behaviors that contribute to innovation in the workplace. The analysis also provides an assessment of the commonality of reported behaviors, indicating that innovative work behavior is more likely to be generally universal in nature, than situation dependent. A better understanding of the discrete behaviors associated with workplace innovation assists Human Resources Development practitioners and educators in assessing, developing, implementing, and evaluating innovation focused initiatives.

CHAPTER 2

Review of Literature

Although much has been written about innovation and innovative work behavior, most previous work has focused on behavior categories or dimensions without seeking to observe or understand how the behavior is manifested in the workplace. This is an issue in many of the approaches to inquiry previously applied, in that they seek to classify or categorize behavior into various dimensional schemes without seeking to know and understand what behaviors people actually exhibit when and where innovation happens. The focus of this study is observation based in order to determine what innovation behaviors occur in work situations, in contrast to a trait or attribute based approach that could include behavioral observations, but would seek to determine innate individual characteristics associated with those behaviors. A better understanding of the discrete behaviors associated with workplace innovation can assist Human Resources Development practitioners and educators in conducting innovation focused training and developmental improvement activities.

This chapter addresses: the volume of attention to the topic, the significance of the topic, innovativeness versus innovative work behavior, critical incident technique, conclusions from the literature review, and a chapter summary is presented.

The Volume of Attention to the Topic

The volume of attention paid to the topic of innovation in popular and scholarly media can be envisioned and demonstrated in numerous ways. As previously noted, the topic has received attention from scholars for some time (Dismukes, 2005; Garcia & Calantone, 2002; King, 1990; Rogers, 2003). Recent examples abound in popular media. In an example from widely known popular media, Lechleiter (2010) wrote, “America's economy is in danger of losing what has always been our greatest competitive advantage: our genius for innovation” (para. 4). From Technology Management focused popular media, Hargadon (2011), addresses the concept of innovative work behavior more directly, stating:

In the study of innovation, a new notion is taking hold: that we should be studying innovation as a process in that people act, experiment, learn, develop, and grow and, along the way, so too do their ideas, businesses, and networks (para. 3).

Books that have their origins as scholarly works have become, “cross-over,” successes selling well in the popular market; for example: Kuhn's (1996) *The Structure of Scientific Revolutions*, Kelly's (2001) *The Art of Innovation*, Kelly and Littman's (2005) *The Ten Faces of Innovation*, Christensen's (1997) *The Innovator's Dilemma*, and *The Innovator's DNA* by Dyer, Gregersen, and Christensen (2011).

Even a simple search of the popular internet search website, *Google*, can help to illustrate the volume of interest and publication. The *Scholar* subset of the *Google* internet search engine specifically searches internet sites associated with scholarly, technical, or academic publications (books and journals). Specifically, the results of a search for the term,

“innovation,” in the *Scholar* portion of the *Google* search engine on September 14th, 2012 indicated that over 99,000 references are available in the *Scholar* category dated in 2012 alone.

The Significance of the Topic

Economic significance. Innovation as an area of inquiry for Technology Management scholars, and Human Resource Development scholars and practitioners in particular, is significant due to its economic impact and because of its implications for performance improvement. The economics of innovation has been a topic of interest to economists for a long time. Two fairly recent authors on the history of the role of innovation in economics, Knell (2012) and Antonelli (2007), corroborate each other on the significance of innovation to economics, the major authors on the subject, and the evolving schools of thought on the subject. Antonelli (2007) writes, “Technological change should be credited for an astonishing contribution to economic growth” (p. 5). He notes that this is particularly true in capitalist economic systems, going on to state:

Innovation, as distinct from invention, is the distinctive feature of the competitive process. Competition takes place by means of the introduction, adoption and diffusion of innovation, rather than by means of quantity and price adjustments. At the same time competition is the driving engine that pushes firms to introduce innovations. (Antonelli, 2007, p. 12).

Both Antonelli and Knell begin their discussion on the evolution of the role of innovation in economic thought with Adam Smith’s (1776) *Wealth of Nations*. Knell (2012) observes, “Smith began the *Wealth of Nations* by describing how the interaction between market demand and the specialization of tasks drive innovation and economic growth” (p. 2).

The relationship between innovation and economic growth is a recurrent theme in economics. Antonelli also discusses Smith's observations on the role of innovation through task specialization, that Smith referred to as the division of labor, in economic growth. Antonelli illustrates the role of innovation in economic thought by contrasting Smith's work with that of Karl Marx (1867). As Antonelli explains, while Smith did note the emergence of some technological innovations from his era, such as the water mill and the spring driven clock, Smith's focus was predominantly on labor because during that time the means of production was still closely linked to individual labor. Antonelli contends that in part, Smith and Marx address the same economic function from different historical perspectives. Marx (1867) in *Das Kapital* specifically addresses the means of production and notes technological innovation as transformative to the means of production. In Antonelli's view, Smith also addressed the means of production, but the state of technology at the time Smith was writing prevented him from distinguishing between individual laborers and the means of production.

A perspective on the means of production with particular applicability to the role and significance of innovative work behavior in economics is put forward by Belasco and Stayer (1994). They note that the means of production within an economic system is controlled via control of whatever commodity critical to that production is in shortest supply. In this view, Smith and Marx are both correct within the particular contexts that each wrote. Smith rightly focuses on labor, or personnel, because during his era that was the commodity most critical to production. In Marx's era, capital was more important than personnel. Technological improvements to agricultural production reduced the demand for labor in that segment of the economy, making more personnel available for industrial production. Investable capital was required to build factories and machine tools that the available industrial labor could be applied

to. Belasco and Stayer argue that in contemporary and future economies, knowledge and ability are the commodities most critical to production; they write, “The principle tools of production today are not machinery and equipment, but the ideas and talents of people” (p. 31).

Antonelli and Knell corroborate each other on several other important authors, and the one that they agree is central to the evolution of economic thought on innovation is Schumpeter, through numerous works over several years. Knell (2012) writes, “Innovation as an economic concept is generally traced back to the work of Joseph Schumpeter” (p. 2). Antonelli states, “The work of Joseph Schumpeter is at the heart of economics of innovation” (p. 13). Schumpeter addressed many facets of innovation’s role in economics, but he is likely best known for introducing the concept of creative destruction that posits innovation as a process of creating new means of economic exchanges that supplant preceding ones in the economic marketplace because the new means are more effective, and/or desirable, than their predecessors. Schumpeter saw innovation as both the engine and the mechanism of economic competition (Antonelli, 2007; Knell, 2012).

The theme of innovation’s importance in economics, particularly in economic growth is echoed by other authors. Whitt and Schultze (2009) state, “If there is any one business lesson of the last decade that has acquired near-universal empirical support and expert agreement, it is this: innovation is a good thing” (p. 267). They go on to write, “The global economy feeds on the constant infusion of the products of innovation” (p. 267). To explain this, Whitt and Schultze draw on a metaphor offered by Romer (2007):

Economic growth occurs whenever people take resources and rearrange them in ways that are more valuable. A useful metaphor for production in an economy comes from the kitchen. To create valuable final products, we mix

inexpensive ingredients together according to a recipe. The cooking one can do is limited by the supply of ingredients, and most cooking in the economy produces undesirable side effects. If economic growth could be achieved only by doing more and more of the same kind of cooking, we would eventually run out of raw materials and suffer from unacceptable levels of pollution and nuisance. Human history teaches us, however, that economic growth springs from better recipes, not just from more cooking. New recipes generally produce fewer unpleasant side effects and generate more economic value per unit of raw material (p. 270).

Whitt and Schultze conclude, “The mystery of why some nations grow at faster rates than others can now be explained, at least in part, in terms of how effectively a particular nation’s economy optimizes the creation of these new innovative recipes for growth” (p. 275).

Cainelli, Evangelista and Savona (2004) empirically studied the impact of innovation in the service sector and concluded:

Innovation has a positive impact on the economic performance of firms in the service sector as a whole and across most service industries. Innovating firms perform better than non-innovating firms do. Further, within the group of innovating firms, those spending resources on innovation above the sectoral [*sic*] average also show productivity levels and sales’ growth rates above the average (p. 125).

Mandel (2012) examined the role of innovation in employment and concluded, “Innovation creates jobs, and in this case, lots of them” (p. 2). Gill (2012) examined economic and public health data from various departments of the United States Government (Census Bureau,

Department of Commerce, Department of Labor, Health and Human Services, and others) and determined that there is a high correlation between public health indicators and indicators for innovation; he concludes, “It could be argued that better technological innovation is linked with better public health” (p. 74).

Even economists who are not particularly optimistic about the economic future of the United States cite innovation as foundational to economic growth and prosperity. Gordon (2012) takes a very similar view of the role of innovation in economic development and the evolution of economic thought to the views of Knell (2012) and Antonelli (2007). Gordon, however, contends that some innovations, and some periods of innovation, have greater effects on the economy than others. Gordon’s position is that economic growth prior to 1750 was so slow as to be essentially immeasurable. This is particularly evident compared to the period of the early Industrial Revolution, roughly 1750 to 1850, and the late Industrial Revolution 1850 to 1920. In Gordon’s view the innovations that came about in the late Industrial Revolution had a more profound effect on the economy because they dramatically increased the capabilities of the production, transportation, and communications systems simultaneously and each amplified the economic effects of the others. For Gordon, the likelihood of a similar synergistic period of innovation appears remote. However, even with this view, Gordon concludes, “The benefits of ongoing innovation on the standard of living will not stop and will continue, albeit at a slower pace than in the past” (p. 2).

Significance to training and development. Innovation as an area of inquiry for Technology Management scholars, and Human Resource Development scholars and practitioners in particular, is also significant due to its implications for performance improvement. The American Society for Training and Development (ASTD) defines

performance as, “A combination of the accomplishments produced by people on the job and the behaviors used to achieve these accomplishments” (Biech, 2008, Appendix A, section P). As Swanson and Holton (2009) note, “no single view of T&D (training and development) exists. . . . a single lens would be inadequate” (Chapter 10, section 2). To illustrate the significance of innovative work behavior to performance improvement, the present discussion will consider one particular training and development performance improvement model, the ADDIE model (Rummler, 2008; Swanson, 1996; Swanson & Holton, 2009).

ADDIE is an acronym representing the major steps in a training and development program to improve individual and organizational performance: Analyze, Design, Develop, Implement, and Evaluate. This basic model for a training and development program to improve individual and organizational performance has, with occasional slight variations, been widely studied and applied in Human Resource Development scholarship and practice since the mid-1970s (Rummler, 2008; Swanson, 1996; Swanson & Holton, 2009). Rummler (2008) states:

The foundation, the starting point of everything discussed in this handbook, is effective needs assessment and analysis. The ultimate success of WLP professionals; their programs; and, most likely, their employers depends on the accuracy of the needs analysis they conduct. (Section II, para. 21)

Rummler also refers to, “correctly identify the value-added work that must be performed in the workplace,” as one of the, “essential,” responsibilities of the Workplace Learning Professional (Section II, para. 7). Swanson and Holton (2009) state that the purpose of the process is, “for developing human expertise for the purpose of improving organization, process, and individual performance” (Chapter 10, section 6, para. 1).

A common feature of ADDIE as described by Swanson (1996), Rummler (2008), and Swanson and Holton (2009), is the organizing of performance needs analysis into three levels: organizational, process, and individual. Much of the previous scholarship on innovative work behavior, as discussed later in this chapter, and the present study, focused at the individual level. The principle applicability of the information gained from the present study is to the analysis phase of the process. Swanson and Holton (2009), state that the first task of the Workplace Learning Professional or Human Resource Development practitioner (the terms are used interchangeably here) in the ADDIE process is to, “diagnose the performance requirements of the organization that can be improved through training, and document the expertise required to perform in the workplace” (Chapter 10, section 6, para. 8). The present study contributes to the partial fulfillment of these diagnoses of performance requirements, and determination of expertise required for innovative work behavior. Swanson and Holton (2009) go on to write, “Given the need for human expertise, the documentation of what a person needs to know and be able to do (expertise) is the second part of the analysis phase” (Chapter 10, section 6, para. 10).

The significant economic impact of innovation, and the emphasis on defining and understanding effective workplace behavior in the performance improvement process, make the importance of an increased understanding of effective innovative work behavior evident. Swanson and Holton (2009) conclude their discussion of the analysis phase of ADDIE by writing, “task analysis invariably requires close careful study and generally spending time with a subject matter expert in his or her work setting” (Chapter 10, section 6, para. 10). While this study cannot, and should not attempt to, substitute for the time spent with subject matter experts in the work setting, it can make time spent later in that activity much more effective, and

advance the understanding of innovative work behavior in a logistically less consuming way. The application of critical incident technique uses the respondents' time spent with employees at work, and their expertise on what employee behaviors they find desirable for their organization, to replicate the role that would be played by one or several researchers. This approach coupled with the sampling procedures employed allowed for collecting more direct behavior observations over a broader cross-section of organizations than could be effectively accomplished by the same number of researchers in the same amount of time.

Innovativeness Versus Innovative Work Behavior

Perspectives and definitions. To place the discussion of what innovative work behavior is into context, it is necessary to briefly consider what, "innovation," is. To reiterate, a significant volume of material has been published in both scholarly journals and the popular press on the topic of innovation over the past four decades (Dismukes, 2005; Garcia & Calantone, 2002; King, 1990; Rogers, 2003). West and Farr (1989) wrote, "The vast literature on the subject of innovation at work is a jungle of inconsistent findings based on studies of disparate aspects of 'innovation' defined in a multiplicity of ways" (p. 17). As with any field of study, there are a few theoretical outliers, however, the preponderance of scholarship and popular writing on innovation can be classified into one of three perspectives: the organizational psychology perspective, the economic perspective, or the diffusion perspective. These dominant theoretical frames are not necessarily mutually exclusive and there is frequent overlap in various combinations inherent in the authors' theoretical stances.

Innovative work behavior studies are predominantly from the organizational psychology perspective, but not exclusively so. The theoretical perspective of many studies, while founded

in organizational psychology, includes elements of the economic and/or diffusion perspectives as well. Some scholarship is founded in the economic or diffusion perspectives. For example, in 1979, Krugman, an economist, stated flatly, “Innovation consists of the development of new products” (p. 253). Von Hippel, from a management and engineering background, took a very similar view in his 2002 paper that examined innovation and innovative work behavior as they occur within the context of open source software development.

One example of an almost purely economic view is Zawislak, Borges, Wegner, Santos, and Castro-Lucas (2008), who sought, “to present the concept of an ‘innovation function’ as a set of elements – entrepreneurship, institutions, capabilities and capital – and their inter-relations as a way to explain innovation” (p. 18). They refer to, “function,” in the microeconomic sense, similar to the production function or the distribution function. They propose the microeconomic formula model: $\text{Innovation} = f(\text{entrepreneurship, institutions, capabilities, capital})$ (p. 18). Similarly, Midgley and Dowling (1978) also propose to apply a formula to innovative behavior; however, where Zawislak et al. (2008) conceptualized innovation as the introduction of new products and/or services, Midgley and Dowling follow Rogers (1971) and conceive of innovation as early adoption of innovations. Midgley and Dowling are in fact critics of Rogers, pointing out that innovation adoption behavior is not necessarily consistent for all available innovation adoption decisions. They refer to case specific innovation adoption behavior as, “actualized innovation,” and draw a distinction from what they refer to as, “innate innovation,” characterized as a personality trait.

Midgley and Dowling expressed actualized innovation as: $AI = (m - t)/s$, where ‘I’ is one current metric for innovativeness, ‘m’ is the mean time of adoption for the social system, ‘s’ the standard deviation of adoption times and ‘t’ the time at that the particular individual in

question adopts (p. 232). They expressed innate innovation as: $\Pi = f(I/E)$, where 'E' is the quantum of communicated experience required by the individual (p. 235). Midgley and Dowling went so far as to propose a formula to calculate an individual's innovativeness, score. They wrote,

the direct innate-innovativeness score can be expressed as:

$$II = \sum_{i=1}^n w_i s_i,$$

where II = the individual's innate-innovativeness score,

n = the number of selected (significant) items,

w_i = the regression weight attached to the i th item,

and s_i = the individual's score on the i th item" (Midgley &

Dowling, 1978, p. 239)

Midgley and Dowling offered a model of innovative behavior that is very close to a flow chart representation of Rogers' (1971, 2003) discussion of the innovation decision process. Like Zawislak et al., Midgley and Dowling sought to express innovative behavior in an equation. Each approached the fundamental nature of innovation differently, but both have foundations in economics and organizational psychology.

Mairesse and Mohnen (2002) also sought to express innovative behavior in an economic equation based on an early adoption definition of innovativeness. They however, were more focused on organizational behavior at the firm level than on individual behavior. They also viewed innovativeness as dual in nature, consisting of both propensity for early adoption, and intensity of early adoption; intensity being defined as the share of total firm sales generated through early innovation adoption. Another example of a theoretical perspective with

foundations in both the economic and group psychology fields is Hering and Philips (2005) who conceive of innovation generally as a management process, but a process that succeeds based on the dynamic interaction of roles played out by individuals within the organization.

Drucker was a prolific and well known scholar of management and addressed innovation in some of his work, most notably his 1985 book, *Innovation and Entrepreneurship: Practice and Principles*. Drucker tended to treat innovation at the individual level as somewhat of a ‘black-box.’ Drucker characterized innovation as a process where ideas entered as the input, and new products and/or services came out as the output. Drucker’s scholarship on management, in regard to innovation, predominantly addressed these input and output components of the process, while largely glossing over the mechanics of the process itself. As is discussed subsequently, many researchers work from the position that innovative work behavior is fundamentally about the manipulation and application of ideas. Scott and Bruce (1994a) wrote, “The foundation of innovation is ideas” (p. 580). Drucker (1985, p.26) contributed a categorization of where ideas for new products and/or services come from.

Perhaps the most significant authors who combine important elements from economic and psychological theory are Dyer, Gregersen, and Christensen (2008, 2009, 2011). Their original study, published in 2008, and their subsequent article (2009) and book (2011), all treat innovation as fundamentally economic in nature. That is, that innovation is the starting of new business ventures. Innovative behavior, by contrast, is for Dyer, Gregersen, and Christensen the application of identifiable skills.

Like Dyer, Gregersen, and Christensen, some authors view innovative work behavior as integral to entrepreneurial activity. Hayton and Kelley (2006) envision innovating as one of four roles within entrepreneurship, along with: brokering, championing, and sponsoring. In

this context, their definition of innovative behavior is somewhat narrow, “. . . having the creative insight about particular knowledge and information combinations and what they can mean for users. . . (pp. 414 – 415).” Finez (2008) equates entrepreneurship, the starting of new business ventures, with innovative work behavior, creating two behavior models that are trait based. Finez envisions individual behavioral traits as the interaction of a person’s wants, knowledge, and capabilities. These traits can be perceived by the individual and others as innovative or entrepreneurial. Finez applies a similar view to organizational behavior, seeing organizational behavior as the interaction of collective aptitudes, attitudes and capacities. These organizational characteristics can appear as innovative or entrepreneurial activity.

Just as there are many economically grounded theoretical frames dealing with innovative work behavior, there are also many diffusion grounded theoretical frames. As already discussed, Midgley and Dowling (1978) and Mairesse and Mohnen (2002) grounded their attempts to depict innovative behavior with an equation in diffusion centric definitions of innovation. McGeown (1980) also follows Rogers (1971) and conceptualizes innovative behavior as propensity to adopt innovations. His study has an additional psychological orientation, identifying attitudinal commonalities that correlated with early innovation adoption behavior. In his 2009 study of Dutch small business owners, De Jong investigated the psychological antecedents of what he refers to as propensity to exploit innovations. De Jong’s context demonstrates that in this case the terms innovation adoption and innovation exploitation are effectively synonymous in describing behavior.

For Bigoness and Perreault (1981) early innovation adoption is the manifestation of innovativeness, or innovative behavior. They conceive of innovation behavior as existing within three axes or dimensions that they referred to as, “domains,” one of that is,

“innovativeness,” propensity for early adoption; the second is, “content,” that refers to being either a generalist or a specialist; and the third is, “reference,” that indicates an internally or externally oriented perspective. Their structural approach to conceptualizing innovative work behavior is very similar to the dimensional conceptualizations that came later. They depict their conceptual framework as shown in Figure 2.

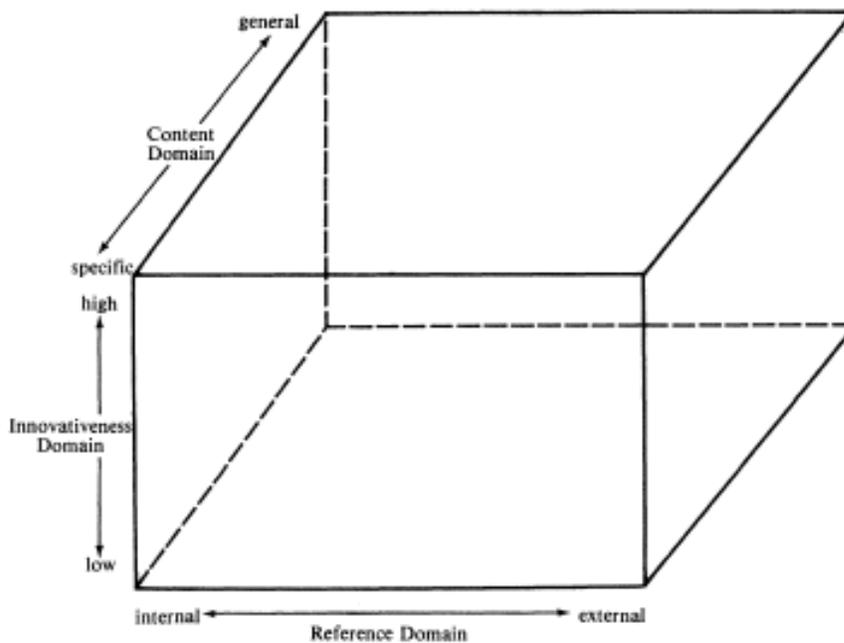


Figure 2. Schematic representation of a conceptual framework for the study of innovators (Bigoness & Perreault, 1981, p. 71).

Some authors bring unique perspectives to the discussion of what innovative work behavior is. Wylant (2008) conceptualized the phenomenon of innovation as an entity, as opposed to an action or a process, writing, “. . . the constituent elements of innovation, that can be identified as the new thing to be introduced, the act of introducing it, and some type of arena where the introduction occurs” (p. 6). Townsend (2004) approached innovation from a very constructivist point of view, stating, “Innovation is a very localized phenomenon, defined within very specific contextual boundaries. These boundaries do not necessarily transfer outside

of the context in that they are found” (p. vii). Pellissier (2008) also approaches innovative work behavior from a very constructivist perspective writing:

Innovation is to be understood as the result of cumulative dynamic interaction and learning processes involving many stakeholders. Here innovation is seen as a social, spatially embedded, interactive learning process that cannot be understood independently of its institutional and cultural context (p. 69).

Tether, Mina, Consoli and Gagliardi (2005) take a similar view, essentially concluding that innovative work behavior cannot be meaningfully defined when they wrote, “Perhaps the most important message is that there is no ‘one size fits all’ model of innovation, and therefore no single model of the managerial and workforce skills necessary for innovation” (p. 95). At nearly the opposite end of the spectrum are Garcia and Calantone (2002) who undertook a survey of the literature and reported 21 different definitions of innovative behavior, founded in 15 different theoretical constructs.

Some authors choose to craft their own definitions, seeking to advance theory in the field. Lee (2008) takes a perspective very similar to other authors who write from one of the variations on the propensity to adopt view when he defines innovative work behavior as, “the voluntary *willingness* (emphasis added) by individual employees to constitute on-the-job innovations” (p. 28). Some of the authors cited enjoy positions of notoriety both internal and external to the community of innovation scholars, principally: Rogers, Krugman, Drucker, Von Hippel, and Dyer, Gregersen, and Christensen. In the specific field of innovative work behavior investigation, all of these authors are largely outliers to the mainstream of inquiry. The most frequently cited authors on defining innovative work behavior are West and Farr (1989). The second most widely cited definition in the same category comes from Scott and

Bruce (1994a, 1994b). Although Scott and Bruce (1994a, 1994b) offer their own definition, they cite West and Farr (1989) as the inspiration for it.

West and Farr (1989) state:

Innovation is the intentional introduction and application within a role, group or organization of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit role performance, the group, the organization or the wider society. Innovation is restricted to intentional attempts to derive anticipated benefits from some change. Innovation involves an application component in the process (p. 16).

West and Farr (1989) define, “individual innovation to be: the implementation of new and different objectives, methods, procedures, working relationships and skills” (p. 23). Several authors adopt West and Farr’s (1989) definition for their own studies (Anderson & West, 1998; Van der Vegt & Janssen, 2003; West & Andersen, 1996; Yuan & Woodman, 2010). Very much like Dyer, Gregersen, and Christensen, West and Farr first published their work as a journal article (1989), and then subsequently as a book (1990). In some cases authors cited the book and in some cases the article; the definition is the same in both. Additionally, some investigators cited Farr and Ford (1990), however, the Farr of Farr and Ford (1990) and the Farr of West and Farr (1989, 1990) are one in the same person, and the definitions are again identical. Anderson, De Dreu, and Nijstad (2004) referred to West and Farr’s (1989, 1990) definition as, “generally accepted” (p. 148) in the field.

Scott and Bruce published two closely related articles in 1994 that share a common definition:

Individual innovation begins with problem recognition and the generation of ideas or solutions, either novel or adopted. During the next stage of the process, an innovative individual seeks sponsorship for an idea and attempts to build a coalition of supporters for it. Finally, during the third stage of the innovation process, the innovative individual completes the idea [by offering it in a form that can be adopted] (1994a, pp. 581 – 582).

Similar to the situation with West and Farr (1989, 1990), various authors cite one paper or the other by Scott and Bruce (1994a, 1994b), however the distinction is almost entirely transparent unless the reader consults the reference list, and also almost entirely inconsequential, because the definitions are identical.

An author who is often cited for a definition of innovative work behavior is Janssen. In one of his most frequently cited works, Janssen (2000) writes:

Based on West and Farr (1989) and West (1989), innovative work behavior is defined here as the intentional creation, introduction and application of new ideas within a work role, group or organization, in order to benefit role performance, the group, or the organization. This definition restricts innovative behaviour [*sic*] to intentional efforts to provide beneficially novel outcomes. . . . Following Scott and Bruce (1994), we conceive innovative work behavior in the workplace as complex behaviour [*sic*] consisting of a set of three different behavioural [*sic*] tasks: idea generation, idea promotion, and idea realization (p. 288).

Nagarajan, Flood, Slattery and Sardessai (2005) cite Janssen (2000) exclusively for their definition. Others, for example, Carmeli, Meitar, and Weisberg (2006), cite West and Farr

(1989), Scott and Bruce (1994a), and Janssen (2000), inclusively and offer a somewhat hybridized definition:

Innovative behavior is defined here as a multiple-stage process in that an individual recognizes a problem for that she or he generates new (novel or adopted) ideas and solutions, works to promote and build support for them, and produces an applicable prototype or model for the use and benefit of the organization or parts within it (p. 78).

Two other authors who are also frequently cited as contributing to conceptualizations of innovative work behavior, but less so than West and Farr (1989, 1990), Scott and Bruce (1994a, 1994b), and Janssen (2000), are Kanter (1988), and Kirton (1976). Kanter's principle contribution to theory and definitions is the concept that innovative work behavior must produce something, a product or a process, that can be adopted. He wrote that for behavior to be considered innovative, it should generate, "a prototype or model of the innovation ... that can be touched or experienced, that can now be diffused, mass-produced, turned to productive use, or institutionalized" (p. 191). Kirton's principal contribution to innovative work behavior theory and definitions is the concept that individuals have innate tendencies in their approaches to problem solving and that these tendencies exist on a spectrum or continuum with 'adaptive' (the same or very similar solutions for the same or very similar problems) in one direction, and 'innovative' (significantly different solutions for the same or very similar problems) in the opposite direction. In one sense, Kanter's contribution to the dialogue addresses the outputs of innovative work behavior (products, services, processes), and Kirton's contribution addresses the inputs (ideas).

Dimensionality. Much of the debate among scholars deals less with what the substance of innovative work behavior is, and more with how many constituent parts exist and what they are; in other words, the dimensionality. Not all researchers subject their theoretical models to empirical testing; of those who do, some obtain results that support their conceptual models, some obtain results indicating monodimensionality, and others obtain results that support some of the conceptualized dimensions but not all. De Leede, Kraan, Den Hengst, and van Hooff (2008) employ a monodimensional perspective and measure. They define and measure innovative work behavior based on responses to the statement, “In my work I discover new solutions for bottlenecks in my work that remain unsolved” (p. 31); on a five-point Likert scale (1=certainly not - 5=most certainly p. 30). Imran and Anis-ul-Haque (2011) also employ a monodimensional construct and instrument consisting of 22 items on a Likert-type scale.

In 2004, Mathisen and Einarsen compiled a survey of available instruments for assessing support for innovative work behavior in workplace environments, but largely avoided specifically defining the term. In their commentary, they indicate that they work from an essentially two dimensional model, consisting of creativity and implementation. Chen and Huang (2009) state a two dimensional view of innovative work behavior, but their focus is on the subject matter of the innovation, as opposed to the behavior exhibited by the innovators; they write, “The present study adopts two dimensions of innovation performance including administrative and technical innovation performance” (p. 109). Hammond, Neff, Mac, Farr, Schwall, and Zhao (2011) conceptualize two components: idea generation, and idea implementation. They state their position concisely, “It is, ultimately, individuals who generate ideas and are responsible for turning those ideas into a reality” (p. 99). De Jong and Den Hartog (2007), who would later (2010) develop and test an instrument based on four

hypothesized dimensions, also worked from a two dimensional model. They write, “Our focus is on two core innovative behaviours [*sic*] that reflect the two-stage process: idea generation and application behaviour [*sic*] ” (p. 43). De Jong and Den Hartog investigated leaders’ influence on employee innovative work behavior. Through a structured interview process with managers and employees, they identify thirteen leader behavior constructs that correlated to one or both of their conceptualized dimensions.

The most common dimensional conception involves three dimensions. Hammond et al (2011) conducted a meta-analysis of prior studies and found strong correlations to 16 variables that they grouped into three categories: individual factors, job factors, and contextual factors. Mukherjee, and Ray (2009) conceive of innovative work behavior as comprised of, “idea generation, idea promotion and idea realization” (p. 102). They used the instrument developed by Janssen (2000) and found a high correlation between innovative work behavior and private sector enterprise modernization in India. Hsiao, Chang, and Chen (2011) applied the same ‘idea generation, idea promotion, and idea realization’ model, and Janssen’s (2000) instrument and found a high correlation to self-efficacy in Taiwanese middle and secondary school teachers. Binnewies and Gromer (2012) studied middle and secondary school teachers in Portugal applying a three dimensional model that they labeled, “idea generation, idea promotion, and idea implementation” (p.100). Binnewies and Gromer use an instrument developed by Holman, Totterdell, Axtell, Stride, and Port (2005) and establish correlations to various characteristics of the teachers’ work environment. Binnewies, and Gromer find support for the validity of the three dimensional construct in their study, writing, “our results point out that it is valuable to examine idea generation, promotion, and implementation as separate outcomes as they were predicted by different factors” (p. 103).

Suli (2008) also investigates the relationship of work environment, job demands, and innovative work behavior, but as moderated by the individual's attitude toward the work environment. Suli refers to individual attitude as, "positive affectation," (p. 692) and envisions innovative work behavior as a three dimensional construct. Suli applied Janssen's (2000) instrument and found that job demands are initially positively correlated with innovative work behavior, but that beyond a threshold the relationship reverses, and that the effect is more pronounced in people who exhibit high positive affectation, as shown in Figure 3. Suli's results suggest that job demands have an initial positive effect on employee innovative work behavior, and that there is an optimal range of job demands that maximizes this effect. However, beyond the optimal range, increasing job demands have a negative effect on employee innovative work behavior. The results also indicate that this effect is most pronounced among people who like their jobs, or display high positive affectation.

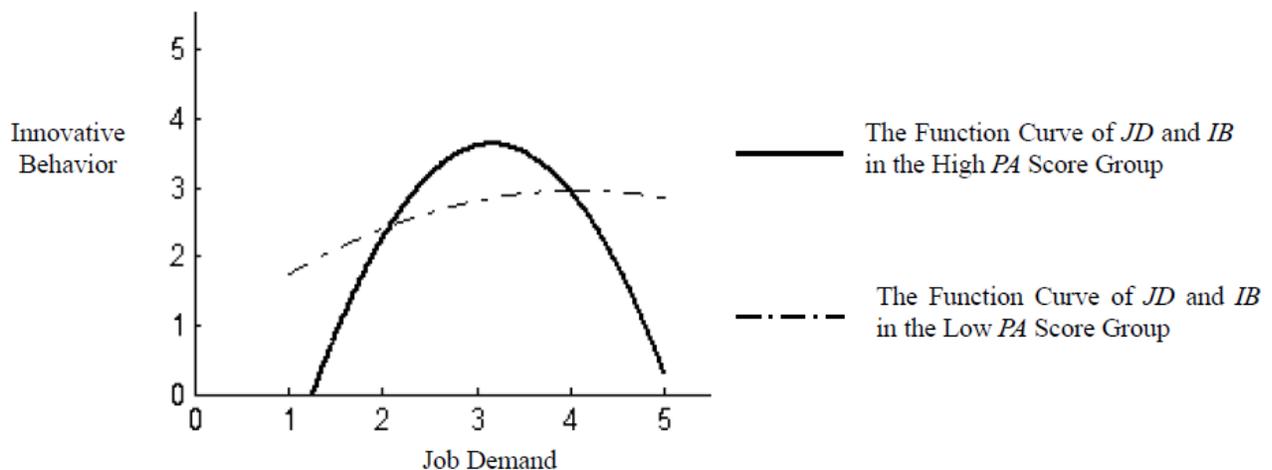


Figure 3. Illustration of findings suggesting an optimal range of job demands for innovative work behavior (Suli, 2008, p. 695).

Lewrick, Raeside, and Peisl (2007) investigate factors external to the workplace, analyzing the correlations between innovative work behavior and individuals' social networks.

They stated their three part definition writing, “innovation is considered here to be the production, diffusion and use of new and economically useful knowledge” (p. 38). Weiss (2002) refers to the practice of design as, “the innovation engine” (p. 36). Weiss applies a three dimensional model that bears some similarity to the ‘idea generation, idea promotion, idea implementation’ model, but with different labels, and from a somewhat narrow product development frame of reference. In 2004 Janssen and West collaborated with Van Der Vliert on a theoretical discussion of the benefits, costs, and moderators of innovative work behavior. They worked from a three dimensional construct that they labeled, “generation, promotion, and realization of new ideas” (p. 130).

Many other researchers work from a conceptual model with four dimensions. Carmeli, Meitar, and Weisberg (2006), cited earlier, conceive of innovative work behavior in four dimensions: problem recognition, idea generation, idea promotion, and idea application. Carmeli, Meitar, and Weisberg use Scott and Bruce’s (1994b) instrument and find high correlations to their measures of self-leadership. In his 2007 dissertation, De Jong examined the relationship to organizational leadership; he writes, “Innovative work behavior is a four dimensional construct, including 1. opportunity exploration, 2. idea generation, 3. championing and 4. application” (p. 25). De Jong used a hybridized instrument combining items from Janssen (2000), Scott and Bruce (1994b), and others (Kleysen & Street, 2001; Tierney, Farmer & Graen, 1999) but the results did not support a multi-dimensional model. De Jong concluded, “The dimensions of opportunity exploration, idea generation, championing and application correlate highly and may be best seen as combining additively to create an overall scale of innovative work behavior” (p. 124).

Carmeli and Spreitzer (2009) examine other interpersonal relationships in the workplace. They envision innovative work behavior in four parts, stating, “innovative behavior goes beyond creativity to include the adoption, production, and implementation of novel and useful ideas (Scott & Bruce, 1994)” (p. 170). Carmeli and Spreitzer use Scott and Bruce’s (1994b) instrument and find high correlations with qualities they identify as ‘trust, connectivity, and thriving.’ A significant limitation of their study, that they acknowledge, is the issue of causality, or directionality of the correlation. Some relationships may give rise to more innovative behavior, or innovative behavior may engender particular kinds of relationships.

In 2010, Cantwell attempted to take a broader view of the potential predictors, investigating innovative work behavior’s correlations with interpersonal relationships and other work environmental factors. Cantwell conceives of, “four distinct factors: a) problem recognition, b) idea generation, c) idea promotion, and d) idea realization” (p. 32). However, Cantwell later concludes that innovative work behavior should be categorized as creative behaviors, and implementation behaviors (p. 109). Also in 2010 De Jong and Den Hartog developed and tested an instrument based on a four dimensional model; they write, “This article is concerned with developed [*sic*] a measure of innovative work behavior with four potential dimensions: the exploration, generation, championing and implementation of ideas” (p. 23). But concede that, “Evidence for the distinctiveness of the four dimensions was, however, weak, suggesting that innovative work behavior is one-dimensional” (p. 23).

Another approach founded on a four element model is presented as the, “Innovation Skills Profile (ISP)” (Conference Board of Canada, 2008b). The profile envisions innovative work behavior as comprised of four, “pillars,” or individual skill sets. These are labeled: “creativity and continuous improvement skills, risk-taking skills, relationship-building skills,

and implementation skills” (Conference Board of Canada, 2008b). While these pillars bear a semantic resemblance to the elements theorized by other authors, the pillars have a very specific individual job skills orientation. This theoretical construct became the foundation for an instrument named the, “General Innovation Skills Aptitude Test (GISAT)” (Conference Board of Canada, 2008a). This construct and the corresponding instrument have been adopted by the Society for Knowledge Economics, an Australian not-for-profit organization funded by a consortium of international corporations, Australian Government organizations, and academic institutions (Society for Knowledge Economics, 2009, p. 44). The Society for Knowledge Economics has adopted the GISAT as a means to study and promote Australia’s national expansion into the, “knowledge economy” (Society for Knowledge Economics, 2009, p. 44). The material published on the ISP and the GISAT does not address their theoretical origins, or any analysis or testing performed to establish their validity and reliability.

A few authors envision a construct with five dimensions. Kleysen and Street (2001) developed and tested an instrument based on five dimensions, “opportunity exploration, generativity, formative investigation, championing, application” (p. 285). However, they conclude, “The results obtained from the previous analysis do not lend empirical support for the factor structure hypothesized in this paper” (p. 291). Chao, Lin, Cheng, and Tseng (2011) investigated the relationship between managerial leadership behaviors and innovative work behavior citing Kleysen and Street’s (2001) five part model but using Janssen’s (2000) instrument. In their experiment, Chao, Lin, Cheng, and Tseng reported a Cronbach’s α of between 0.85 and 0.88 for all factors, strongly supporting factor validity. Messmann and Mulder (2012) also developed and tested an instrument based on five dimensions, “opportunity

exploration, idea generation, idea promotion, idea realization, and reflection” (pp. 45 – 46). Messman and Mulder (2012) found empirical support for only four.

Common Characteristics. Regardless of how many dimensions particular authors envision, or what other variables they examine the correlation to, the three sources most frequently cited as foundational to conceptions of innovative work behavior are: West and Farr (1989, 1990), Scott and Bruce (1994a, 1994b), and Janssen (2000). Scott and Bruce cite West and Farr, and Janssen cites both Scott and Bruce, and West and Farr. There are four central characteristics that all three sources agree on. The first of these is that innovative work behavior is more than just the application of creativity to workplace demands. West and Farr (1989) pose the question, “is innovation simply another name for creativity within organizations?” (p. 16). They conclude that, “this is certainly not true of an innovation according to our definition, that may be new to a particular organization or work group, but may be relatively common elsewhere” (p. 16). Scott and Bruce (1994a) write,

Creativity has to do with the production of novel and useful ideas, and innovation has to do with the production or adoption of useful ideas and idea implementation. . . innovation also encompasses the adaptation of products or processes from outside an organization. (Scott & Bruce, 1994a p. 581)

Janssen is somewhat less emphatic on this point but still consistent stating, “individual innovation begins with idea generation, that is, the production of novel and useful ideas in any domain” (p. 288).

The second point of concordance among West and Farr (1989, 1990), Scott and Bruce (1994a, 1994b), and Janssen (2000) is that innovative work behavior involves the promotion of new ideas, regardless of their source of origin. According to West and Farr (1989) one

characteristic is that, “individuals can learn to manipulate their environments to make them more conducive to their well-being and effectiveness” (p. 27). Scott and Bruce (1994a) are more explicit on this point; they state, “an innovative individual seeks sponsorship for an idea and attempts to build a coalition of supporters for it” (p. 582). Janssen is the most pointed on this characteristic, writing, “once a worker has generated an idea, he or she has to engage in social activities to find friends, backers, and sponsors surrounding an idea, or to build a coalition of supporters who provide the necessary power behind it” (p. 288).

The third characteristic that West and Farr (1989, 1990), Scott and Bruce (1994a, 1994b), and Janssen (2000) agree on is that ideas must be realized, or made tangible in some way. In defining innovative work behavior, West and Farr (1989) state, “the definition also encompasses the notion that innovation involves an application component in the process” (p. 16). Scott and Bruce (1994a) expand on this point writing, “during the third stage of the innovation process, the innovative individual completes the idea by producing ‘a prototype or model of the innovation ... that can be touched or experienced, that can now be diffused, mass-produced, turned to productive use, or institutionalized’ (Kanter, 1988: 191)” (p. 582). Similarly, Janssen (2000) concludes, “The final task of the innovation process concerns idea realization by producing a prototype or model of the innovation that can be experienced and ultimately applied within a work role, a group or the total organization” (p. 288).

The fourth characteristic that West and Farr (1989, 1990), Scott and Bruce (1994a, 1994b), and Janssen (2000) agree on is that it must be beneficial in some sense. West and Farr (1989) state, “innovation is restricted to intentional attempts to derive anticipated benefits from some change” (p. 16). Scott and Bruce’s (1994a) definition simply requires that the ideas implemented be, “useful” (p. 581). A portion of Janssen’s (2000) definition is that the behavior

is undertaken, “in order to benefit role performance, the group, or the organization” (p. 288).

Janssen (2000) goes on to write,

Profits from innovation could include both better functioning of the organization and social-psychological benefits for individual workers or groups of individuals, such as a more appropriate fit between perceived job demands and a worker's resources, increased job satisfaction, and better interpersonal communication. (Janssen, 2000, p. 288).

West and Farr (1989, 1990), Scott and Bruce (1994a, 1994b), and Janssen (2000) agree that the four central characteristics are: innovative work behavior is more than just the application of creativity to workplace demands; it involves the promotion of new ideas, regardless of their source of origin; that the ideas must be realized, or made tangible in some way; and that the realized idea is beneficial in some sense. Numerous other authors, as discussed in this section, have investigated a broad range of correlates to innovative work behavior. What is lacking from the literature is an investigation of what individual employee behaviors manifest these characteristics. While a number of research methods could address the lack of knowledge on specific innovative behaviors, this study employed critical incident technique to that end.

Critical Incident Technique

As a qualitative research method, critical incident technique traces its origins to Flanagan (1954). In reflecting on the evolution of the method over the intervening 50 years, Butterfield, Borgen, Amundson, and Maglio (2005) state, “CIT has become a widely used qualitative research method and today is recognized as an effective exploratory and

investigative tool” (p. 475). Of Flanagan’s (1954) original article Butterfield et al note, “it has been more frequently cited by industrial and organizational psychologists than any other article over the past 40 years” (p. 475). In addition to examining the proliferation and evolution of the use of critical incident technique, Butterfield et al (2005) also cite 20 studies that examined the efficacy of the method and had positive findings.

As originally defined by Flanagan (1954), and followed numerous times by subsequent researchers, critical incident technique is comprised of five steps: identify the general aims of the study; plan the study; collect the data; analyze the data; interpret the data and report (Butterfield et al, 2005; FitzGerald, Seale, Kerins & McElvaney, 2008; Flanagan, 1954). Flanagan (1954) refers to critical incident technique as, “a set of procedures for collecting direct observations of human behavior in such a way as to facilitate their potential usefulness in solving practical problems” (p. 327). Like many research methods, critical incident technique has both a collection component, and an analysis component. Referring to the collection component, Flanagan (1954) states:

The essence of the technique is that only simple types of judgments are required of the observer, reports from only qualified observers are included, and all observations are evaluated by the observer in terms of an agreed upon statement of the purpose of the activity (p. 335).

A key element of critical incident technique is that the researchers are not the primary observers of the behavior under study. Other individuals in a position to both observe the studied behavior and render an informed characterization of it report their observations and characterizations to the researchers. Any means that accurately captures the primary

observations and characterizations may be applied (Butterfield et al, 2005; FitzGerald, et al, 2008; Flanagan, 1954).

With regard to the analysis component of critical incident technique, Flanagan states:

This step is usually an inductive one and is relatively subjective. Once a classification system has been developed for any given type of critical incidents, a fairly satisfactory degree of objectivity can be achieved in placing the incidents in the defined categories (p. 335).

It is in the analysis component that critical incident technique takes on its principally qualitative nature. While it is conceivable that a similar collection approach could be employed asking observer/respondents to report in quantitative terms (perhaps number of times that a particular phenomenon was observed within some other parameter) there are often a variety of other ways available to gather quantitative data. Most often, critical incident technique is applied in inquiries that fundamentally seek to make meaning from observations. This is accomplished through the qualitative classification of reported critical incidents into categories followed by an inductive categorical sorting of critical incidents (Butterfield et al, 2005; FitzGerald, et al, 2008; Flanagan, 1954).

A contemporary example of how critical incident technique has been applied is Hamlin, Sawyer and Sage's (2011) study on perceived managerial and leadership effectiveness in a non-profit organization. In this study, the authors use critical incident technique to investigate behaviors perceived as effective or ineffective within a specific work role, in a particular type of organization. Hamlin, Sawyer and Sage (2011) used a semi-structured interview approach to collect primary critical incidents. The researchers then conducted semantic analysis based on a, "sameness, similarity, or congruence" (p. 222) analytical construct to accomplish categorical

sorting of the critical incidents. Once sorted, the categorized critical incidents were subjected to content analysis based on a, “summarizing, explicative, and structuring” (p. 222) analytical construct in order to determine appropriate summative labels for the critical incident categories. Those summative labels constituted the identified behavior statements that defined the perceived effective and ineffective behavior in the organization under study. The resulting set of behavior statements could be subjected to further analysis. By examining the distribution of critical incidents to behavior statements the researchers were able to make a quantified statement about how prevalent the reporting of particular behaviors was across the respondent population, and therefor infer the significance of the behavior across the studied organization.

Conclusions from the Literature Review

The key conclusions that can be drawn from a review of the pertinent literature, relevant to the present study are:

- Innovation is a phenomenon of human behavior that occurs in people’s work environments.
- The phenomenon of innovation has tremendous economic impact.
- The behavior people engage in that results in the phenomenon of innovation can legitimately be referred to as, “innovative work behavior.”
- Defining and understanding effective work behaviors can be an important component of educational or Human Resource Development program formulation, implementation, and evaluation.
- Innovative work behavior, as a concept, can be more readily studied through observational techniques than can, “innovativeness,” conceptualized as a psychological

trait or personality attribute, because of the emphasis on behaviors that are observable, reportable, and classifiable.

- Many authors have studied innovative work behavior in numerous ways.
- Many of the authors who have studied innovative work behavior have conceived dimensional models.
- There is a lack of consensus among scholars as to whether or not innovative work behavior is dimensional in nature, and if it is, how many dimensions there are.
- There are four characteristics that distinguish innovative work behavior: that it is more than just the application of creativity to workplace demands; that it involves the promotion of new ideas; that those ideas must be realized; and that the realized ideas are beneficial.
- Most previous studies have sought to classify behavior into various dimensional schemes, while lacking a strong observational component.
- Critical incident technique is an observationally based data collection and analysis method that has been effectively applied to several work behaviors in many contexts.
- Literature review revealed only one previous study that purported to apply critical incident technique to the study of innovative work behavior, but that study applied the technique in a very narrow and disadvantageously limiting way.

Summary

Innovation is a topic that enjoys significant attention in the popular and scholarly media. Innovation is significant to the study of Technology Management for many reasons. Innovation in general is significant to Technology Management due to its impact on the economy and the

discipline of economics. Innovative work behavior in particular is significant to Human Performance Technology because of its potential role as a foundation for performance needs analysis in training and development programs.

Innovative work behavior has been studied by numerous researchers and theorists in numerous ways. A variety of instruments have been developed and researchers have found correlations to a broad range of variables. There are structural conceptualizations that involve from one to five dimensions, however, in those cases where researchers have examined the empirical support for the dimensional nature of their models, the most common findings are that either fewer than the conceived of dimensions are empirically supported or that only one dimension is empirically supported.

There are four defining characteristics of innovative work behavior: that it is more than just the application of creativity to workplace demands; that it involves the promotion of new ideas; that ideas must be realized; and that the realized idea is beneficial. For the significant volume of literature, the element most commonly lacking is an investigation of what individual employee behaviors manifest these characteristics.

One way to collect and analyze information on the individual employee behaviors that manifest these characteristics is through Flanagan's (1954) critical incident technique. This technique has a substantial record of effective application in the research literature. It has both a collection and an analysis component; the significant characteristic of the collection component is the use of respondents as primary behavior observers. The significant characteristic of the analysis component is the inductive categorization of observed critical incidents. A contemporary example of how critical incident technique can be applied is Hamlin, Sawyer, and Sage's (2011) study of perceived effective managerial behavior.

CHAPTER 3

Methods

Much of what has previously been written about innovation and innovative work behavior has focused on behavior categories or dimensions without seeking to observe or understand how it is manifested in the workplace. Critical incident technique is an observationally based data collection and analysis method that has not previously been applied well to the study of innovative work behavior. This study applied critical incident technique to collect first hand behavior observations in the places where innovative work behavior occurs. Analysis of the observations collected showed discrete behaviors that contribute to innovation in the workplace, and distinguished the behaviors most frequently cited as demonstrating employee innovativeness. The results of this study contribute to narrowing the gap between the categorizations or dimensions of behavior theorized and investigated in previous research and concrete examples of what behaviors are exhibited in work environments. These results can assist in assessing, developing, implementing, and evaluating innovation focused Human Resource Development initiatives. This chapter addresses: the study population and sample, instrumentation, data collection, and data analysis.

Population and Sample

The population sampled in this study could potentially be conceived of as the universe of supervisory personnel with access to the internet; however, in practical application it is significantly more limited, as is explained in this section. This study employed a purposive convenience sample (Teddlie & Yu, 2007) of supervisory personnel (defined as individuals who report that they hold positions within their organizations that include the responsibility to evaluate the performance of other personnel, through an affirmative answer to item #2 on the survey instrument) in organizations for that innovation is important (defined as self-reporting on the perception of importance through an affirmative answer to item #1 on the survey instrument). The sample is purposive in that supervisors' perceptions are the object of the inquiry. Respondent characteristics are discussed in Chapter Four.

The sample was a convenience sample in that it takes advantage of pre-existing relationships to reach the largest respondent pool practical. The Indiana State University Business Engagement Office maintains a network of contacts and collaborations with various organizations, predominantly for-profit corporations with a history of, or propensity for, engaging in cooperative ventures with institutions of higher education. This network provided access to leaders and decision makers within those organizations who authorized and provided access to potential respondents, and encouraged participation.

This study employed snowball sampling (Goodman, 1961). Beirnacki and Wolfe (1981) wrote of snowball sampling:

Snowball or chain referral sampling is a method that has been widely used in qualitative sociological research. The method yields a study sample through referrals made among people who share or know of others who possess some

characteristics that are of research interest. The method is well suited for a number of research purposes (p. 141).

Atkinson and Flint (2001) note, “If the aim of a study is primarily explorative, qualitative and descriptive, then snowball sampling offers practical advantages” (para. 4). This study was clearly not explorative in the same context that basic research in the physical sciences is explorative, but rather investigated a previously under examined component of an identified phenomenon. This study was conducted from a realist (post-positivist) paradigmatic perspective (Guba & Lincoln, 1994). The study was predominantly qualitative in nature in that the investigator seeks to capture observations of a given set of behaviors that are defined by the meaning that the observers ascribe to the behaviors observed.

The initial contact tier of the surveyed population was generated through a collaborative analysis of potential study participant organizations between the Principal Investigator and the Director of the Indiana State University Business Engagement Office to determine an initial contact set of organizations and their official representatives who were likely to provide access to supervisory personnel who evaluate the performance of others, and would be disposed to participate in the study. Because the study employed snowball sampling, the first tier and subsequent tier respondents were used to access additional respondents, only the initial tier received correspondence directly from the research team; subsequent respondent tiers received their contacts from respondents in preceding tiers.

In referring to sample size in a critical incident technique studies, Butterfield et al (2005) note, “There is no set rule for how many incidents are sufficient. The crucial thing here is to ensure the entire content domain of the activity in question has been captured and described” (p. 479). FitzGerald et al (2008) conclude, “Over 100 incidents are generally

accepted to be a reasonable figure for analysis” (p. 301). The central point that Flanagan (1954), Butterfield et al (2005), and FitzGerald et al (2008) all agree on is that quality in critical incident technique is enhanced by a large set of critical incidents.

The research advantage that this sampling method maximizes is sample size, or ‘*n*.’ It also isolates the sample definition to two variables, that of reporting that innovation is important to the respondent’s organization, and respondents reporting that they evaluate the performance of others. The research disadvantage that is accepted with this sampling method is that the response rate is unknown because the total number of individuals afforded an opportunity to participate is unknown. Organizations represented in the respondent population are characterized based on the respondent’s selection of one of the U.S. Census Bureau’s, North American Industry Classification System economic sector classifications in item three of the survey instrument (U.S. Census Bureau, 2012).

Innovative work behavior as conceptualized by the authors referenced for this study (De Jong & Den Hartog, 2010; Janssen, 2000; Messman & Mulder, 2012; Scott & Bruce, 1994a, 1994b; West & Farr, 1989, 1990) is universal and not work domain specific. Because the principle objective of this study is to define exhibited innovative work behaviors in more specific detail, and critical incident technique is the method used to achieve that objective, and quality in this technique is enhanced by a larger number of critical incidents (Butterfield et al, 2005; Flanagan, 1954), the advantages of the sampling method for enhanced transferability outweigh the limitations for population description.

Instrumentation

This study employed an online survey instrument original to this study for primary data collection (see Appendix B). Data collection in previous critical incident technique studies has employed a variety of approaches: interviews, direct observations, questionnaires, and review of secondary or tertiary sources. This study employed a survey instrument primarily for logistical reasons. Use of an online instrument permitted accessing a population sample large enough to generate generalizable results within the time and personnel constraints of the study. Informed consent and other ethical considerations were addressed through introductory components of the instrument.

The instrument also included screening items that addressed the innovation orientation of the respondent's organization, and the respondent's status as a supervisor who evaluates the work performance of others. There were demographic items referring to the U.S. Census Bureau (2012), North American Industry Sector Classification of the respondent's organization; the respondent's birth year; the respondent's gender; the respondent's work position tenure; and the quantity range of employees evaluated by the respondent. These items allowed some statistical descriptions of the respondents (Table 1).

There was one item focused on the research question that oriented this study. In this item respondents were asked to provide specific examples of behavior exhibited by the employee whom they evaluate and would classify as most innovative, within the context of Janssen's (2000) definition, also embedded in the instrument. This study, including the instrument and internal procedures for data storage and management, was reviewed and granted exempted status by the Indiana State University Institutional Review Board.

Data Collection

The Principal Investigator, in consultation with the Director of the Indiana State University Business Engagement Office developed an initial list of potential survey respondents based on the purposive population criteria described above. The initial set of potential survey respondents was sent an introductory email (Appendix C) with an invitation to participate. The email invitation included a request to forward the invitation to any colleagues the potential respondents knew that they thought likely to meet the purposive population criteria and would be willing to participate in the study. The invitation email also included a web link to the online survey. The instrument was also distributed through a variety of topically oriented professional discussion web sites (Appendix D). Voluntary participation and informed consent requirements were fulfilled through information embedded in the survey instrument and the electronic acknowledgement function of the survey software (Qualtrics Labs, 2012).

The survey software used in this study is the Qualtrics survey composition, management, collection and analysis system. This software suite is the standard survey development and management package employed at Indiana State University and has been found compliant with all applicable laws and policies by the Institutional Review Board. The program automatically compiles survey responses and assigns random alphanumeric response identifiers to the individual responses, and allows survey response data to be downloaded and displayed in a spreadsheet format. The Principal Investigator was solely responsible for composing the survey; operating the Qualtrics program; compiling, managing, and distributing data; requesting and obtaining Institutional Review Board approval; and preparing, conducting, and evaluating Research Associate training (Appendix E). Survey data were collected from respondents between January 11, and February 9, 2013.

Data Analysis

Data analysis in this study was primarily qualitative in nature (Figure 4), however a quantitative process (Figure 5) was used to distinguish between primary and secondary behaviors (Figure 6). The qualitative portion of the analysis applied categorization criteria described by Hamlin and Sage (2011), and Hamlin, Sawyer, and Sage (2011) and parallel coding triangulation as described by Denzin (2012), Harris, Pryor, and Adams (1997), and Urquhart (2001). The qualitative analysis employed three human data coders: the Principal Investigator and two Research Associates.

The Research Associates were Indiana State University, College of Technology, Department of Human Resource Development and Human Performance Technology graduate students in the Master's Degree program. Research Associates were pre-screened and recommended by the Project Advisor and Committee Chair who was also a professor to both. One Research Associate was male, 54 years old and in the first year of the Human Resource Development Master's Degree program, however already holds a Master of Fine Arts degree in English language composition. The other Research Associate was female, 27 years old and required only the final project to complete the Human Resource Development Master's Degree. All data coders have English as their first language of acquisition and primary language of daily use. Research Associate preparation included readings, discussions, and two practice coding exercises on different data sets (Appendix E).

Individual survey responses were initially identified by a random alphanumeric code generated by the survey administration software (Qualtrics Labs, 2012). The Principal Investigator conducted an initial screening of survey responses for individually identifiable information. No responses were found to contain individually identifiable information

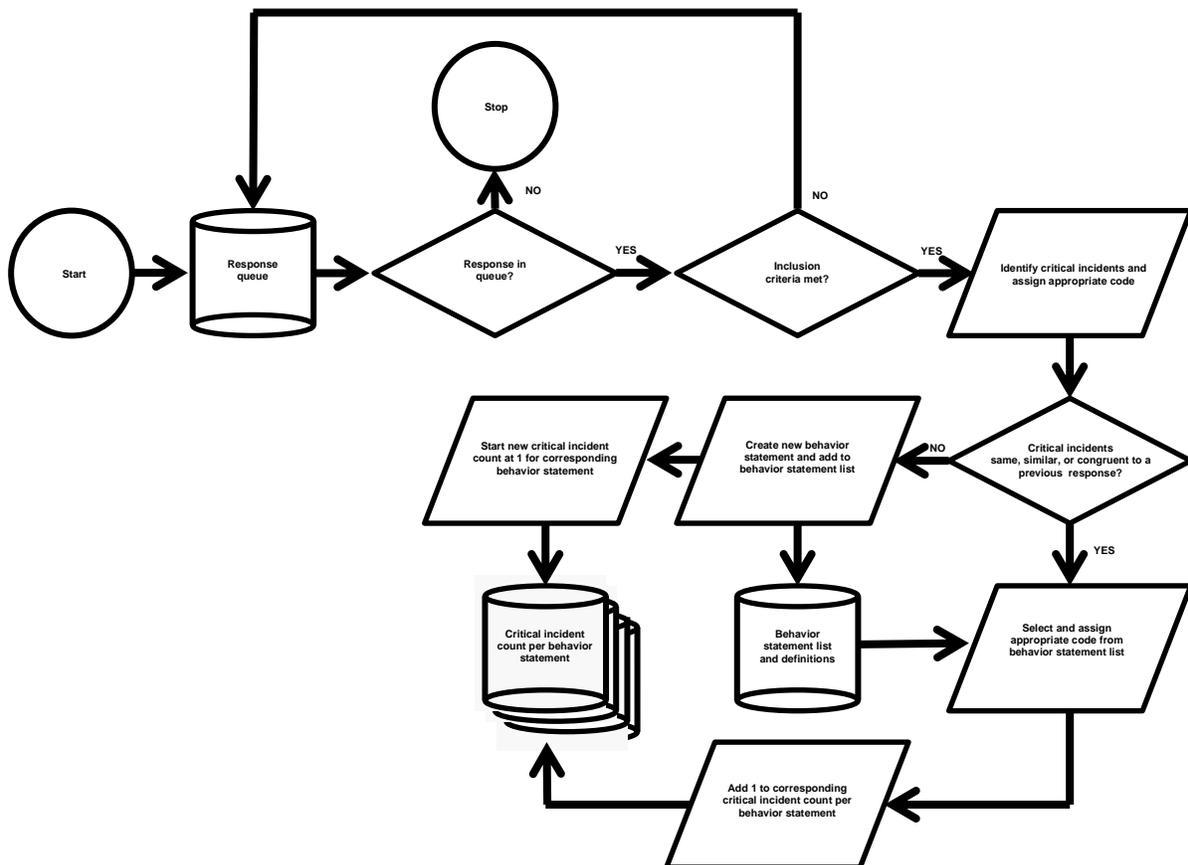
requiring redaction before being forwarded to Research Associates for further analysis. The Principal Investigator and Research Associates individually conducted a secondary screening of responses for completeness and usability in the study. To be usable in the study all items in the survey instrument must have been answered in English, the answers must be assessed by all coders as understandable, and the responses must be assessed by all coders as answering the items contained in the survey instrument; the responses to items #1 and #2 of the survey instrument must have been affirmative.

Following Hamlin and Sage (2011), and Hamlin, Sawyer, and Sage (2011), data coding was accomplished in two phases: open coding, and axial coding, in accordance with the research team procedural checklist (Appendix A). The survey instrument responses were analyzed using open coding to identify those that contained more than one discrete behavior description. This created a larger number of usable critical incidents, each containing just one meaning, or code. These coded critical incidents were then subjected to axial coding in order to identify similarities and difference. Those that were the same, similar, or contained congruent meaning were grouped by behaviors reported. Sameness existed when the phrase or key words describing the behavior reported in two or more critical incidents were identical or near identical. Similarity existed when the phrase or key words were different, but the meaning was the same. Congruence existed where the words used are not synonymous but the meaning of phrases and/or key words are the same or similar (Sawyer & Sage, 2011).

Open coding was conducted individually by each data coder to isolate discrete critical incidents within survey responses and assign initial descriptive codes to the discrete critical incidents. Open coding produced a list of discrete critical incidents and descriptive codes per data coder. Axial coding was conducted collaboratively through a constant comparative

process between all coders' identified critical incidents and initial descriptive codes. Axial coding produced a consolidated and cross-validated list of discrete critical incidents and descriptive codes with definitions. The consolidated and cross-validated list of descriptive codes with definitions that was derived from the coding process became the list of behavior statements. Concurrently, the number of occurrences of the same behaviors being reported in critical incidents was recorded for further analysis. Behavior statements reflect the meaning of all the coded critical incidents corresponding to that behavior statement (Hamlin, Sawyer & Sage, 2011). The qualitative data coding process is summarized in Figure 4, showing the process's two products, the behavior statement list with definitions, and the critical incident count per behavior statement.

Figure 4. Qualitative Data Coding Schematic.



The qualitative analysis began with the Principal Investigator's screening of responses for individually identifiable information. Once individually identifiable information was determined to not be present, the survey data were transmitted to Research Associates in encrypted and password protected files attached to emails which were only accessed on password protected devices. All data coders conducted their own review of responses to determine which ones did and did not meet inclusion criteria. All data coders read every response. For those responses judged to meet inclusion criteria each data coder read each response to isolate critical incidents reporting employee behaviors. The data coders assigned initial descriptive short titles to each critical incident observed in a response. Where data coders observed instances of sameness, similarity, or congruence of meaning between critical incidents, the same descriptive short titles were applied. Following the individual open coding described above, all three data coders met in person for the collaborative axial coding.

Prior to beginning the axial coding, the data coders reviewed each survey response sequentially to ensure that there was consensus on which responses did and did not meet inclusion criteria. There was no disagreement among coders on the responses that did and did not meet inclusion criteria. During the conduct of axial coding, the Principal Investigator managed the team work flow, rotating the position of initiating discussion with each response to avoid one coder unduly influencing or leading the others (Denzin, 2012; Harris, Pryor & Adams, 1997). For each response, the data coder initiating the discussion for that response would state the first critical incident reported in the response based on that coder's reading of the response. The data coders would discuss whether or not they all concurred on what portion of the response constituted a critical incident.

If there was not immediate consensus on what portion of the response constituted a critical incident, each data coder would state the portion of the response that they interpreted as a critical incident and their rationale for that interpretation. Discussion would ensue with data coders weighing the evidence and arguments presented by the others until consensus was reached on which portions of the response in question constituted a critical incident or incidents. In general there was relatively little discussion on which portions of a response constituted a critical incident reporting observed behavior and the data coders did not observe any readily identifiable pattern in this portion of the process; e.g. there was not one coder routinely at variance with the others, nor was there one coder upon whose interpretation the group routinely agreed.

Once critical incidents within responses were isolated the data coder leading discussion on that response would state the short title or titles they applied to the critical incident or incidents. If the data coder leading discussion on that response interpreted sameness, similarity, or congruence of meaning with a previously isolated critical incident either in the present response or a preceding one, they would state such along with their rationale for that interpretation. Discussion would ensue in much the same manner as described above with data coders stating their initial concurrence or non-concurrence with the interpretation presented and their rationale for that concurrence or non-concurrence. This was the crucial portion of the parallel coding triangulation process in that the three data coders provided a mechanism to check and balance the analysis and interpretation of the data present in the survey responses. All data coders appreciated the criticality of this step to the analysis process and the entire study because of the nature of the research question investigated that focused on the meanings ascribed to behaviors reported by observers. As before, the data coders did not observe any

readily identifiable pattern in this portion of the process; e.g. there was not one coder routinely at variance with the others, nor was there one coder upon whose interpretation the group routinely agreed.

The process was repeated sequentially for all included responses, rotating the discussion lead role with each response. Discussion on a given response was complete when all data coders had reached consensus on what portion or portions of a response constituted a critical incident reporting observed employee behaviors; what the appropriate short title for each critical incident was; and based on sameness, similarity, or congruence what the appropriate definition was for each short title. The Principal Investigator functioned as recorder for axial coding. The entire collaborative axial coding process took a total of six hours conducted in two, three-hour segments with a one-hour break in between. Following axial coding, the Principal Investigator compiled the results and transmitted them to Research Associates as previously described. Following a, “cooling off,” period determined individually by each data coder, all data coders applied individual reflective and contemplative analysis to the results of the axial coding to ensure that upon further consideration they still concurred with the results of the axial coding. The data coders met in person a final time fourteen days after the axial coding to compare their individual analyses of the axial coding. In this session discussion followed the same pattern as previously described and concluded that all data coders concurred on the isolation of critical incidents and assignment of short titles. Minor rewordings of some definitions were completed in this session to the ones reported in this document.

Examples of critical incidents coded to behavior statements. For each of the nine behavior statements identified through analysis, an example is given of a corresponding critical incident. The full text of survey responses with critical incidents highlighted and corresponding

behavior statements indicated is at Appendix F. Appendix G provides a summation of the behaviors that were reported in each response in table form.

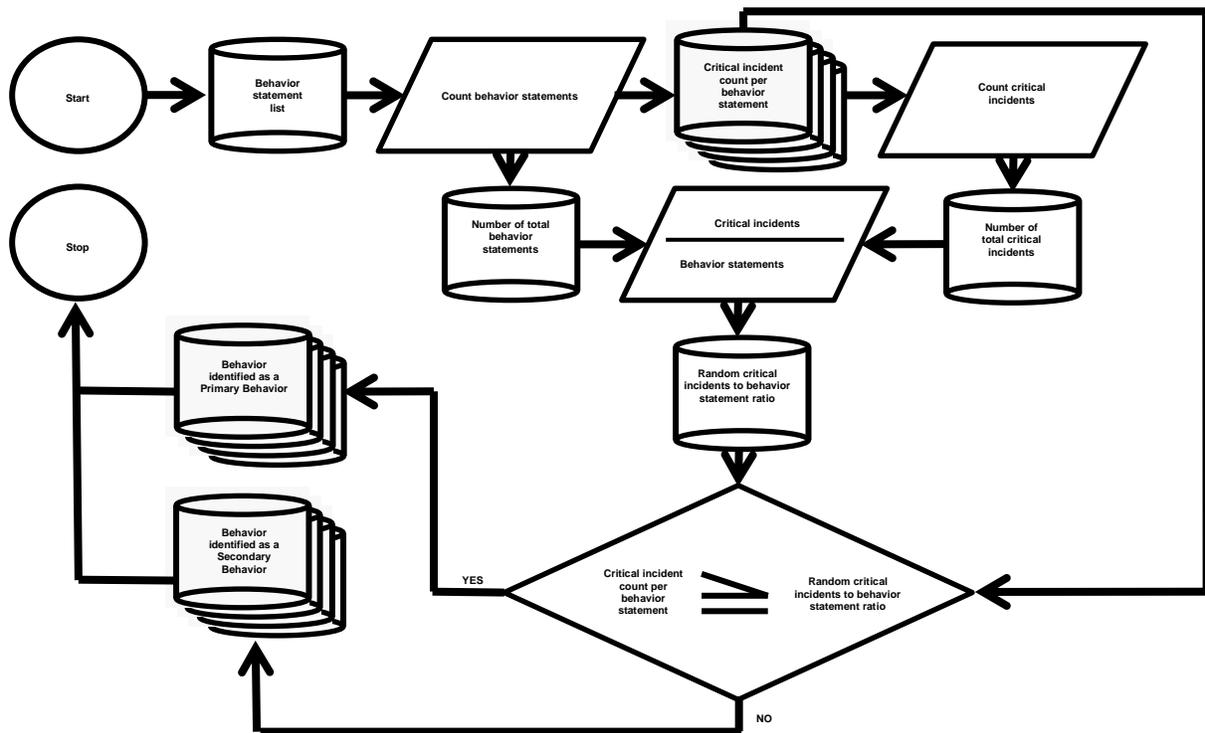
An example of the behavior statement *employee generates ideas* is the critical incident, “thought of an idea that was very different than the other ideas on the table” (Response #45, Appendices F & G). The behavior statement, *employee recognizes problems or opportunities* is exemplified by, “my assistant consistently works toward identifying problem areas in our department” (Response #7, Appendices F & G). The behavior statement *employee acquires ideas from outside the immediate work organization* was derived from the coding of critical incidents like, “The most innovative person I evaluate is exceptional at understanding how to leverage processes, technologies, and people that are outside of what he normally controls” (Response #9, Appendices F & G). The behavior statement *employee promotes ideas to others within the work organization* is illustrated by the critical incident, “this person actively purposed changes necessary to streamline a portion of the process that he was directly responsible for” (Response #4, Appendices F & G). The behavior statement *employee introduces new ideas to the work organization* is reflected in the critical incident, “she created an online access point to our services where none existed before” (Response #10, Appendices F & G). The behavior statement *employee works collaboratively with others* can be observed in the critical incident, “the individual then communicated his ideas with a corporate IT expert responsible for the software integrated into the process and worked together to implement the ideas” (Response #27, Appendices F & G). The behavior statement *employee forecasts future events* is demonstrated by the critical incident, “is on top of and looking into the future of technology” (Response #16, Appendices F & G). The behavior statement *employee applies a systematic approach to their work* was derived from critical incidents such as, “the process

seems to be, identify how to do the thing/process [sic] as best it can be done today, then break the thing/process into steps and make each step better” (Response #8, Appendices F & G). The behavior statement *employee takes risks* was reported exactly once, in one critical incident, in one response, a specific example was not included in the response; the response stated, “those who have initiative [sic] to take risks and share results,” (Response #77, Appendices F & G).

Distinguishing primary and secondary behaviors. Critical incident to behavior statement loading was analyzed. If there were little sameness, similarity, or congruence between critical incidents resulting in a number of behavior statements close to the same as the number of critical incidents, this would indicate relatively little agreement among respondents with regard to the behaviors that constitute effective innovative work behavior, and less potential generalizability of the study findings. Higher levels of sameness, similarity, and congruence between critical incidents results in fewer total behavior statements, and greater potential generalizability of study findings. Similarly, frequency of behavior statement representation in critical incidents was considered. Following Hamlin and Sage (2011), and Hamlin, Sawyer, and Sage (2011), behavior statements with the same frequency of representation in critical incidents are interpreted as having the same level of significance relative to each other. If all behavior statements are of equal significance, then all behavior statements should have the same frequency of representation in critical incidents. Behavior statements with higher frequency of representation in critical incidents are interpreted as having a higher level of significance relative to each other. Behavior statements with lower frequency of representation in critical incidents are interpreted as having a lower level significance relative to each other. Behavior statements represented in critical incidents with a frequency equal to or greater than what would be expected if all behavior statements were of equal

significance, or fully random, are designated as the primary behaviors; behavior statements represented in critical incidents with a frequency less than what would be expected if all behavior statements were of equal significance, or fully random, are designated as the secondary behaviors (Hamlin & Sage, 2011; Hamlin, Sawyer & Sage, 2011).

Figure 5. Quantitative Data Analysis Schematic



This quantitative analysis compared the frequency of observed occurrences of behavior statements in critical incidents to the expected frequency of occurrence if all behavior statements were equal, or randomly distributed. The process identified those behavior statements with a frequency of occurrence equal to or greater than the expected random distribution and designated them as the primary behaviors. The process also identified those

behavior statements with a frequency of occurrence less than the expected random distribution and designated them as the secondary behaviors. This portion of the analysis pertained directly to addressing the research question: *what is it that supervisors within organizations with a stated innovation orientation perceive as effective innovative work behavior?* The primary behaviors identified in the study correspond to what supervisors within organizations with a stated innovation orientation perceive as effective innovative work behavior. The quantitative process applied to distinguish primary and secondary behaviors is depicted in Figure 5, showing how the products of the qualitative analysis, the behavior statement list and the critical incident per behavior statement counts, are compared to the equal distribution of critical incidents to behavior statements to identify those with a frequency distribution equal to or greater than a random distribution as primary behaviors and those with a frequency distribution less than a random distribution as secondary behaviors.

Analysis produced a response to the research question by identifying that of the behaviors reported by respondents that were most significant among all of the reported behaviors. In addressing the research question, the analysis also produced: a list of behavior statements and definitions determined through open and axial coding, an assessment of the relative significance of behavior statements to each other based on critical incident to behavior statement loading analysis, a statistical description of the respondent population derived from the demographic items in the survey instrument, and enabled the discussion, conclusions, and recommendations in Chapter Five.

CHAPTER 4

Results

Most of the approaches used in previous innovative work behavior studies in that they sought to classify or categorize innovative work behavior without seeking to know and understand what behaviors people actually exhibit when and where innovation happens. This study employed an online survey instrument original to the study for primary data collection (Appendix B). The instrument contained one item focused on the research question that this study investigated (Appendix B, and Table 2). The instrument also contained demographic items that allowed a statistical description of respondents' general characteristics (Table 1). This study employed a purposive convenience sample (Teddlie & Yu, 2007) of supervisory personnel (defined as individuals who report that they hold positions within their organizations that include the responsibility to evaluate the performance of other personnel) in organizations for that innovation is important (defined as self-reporting on the perception of that importance). Survey data were collected from respondents between January 11, and February 9, 2013.

This chapter addresses: responses to the survey instrument, respondent characteristics, critical incidents and behavior statements, response to the research question, and peripheral information included in survey responses.

Responses

There were 107 responses to the survey instrument. To be usable in the study all items in the survey instrument must have been answered in English, the answers must have been assessed by all coders as understandable, and as answering the items contained in the survey instrument; the responses to items number one and number two of the survey instrument must have been affirmative. One respondent did not consent to participate, and provided no additional data. No responses contained individually identifiable information that required redaction prior to further analysis. No responses were excluded due to responses not being submitted in English. No responses were excluded as not understandable. Six responses were excluded because of a negative response to item number one. Nineteen responses were excluded because of a negative response to item number two. Thirteen responses were excluded due to incompleteness. Ten responses were excluded as not answering the survey instrument items. A total of 58 responses comprised the final data set for this study.

Respondents' Characteristics

Fifty-eight total respondents were included in the study (Table 1). The survey instrument contained demographic items referring to the U.S. Census Bureau (2012), North American Industry Sector Classification of the respondent's organization; the respondent's birth year; the respondent's gender; the respondent's work position tenure; and the quantity range of employees evaluated by the respondent. These items allowed a statistical description of respondents' general characteristics (Table 1). Of the U.S. Census Bureau's (2012) twenty North American Industry Classification System (NAICS) economic sector classifications, Educational Services and Professional, Scientific, and Technical Services constituted 50% of the respondent population, with the other 50% distributed across ten other economic sectors.

Table 1
Respondent Characteristics

North American Industry Classification System Classifications	Number	Percentage
Educational Services	16	27.6%
Professional, Scientific, and Technical Services	13	22.4%
Manufacturing	9	15.5%
Other Services (except Public Administration)	7	12.2%
Health Care and Social Assistance	3	5.3%
Construction	2	3.4%
Information	2	3.4%
Transportation and Warehousing	2	3.4%
Agriculture, Forestry, Fishing and Hunting	1	1.7%
Finance and Insurance	1	1.7%
Management of Companies and Enterprises	1	1.7%
Public Administration	1	1.7%
Respondent Birth Year Range Frequency	Number	Percentage
1931 - 1940	2	3.4%
1941 - 1950	7	12.0%
1951 -1960	20	34.5%
1961 - 1970	17	29.3%
1971 - 1980	6	10.3%
1981 and later	4	6.9%
No answer	2	3.4%
Median age of respondents	53 years	
SD	11 years	
Respondent Gender	Number	Percentage
Male	45	77.6%
Female	13	22.4%
Respondent Position Tenure Range Frequency	Number	Percentage
<1 to 1 year	7	12.0%
1 year 1 month to 5 years	26	44.9%
5 years 1 month to 10 years	12	20.8%
10 years 1 month to 20 years	6	10.3%
20 years 1 month to 30 years	5	8.6%
>30 years	2	3.4%
Median	4.5 years	
SD	8.58 years	
Number Range of Employees Evaluated by Respondents	Number	Percentage
1 – 5	21	36.2%
6 – 10	16	27.6%
11 or more	19	32.8%
No answer	2	3.4%

Respondents' ages ranged from 25 years to 79 years with two respondents not reporting, and one reporting to the nearest decade; a simple majority of those responding, 31 respondents, were 50 years of age, or older. The respondent gender distribution is predominantly male; no respondents chose the, "other," or, "not identified," options in the survey instrument and all respondents answered the item. Respondents' tenure in their current positions ranged from 35 years to two months, with 27 of the 58 respondents reporting a position tenure of five years or more. The largest plurality of respondents (36.2%) are responsible for evaluating the performance of one to five employees, with the other ranges well represented.

Critical Incidents and Behavior Statements

There were 107 responses to the survey; of these 58 were determined to meet the inclusion criteria; analysis revealed that there were 99 critical incidents reported cumulatively across all 58 usable responses (Appendices F & G); further analysis determined that among the 99 critical incidents there were nine separate and distinct behaviors reported; these nine separate and distinct behaviors are summarized in the behavior statements.

Table 2
Behavior Statements and Corresponding CIs

Behavior Statement	Number of Corresponding CIs
<i>Employee generates ideas</i>	29
<i>Employee recognizes problems or opportunities</i>	17
<i>Employee acquires ideas from outside the immediate work organization</i>	16
<i>Employee promotes ideas to others within the work organization</i>	13
<i>Employee introduces new ideas to the work organization</i>	9
<i>Employee works collaboratively with others</i>	7
<i>Employee forecasts future events</i>	4
<i>Employee applies a systematic approach to their work</i>	3
<i>Employee takes risks</i>	1

Behavior statements defined. In order to complete axial coding, all data coders had to agree on descriptive short titles for the behaviors reported in critical incidents, and definitions for those short titles. Those short titles and their respective definitions, as derived through the constant comparative process to determine sameness, similarity, or congruence between the reported critical incidents, are listed below:

Employee generates ideas is the behavior reported in the collective set of critical incidents where the respondent states that the employee generated an idea or ideas from sources that the respondent referred to as internal to the employee. For example, the critical incident “This individual came up with conceptual ideas to increase the efficiency of a process,” (Response #27, Appendices F & G) was coded as, *employee generates ideas*.

Employee recognizes problems or opportunities is the behavior respondents reported the employee was able to perceive a problem, something in some way dysfunctional, in need of improvement, or an opportunity, something functional but sub-optimal, that could be improved upon. For example, the critical incident “This person is an engineer who seeks out opportunities in areas that support the primary manufacturing of products, and not necessarily opportunities within processes that directly manufacture product. This engineer sees opportunity beyond the direct product,” (Response #3, Appendices F & G) was coded as, *employee recognizes problems or opportunities*.

Employee acquires ideas from outside the immediate work organization is the behavior defined as the employee has used an idea in a work and innovation situation that the employee acquired from a source specifically identified by the respondent as external to the employee’s immediate work organization. For example, the critical incident “The individual used talents learned from previous company and positions to automate a number of manual process with in

[sic] the teams daily workload,” (Response #5, Appendices F & G) was coded as, *employee acquires ideas from outside the immediate work organization*.

Employee promotes ideas to others within the work organization is the behavior described by the collective set of critical incidents containing the respondent report that the employee has actively promoted an idea or ideas to others in a work and innovation situation, without specific reference to the idea’s source. For example, the critical incident “Explained it in detail to co-workers and provided examples of how solutions might work for clients. Sought out management/leadership support and help with implementation,” (Response #12, Appendices F & G) was coded as, *employee promotes ideas to others within the work organization*.

Employee introduces new ideas to the work organization is the behavior observed and reported by respondents in critical incidents that state the employee presents a new idea to the organization in a work and innovation situation, without specific reference to additional directly associated behaviors. For example, the critical incident “This person developed a new product, took it through development milestones, the business case was approved & placed into production with realized commercial results compared to the plan,” (Response #32, Appendices F & G) was coded as, *employee introduces new ideas to the work organization*.

Employee works collaboratively with others is the behavior reported in critical incidents that describe how the employee collaborates with others (internal or external to the immediate work organization) in a work and innovation situation, without specific reference to additional directly associated behaviors. For example, the critical incident “Two people were collaboratively involved,” (Response #39, Appendices F & G) was coded as, *employee works collaboratively with others*.

Employee forecasts future events is reflected in critical incidents that report the employee engages in behavior seeking to predict future events; this behavior has a specific future orientation. For example, the critical incident “Sees weak trends that foretell the future, and can be used to shape the future,” (Response #21, Appendices F & G) was coded as, *employee forecasts future events*.

Employee applies a systematic approach to their work is the behavior common to the critical incidents that report the employee’s application of a systematic approach to their work was integral to the innovation activity. For example, the critical incident “They mathematically described means of identifying "what" a particular process was and "how" that complex process worked, from models and data. From this one particular instance, they were able to abstract a pattern of interaction that identified and could be used as a meta-model for various other phenomena. This lead to a software system and method that could be applied to engineered physical phenomena at the nano and meso-scales,” (Response #39, Appendices F & G) was coded as, *employee applies a systematic approach to their work*.

Employee takes risks is the behavior reported in the critical incident (the behavior was reported exactly once, in one critical incident, in one response, an example was not included in the response) where the respondent reports that the employee engaged in risk taking behavior in a work and innovation situation. The critical incident “Those who have inniative [*sic*] to take risks and share results,” (Response #77, Appendices F & G) was coded as, *employee takes risks*.

Critical incident to behavior statement loading. Critical incident to behavior statement loading was analyzed (Table 2, Figure 6). If there were little sameness, similarity, or congruence between critical incidents resulting in a number of behavior statements close to the

same as the number of critical incidents, this would have indicated relatively little agreement among respondents with regard to the behaviors that constitute effective innovative work behavior. Some of the behavior statements are clearly more frequently cited by respondents than others. Behavior statements with the same frequency of representation in critical incidents are interpreted as having the same level of significance relative to each other. If all behavior statements were of equal significance, then all behavior statements would have the same frequency of representation in critical incidents. Behavior statements with a higher frequency of representation in critical incidents are interpreted as having a higher level of significance, relative to the other behavior statements. Behavior statements with a lower frequency of representation in critical incidents are interpreted as having a lower level of level of significance, relative to the other behavior statements. Behavior statements represented in critical incidents with a frequency equal to or greater than that expected if all behavior statements were of equal significance, or fully random, are designated as the primary behaviors; behavior statements represented in critical incidents with a frequency less than that expected if all behavior statements were of equal significance, or fully random, are designated as the secondary behaviors (Hamlin & Sage, 2011; Hamlin, Sawyer & Sage, 2011).

Analysis identified 99 critical incidents reported in the 58 responses included (Appendices F & G). From those 99 critical incidents, nine behavior statements were identified (Figure 4 and Table 2). Given 99 total critical incidents, and nine total Behavior statements, a completely random distribution of critical incidents to behavior statements would produce a critical incident/behavior statement ratio of 11/1 (Figure 5). Four Behavior statements: *employee generates ideas, employee recognizes problems or opportunities, employee acquires ideas from outside the immediate work organization, and employee promotes ideas to others*

within the work organization, have corresponding critical incidents in excess of a random distribution, indicating that these behaviors are cited more frequently in supervisors' perceptions of effective innovative work behavior than the other reported behaviors, and are therefore designated as the primary behaviors (Figure 6). This identification of the primary behaviors informs a response to the research question.

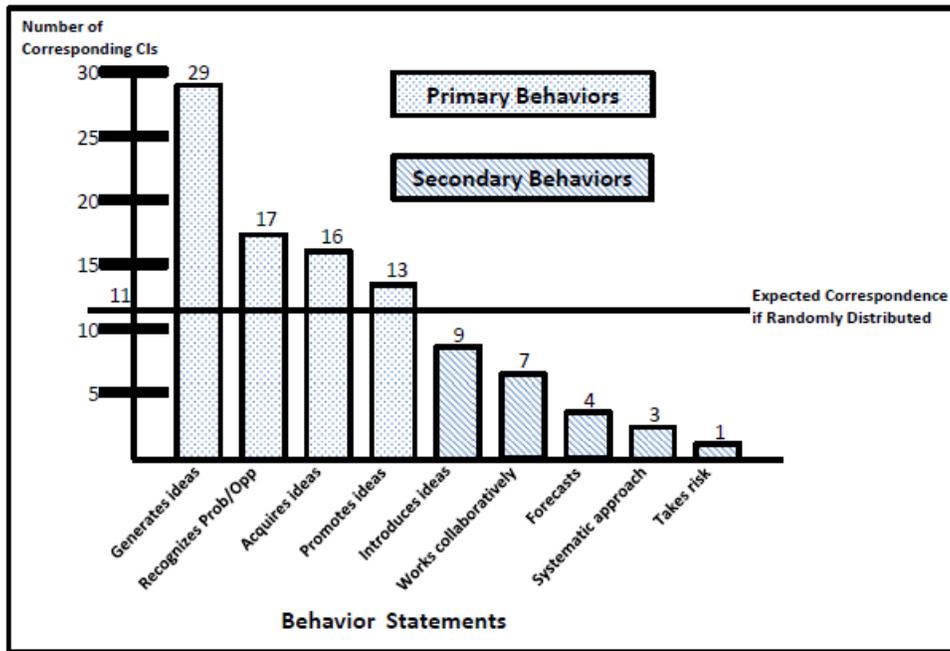


Figure 6. Primary and Secondary Behaviors

Responding to the Research Question

Analysis of the data collected produced a response to the research question by identifying the reported behaviors that were most frequently cited by respondents. In determining this the analysis also produced: a list of behavior statements with definitions determined through open and axial coding, an assessment of the relative significance of behavior statements to each other based on critical incident to behavior statement loading analysis, a statistical description of the respondent population derived from the demographic items in the survey instrument, and enabled the discussion, conclusions, and recommendations in Chapter Five.

The research question that guided this study was: *what is it that supervisors within organizations with a stated innovation orientation perceive as effective innovative work behavior?*

The results of this study indicate that what supervisors within organizations with a stated innovation orientation perceive as effective innovative work behavior can be summarized into four primary behaviors: *generating ideas, recognizing problems or opportunities, acquiring ideas from sources external to the employee's immediate work organization, and promoting ideas to others within the work organization.*

Secondary behaviors. In addition to the primary behaviors reported by respondents, there were also five secondary behaviors reported with lower frequency. The most frequently cited of these was the behavior statement, *employee introduces new ideas to the work organization*, cited nine times in the critical incidents, two times fewer than could be expected from a fully random, or equal distribution of critical incidents to behavior statements. The other secondary behaviors reported: *employee works collaboratively with others, employee*

forecasts future events, *employee applies a systematic approach to their work*, and *employee takes risks*, were also reported in critical incidents, but with lower frequency than the primary behaviors (Table 2, Figure 6). The behavior statement, *employee takes risks*, was reported exactly once, in one critical incident, in one response, an example was not included in the response. While this behavior statement is an outlier in the data set, and cannot be defined more specifically than as noted previously, it was present in a response that met all inclusion criteria and coded as a clear statement of observed behavior from the respondent.

Peripheral Information Included in Survey Responses

In addition to the critical incidents included in survey responses that reported discrete employee behaviors there was a substantial volume of peripheral commentary included in survey responses as well. Some of the peripheral commentary appeared to be intended to provide some context for the respondent's comments, for example: "in our organization we deal with difficult situations, and difficult consequences, every day" (response #13, Appendix F); "due to personnel cut backs within our organization we were facing closure of one of our subordinate units. This would result in a loss of about 45% to 50% of our student population. I had no financial resources to replace the personnel losses" (response #73, Appendix F); or "I find these deeds highly impressive as he comes from a poor family background (economically, socially & educationally)" (response #94, Appendix F).

However, more of the peripheral commentary appeared to center on attribute descriptions of the employee whose behavior is cited, as opposed to the report of behavior itself. For example: "the person I have in mind works very hard at the job" (response #8, Appendix F); "the person I'm considering is eager" (response #10, Appendix F); or "is not

afraid” (response #16, Appendix F). Because the focus of this study was on what behaviors employees exhibited that supervisors characterized as innovative, the commentary on attributes was not considered relevant to addressing the research question that guided the study. In other words, this study focused on *what* supervisors reported that employees did, and not on *how* they did it. Attribute comments were present in 31 of the 58 responses. Peripheral attribute information is discussed further in Chapter Five.

CHAPTER 5

Discussion, Conclusions, and Recommendations

There has been a great deal of discussion in both scholarly and popular forums about innovation (Dismukes, 2005; Garcia & Calantone, 2002; King, 1990; Rogers, 2003). One field of inquiry within the areas of study dealing with innovation is innovative work behavior. Innovation in general is significant to many fields in numerous ways, including Technology Management. Innovative work behavior is particularly significant to Human Resource Development because of its potential in training and development programs. Critical incident technique is an observationally based data collection and analysis method that has not previously been applied well to the study of innovative work behavior. The results of this study provide valuable insights on the workplace behaviors that supervisors consider demonstrative of effective employee innovative work behavior.

This chapter addresses: answering the research question, a discussion of the findings, recommendations for further study, implications for human resource development practice, secondary behaviors also reported, peripheral information included in survey responses, initial assumptions confirmed or denied, limitations observed in the conduct of the study, and general conclusions.

Answering the Research Question

The data and analysis presented in Chapter 4 support the conclusion that what supervisors within organizations with a stated innovation orientation perceive as effective innovative work behavior are four primary behaviors: *generating ideas, recognizing problems or opportunities, acquiring ideas from sources external to the employee's immediate work organization, and promoting ideas to others within the work organization*. This finding was determined based on an analysis of the 99 critical incidents reported in 58 responses to the survey instrument. Within the 99 critical incidents reported, only nine separate and distinct behaviors were reported. These identifiable discrete behaviors constitute the behavior statements. The four behavior statements with higher than random rates of citation are the primary behaviors that supervisors perceive as effective innovative work behavior.

Discussion of the Findings

In the current research literature on innovative work behavior there is a paucity of information on specific innovative behaviors exhibited in the workplace. Although much has been written about innovation and innovative work behavior, most previous work has focused on behavior categories or dimensions without seeking to observe or understand how it is manifested in the workplace. Critical incident technique, as described by Flanagan (1954) involves asking respondents to report on behaviors that the observers deem either effective or ineffective, within very specific contexts and definitions. This technique allows researchers to inductively determine the critical behavior set required to be effective within the particular contexts and definitions.

The purpose of this study was to address the gap in the current body of knowledge between the categorizations or dimensions of behavior theorized and investigated by previous researchers and concrete examples of what behaviors people exhibit in their work environment while innovating. This study addressed the gap in the body of knowledge by applying critical incident technique to collect first hand behavior observations in the places when and where it occurs. Analysis of the observations collected shows discrete behaviors that contribute to innovation in the workplace.

Innovative work behavior as an area of inquiry is significant due to its economic impact and because of its implications for performance improvement. The economics of innovation has been a topic of interest to economists for a long time. Understanding the specific behaviors that supervisors perceive as effective for innovating in work environments has the potential to eventually form the foundation of interventions that develop and promote those behaviors. Increasing the innovative capacity and achievement of individuals in their work environments can contribute to the overall level of innovative activity within an economic system, thereby increasing those beneficial outcomes that economists have found to positively correlate with innovative activity, for example: economic growth (Whitt & Schultze, 2009), job creation (Mandel, 2012), public health (Gill, 2012), and increased standard of living (Gordon, 2012).

Economic benefit may also be derived because the primary behaviors reported by respondents all deal with the manipulation of ideas. This observation is of particular economic significance in light of Belasco and Stayers' (1994) argument that in contemporary and future economies, knowledge and ability are the commodities most critical to the means of production; they write, "The principal tools of production today are not machinery and equipment, but the ideas and talents of people" (p. 31). If Belasco and Stayer are correct that

ideas are a key tool of economic productivity, and the findings of this study that *generating ideas, recognizing problems or opportunities, acquiring ideas from sources external to the employee's immediate work organization, and promoting ideas to others within the work organization* are the employee behaviors that are most important to supervisors for effective innovative work behavior, then this information has the potential to guide organizational decision making about what behaviors to train, promote, or select for in order to increase economic productivity.

To illustrate the significance of innovative work behavior to performance improvement, the present study considered one particular training and development performance improvement model, the ADDIE model (Rummler, 2008; Swanson, 1996; Swanson & Holton, 2009). The first task of the Human Resource Development in the ADDIE process is to, “diagnose the performance requirements of the organization that can be improved through training, and document the expertise required to perform in the workplace” (Chapter 10, section 6, para. 8). This study begins to accomplish this task by asking supervisors to report what behaviors they have observed in the employee whose performance they evaluate and would characterize as the most innovative.

Swanson and Holton (2009) conclude their discussion of the analysis phase of ADDIE by writing, “task analysis invariably requires close careful study and generally spending time with a subject matter expert in his or her work setting” (Chapter 10, section 6, para. 10). This study cannot, and should not attempt to, substitute for the time spent with subject matter experts in the work setting, but by having identified those primary behaviors that supervisors within organizations with a stated innovation orientation perceive as effective innovative work behavior, the results of this study can make time spent later with subject matter experts in the

work setting much more effective. This study has advanced the understanding of innovative work behavior in a logistically less consuming way.

The preponderance of scholarship and popular writing on innovation can be classified into one of three perspectives: the organizational psychology perspective, the economic perspective, or the diffusion perspective. These dominant theoretical frames are not necessarily mutually exclusive and there is frequent overlap in various combinations inherent in various authors' theoretical stances. Perhaps the most significant authors who combine important elements from economic and psychological theory are Dyer, Gregersen, and Christensen (2008, 2009, 2011). Their original study, published in 2008, and their subsequent article (2009) and book (2011), all treat innovation as fundamentally economic in nature. That is, that innovation is the starting of new business ventures. Innovative behavior, by contrast, is for Dyer, Gregersen, and Christensen the application of identifiable skills, that they refer to as the five, "discovery skills": *associating*, *questioning*, *observing*, *experimenting*, and *networking* (2009, pp. 3 – 6).

Of the behaviors described by Dyer, Gregersen, and Christensen as discovery skills, *associating*, *observing*, and *networking* are the most similar to the primary behaviors reported in this study. Dyer, Gregersen, and Christensen define *associating* as, "the ability to successfully connect seemingly unrelated questions, problems, or ideas from different fields" (2009, p. 3). This definition is very similar to the definition of the behavior statement, *employee generates ideas*, developed through the analysis applied in this study: the employee generated an idea or ideas from sources that the respondent reported as internal to the employee. Dyer, Gregersen, and Christensen define *observing* as, "scrutinizing common phenomena, particularly the behavior of potential customers" (2009, p. 4). This definition is

very similar to the definition of the behavior statement, *employee recognizes problems or opportunities*: to perceive a problem, something in some way dysfunctional, in need of improvement, or an opportunity, something functional but sub-optimal, that could be improved upon. Dyer, Gregersen, and Christensen define *networking* as, “finding and testing ideas through a network of diverse individuals” (2009, p. 6). This definition is very similar to the definition of the behavior statement, *employee acquires ideas from outside the immediate work organization*: to use an idea in a work and innovation situation that the employee acquired from a source specifically identified by the respondent as external to the employee’s immediate work organization.

Of note, Dyer, Gregersen, and Christensen’s work focused specifically on Chief Executive Officers (CEOs) of for-profit commercial corporations. This study focused on the behavior of employees as perceived by the supervisors responsible to evaluate those employees. While there are several similarities between the behaviors observed and reported in the two studies, the respective findings share one very striking general characteristic beyond their mutual focus on the manipulation of ideas. While innovation is not necessarily a singularly linear process, the behaviors reported by respondents in this study, and those reported by Dyer, Gregersen, and Christensen appear to all be distinctly more focused on the initiation of innovation than on any form of conclusion. This observation appears counterintuitive. Supervisors, who are responsible for evaluating the performance of others within an organization, and CEOs who are ostensibly responsible for all that their organization does or fails to do, are entrusted with that responsibility pursuant to the concurrent responsibility to deliver organizational results. In light of this, a higher degree of results oriented responses

might reasonably have been expected, but is clearly not present. Herein lays additional opportunity for further study.

Much of the debate among scholars deals less with what the substance of innovative work behavior is, and more with how many constituent parts exist and what they are; in other words, the dimensionality. Not all researchers subjected their theoretical models to empirical testing; of those who did, some obtained results that support their conceptual models, some obtain results indicating monodimensionality, and others obtained results that support some of the conceptualized dimensions but not all. This study's findings are largely consistent with previous scholarship, particularly those studies that applied a multidimensional conceptualization. As noted in Chapter Two, the three dimensional model is the most common, with dimensions identified as, "idea generation, idea promotion, and idea realization" (Hsiao, Chang & Chen, 2011; Mukherjee & Ray, 2009). Binnewies and Gromer (2012) apply a very similar three dimensional model labeled, "idea generation, idea promotion, and idea implementation" (p. 100). The idea generation, and idea promotion dimensions conceptualized in these models are consistent with the primary behaviors, *employee generates ideas*, and *employee promotes ideas to others within the work organization*, reported in this study.

Carmeli, Meitar, and Weisberg (2006) introduced a four dimensional model consisting of: problem recognition, idea generation, idea promotion, and idea application. In 2007, De Jong employed a four dimensional model consisting of: opportunity exploration, idea generation, championing, and application. Cantwell's (2010) model consists of: problem recognition, idea generation, idea promotion, and idea realization. In these cases, the dimensions identified as, problem recognition, or opportunity exploration, are consistent with the primary behavior, *employee recognizes problems or opportunities*, reported in this study.

Also as noted in Chapter Two, among those studies that employed a multidimensional conceptualization, and performed factor analysis on their instruments, the most common finding was that multiple dimension were not supported. The information collected and analysis applied in this study do not explain the results of factor analysis obtained in previous studies, but may indicate areas for further study. In this study, there were a total of 99 critical incidents reported in 58 total responses. Of these, 32 responses contained multiple critical incidents. While not conclusive, this tendency to consider multiple behaviors significant may make distinguishing between behavioral dimensions more difficult. Additionally, the high rate of unsolicited attribute commentary observed in this study (included in 31 of the 58 responses) may indicate that study participants are often challenged to meaningfully distinguish between demonstrable behaviors, and inferred traits or attributes.

This study contributes to the overall body of knowledge in that it applied critical incident technique to the study of innovative work behavior in a manner consistent with Flanagan's (1954) original conceptualization and application of critical incident technique, and unlike the majority of previous studies, asked supervisors to report direct observations of behaviors demonstrated by the personnel that the supervisors are responsible for evaluating. That this study's findings are largely consistent with previous scholarship causes this and previous studies to provide mutual support and reinforcement to each other. That this study and previous scholarship are not completely consistent provides opportunities for further study.

Recommendations for Further Study

The most significant way in that this study's findings are not fully consistent with previous scholarship is that the multidimensional models conceptualized in previous studies

often included some form of end-state dimension: idea realization (Hsiao, Chang & Chen, 2011; Mukherjee & Ray, 2009), idea implementation (Binnewies & Gromer, 2012), idea application (Carmeli, Meitar & Weisberg, 2006), and there was not an analogous behavior, even a secondary behavior, observed in this study. While innovation is not necessarily a singularly linear process, the behaviors reported by respondents in this study appear to all be distinctly more focused on the initiation of innovation than on any form of conclusion. This observation appears counterintuitive. Supervisors, who are responsible for evaluating the performance of others within an organization, are often entrusted with that responsibility pursuant to the concurrent responsibility to deliver organizational results. In light of this, a higher degree of results oriented responses might reasonably have been expected, but is clearly not present.

One possible explanation for this observation may be that it is due to the emphasis on individual behavior in this study. It may be that supervisors tend to view outcomes from an organizational perspective rather than from an individual performance perspective. One potential way to test for differences in individual versus organizational perspectives might be to conduct a partial replication of this study, but instead of presenting respondents with a survey item that asks, "Thinking of the people whose performance you evaluate, consider the person that you would characterize as most innovative; please relate an event or series of events that lead you to that conclusion. Specifically, what actions did the person take, what did they do, that cause you to characterize them as the most innovative?" (Appendix B), present respondents with a survey item something to the effect of, "Thinking of your organization's most recent innovation success, please relate an event or series of events that led to that success. Specifically, what actions did your organization take, what was done, that causes you to

characterize the innovation as a success?” If a survey item worded in an organizational context elicited more end-state oriented critical incidents, that result would tend to support the hypothesis that supervisors view outcomes from an organizational perspective, more than from an individual performance perspective.

This study’s respondent population presents additional opportunities for further study. This study employed chain referral, or snowball sampling to maximize total responses received. Respondents with particular characteristics other than being supervisors who evaluate the performance of others and holding that position within an organization with a stated innovation orientation were not specifically sought out for either inclusion or exclusion in this study. The sample for this study is dominated by males, 50 years of age or older, from Educational Services, and Professional, Scientific, and Technical Services, with five or more years in their work positions. It would be informative to replicate this study in populations that are distinctly different in terms of the same characteristics considered in this study, or in populations that are distinguished by some other readily identifiable characteristic.

Another area for possible further research is related to the high frequency of unsolicited attribute commentary included in survey instrument responses. A later section of this chapter discusses this material in greater detail. Personality traits and psychological attributes are clearly of concern to respondents. Nothing in the present study directly contradicts any of the theory or findings presented in the more trait based studies cited previously. Confusion among subjects in the various studies over distinguishing between behaviors and personal characteristics may be influencing the results in both those studies and this study. One way to address this may be to apply trait based, and behaviorally based instruments to the same populations and look for significant correlations between trait and behavioral responses.

Implications for Human Resource Development Practice

A better understanding of the discrete behaviors associated with workplace innovation will assist Human Resources Development practitioners and educators in assessing, developing, implementing, and evaluating innovation focused Human Resource Development initiatives. Our understanding of the discrete behaviors associated with workplace innovation is still far from complete; however, there are some ways that the findings of this study can be applied almost immediately in Human Resource Development practice.

Also noted in preceding sections of this chapter, there is a distinct emphasis in the critical incidents reported on behaviors most closely associated with the initiation of innovation, as opposed to any definable end-state. One method of developing human resources within an organization is through personnel selection. Given the knowledge that the behaviors of *generating ideas, recognizing problems or opportunities, acquiring ideas from sources external to the employee's immediate work organization, and promoting ideas to others within the work organization* are important to supervisors, personnel selection methods could be modified to also emphasize these behaviors.

For example, in an interview setting, the Human Resource Development professional could ask a perspective employee questions similar to, "Tell me about a time or times when you have generated ideas at work?" "Tell me about a time or times when you have recognized a problem or opportunity for improvement at work?" "Tell me about a time or times when you found ideas applicable to your work situation from outside your immediate work organization?" "Tell me about a time or times when you successfully promoted ideas to others within your work organization?" Perspective employees who can provide concrete, externally verifiable, examples of their having effectively performed these behaviors may be more likely to behave in

similar ways in future employment, and this behavior may be beneficial for organizations with a specific innovation orientation. While this approach is somewhat imprecise, it does represent a way that this study's findings could be applied to contemporary Human Resource Development practice, almost immediately.

A similar approach could potentially be applied in an internal selection process. If an organization conducts formal narrative performance evaluations with employees and retains searchable records of these evaluation narratives, then the narratives could be screened for reports of behaviors consistent with the primary behaviors reported in this study. Provided future research continues to support the relevance of the primary behaviors reported in this study, it may eventually be possible to incorporate these behaviors into a developmental program that seeks to promote and refine the behaviors. For example, the McCauley and Douglas (1998) five-step development model (exposition, practicum, self-reflection, guided reflection, repetition) could be applied, substituting innovative work behaviors for leadership behaviors. The behaviors cited most frequently by respondents could also be used as a foundation to develop learning activities for use in the practicum step.

Secondary Behaviors Also Reported

In addition to the primary behaviors reported by respondents, there were also five secondary behaviors reported with lower frequency. The most frequently cited of these was the behavior statement, *employee introduces new ideas to the work organization*. As noted in Chapter Three, if all behavior statements had been cited with equal frequency in the critical incidents, indicating equal levels of prominence in the respondents' perceptions, there would have been eleven critical incidents per behavior statement. The behavior statement, *employee*

introduces new ideas to the work organization, was cited nine times in the critical incidents, two times fewer than could be expected from a fully random, or equal distribution of critical incidents to behavior statements. The behavior statement, *employee promotes ideas to others within the work organization*, was cited thirteen times in the critical incidents. An argument can be made that because the two behavior statements have critical incident loads equidistant from a fully random distribution, they are of near equal significance to the respondents. However, following Hamlin and Sage (2011), and Hamlin, Sawyer, and Sage (2011), behavior statements with greater than random critical incident loading were identified as the most significant among the total set of behavior statements.

The other secondary behaviors reported: *employee works collaboratively with others*, *employee forecasts future events*, *employee applies a systematic approach to their work*, and *employee takes risks*, were reported in critical incidents, but with much lower frequency than the primary behaviors (Table 2). The behavior statement, *employee takes risks*, was reported exactly once, in one critical incident, in one response, and an example was not included in the response. While this behavior statement is an outlier in the data set, and cannot be defined more specifically than as noted in Chapter Four, it was present in a response that met all inclusion criteria and coded as a clear statement of observed behavior from the respondent.

Peripheral Information Included in Survey Responses

The focus of this study was observation-based in order to determine what innovative work behaviors occur in employment situations, in contrast to a trait or attribute based approach that could include behavioral observations, but would also likely include analysis intended to identify the underlying traits or attributes indicated by the observed behaviors. Innovative work

behavior is just one area of study within the various fields of inquiry dealing with innovation. This field of study seeks to answer questions about the behaviors that people exhibit in work environments when and where innovation occurs, as opposed to approaching innovation at the individual level from more of a personality trait based perspective. The distinction is an important one because this study is fundamentally observation-based to determine what behaviors occur in work environments, in contrast to a trait or attribute based approach that seeks to determine innate individual characteristics associated with particular behaviors.

Some survey responses received were excluded because all data coders agreed that the response failed to answer the survey item pertaining to innovative work behavior observed. While these responses were not subjected to formal data coding, the anecdotal observation made was that these responses constituted lists of personality traits or psychological attributes assessed by the respondent as significant to effective innovative work behavior. Purely trait-based responses were not included for reasons discussed in Chapters Two and Three. Many of the responses coded as valid, meeting inclusion criteria and including recognizable critical incidents, contained attribute comments in addition to direct observational statements of behavior. These respondent attribute comments did not contribute to answering the research question that guided this study, but were present in 31 of the 58 included responses.

While outside the direct scope of the present study and not the focus of this study, the high frequency of respondents choosing to include attribute commentary, in some cases to the exclusion of reporting behavior observations, tends to indicate that conceiving of innovative work behavior in trait or attribute terms is common among the respondents. The anecdotal observations of these attribute comments are that references to high levels of personal initiative, and personal courage are the most common types of references made.

Initial Assumptions Confirmed or Denied

For the purposes of this study, several assumptions were made. Each assumption is stated in *Italics* below and followed by a brief discussion of how the data and analysis in this study do or do not confirm or deny the initial assumptions.

Respondents will report truthfully and accurately. While not definitively conclusive, there is no indication in the data collected or analysis conducted that would tend to deny this assumption. The prohibition against including personally identifiable information in responses, required by ethical standards in the conduct of human subject research, makes specific and independent verification of respondent statements impossible. However, there were no internally inconsistent statements contained in responses, and none that appeared to the data coders to be so extraordinary as to call the statement's veracity into question.

Respondents will apply the definition of innovation provided in the instrument. There is no indication in the data collected or analysis conducted that would tend to deny this assumption. Some respondents did include unsolicited commentary on the definition of innovation provided in the instrument, that was generally positive in nature, but all observed behavior descriptions contained in the critical incidents in the survey responses were consistent with the definition of innovation provided.

Respondents will comply with the instructions in the survey instrument and report employee behaviors that they perceive as innovative within the context of the definition provided. This assumption is partially confirmed. Twenty-three of 107 responses received were excluded for either providing incomplete answers, or failing to answer the survey items. An additional 26 responses were excluded for other reasons. In total, 49 of 107 responses received met exclusion criteria. However, 58 of 107 responses did fully comply with the

instructions in the survey instrument and report employee behaviors that the respondent perceived as innovative within the context of the definition provided.

Respondents are capable of recognizing and accurately reporting innovative employee behavior within the context of the definition provided. This assumption is also partially confirmed. Fifty-eight of 107 respondents did recognize and report innovative employee behavior within the context of the definition provided. However, 23 of 107 responses received were excluded for either providing incomplete answers, or failing to answer the survey items, and many of the responses coded as valid, meeting inclusion criteria and including recognizable critical incidents, contained attribute comments in addition to direct observational statements of behavior. These respondent attribute comments are outside the scope of the present study, but were present in 31 of the 58 included responses.

Innovative work behavior is possible in any and all work situations. While not definitively conclusive, there is no indication in the data collected or analysis conducted that would tend to deny this assumption. Of the U.S. Census Bureau's (2012) twenty North American Industry Classification System (NAICS) economic sector classifications, twelve were reported by respondents. The diversity of economic sectors, supervisor periods of position tenure, and distribution in number range of employees evaluated by the supervisor respondents (Table 1), all tend to indicate that innovative work behavior is possible in a very broad range of, if not every, work situation.

Respondents' performance evaluations of others are significant to the organization where the supervisor/supervisee relationship exists. The data collected and the analysis conducted in this study do not confirm or deny this assumption, however the assumption is central to the rationale for specifically targeting supervisors as the respondent population for

this study, and a reasonable inference can be made that if the respondents' performance evaluations of others were not significant to the organization in that the supervisor/supervisee relationship exists, then those evaluation activities would not take place.

Limitations Observed in the Conduct of the Study

This study was limited by several factors; those limitations pertained primarily to the study's purpose, population, sample, instrument, and analysis. This study focused specifically on workplace behaviors that supervisors characterized as innovative. There are a number of other questions pertaining to innovation in the workplace that may have varying degrees of effect on individual innovative work behavior. For example, situational context in that innovative work behavior is exhibited, work roles of individuals engaging in the behavior, potential correlations between organization type and the frequency, intensity, and type of innovative work behavior, to name a few. This limitation was accepted so as not to detract from focus on the research question.

Accepting this limitation did allow the study to focus on the observed employee behaviors reported by supervisors in order to address the research question. Analysis of the data collected demonstrates that there are four primary behaviors that supervisors within organizations with a stated innovation orientation perceive as effective innovative work behavior: *generating ideas, recognizing problems or opportunities, acquiring ideas from sources external to the employee's immediate work organization, and promoting ideas to others within the work organization*. Additionally, the unsolicited inclusion of attribute-based employee descriptions by respondents in 31 of the 58 included responses (53.45%), and the additional 10 respondents who provided only an attribute-based description with no behaviors

reported, indicates that in several instances perceived employee attributes are closely associated with effective work behaviors. This observation indicates that the influence of supervisor attribute perceptions may be a more significant factor than the other potential influences originally envisioned in this limitation, and so of higher priority of possible future research.

This study was also limited by the nature of the respondents. The two variables common to all respondents included in the study were self-identification as a supervisor, specifically someone who is responsible for evaluating the performance of others as part of their routine work requirements, and holding that position within an organization with a stated innovation orientation. Educational Services and Professional, Scientific, and Technical Services from the U.S. Census Bureau's (2012) North American Industry Classification System (NAICS) economic sectors constituted 50% of the respondent population. The majority of respondents were 50 years of age, or older, and predominantly male. Respondents with five or more years in their work positions were 46.6% of the population. The ranges of the number of employees evaluated by respondents (1 – 5, 6 – 10, 11 or more) are all well represented in the respondent population (Table 1).

The results of this study provide a point of comparison for the results of similar future studies in populations with different characteristics. Respondents in this study were particularly concentrated in two economic sectors, the male gender, and the age range greater than 50 years. Additional studies with populations closer to a normal distribution in those variables are required to accurately determine whether a statistically significant correlation exists between any or several of those variables and observed employee behaviors reported.

The sampling methodology also imposed some limitations. The sample is a purposive convenience sample based on work role, accessibility, and likelihood of participation; as such it

was not specific to any one organization or class of organizations. The study used snowball sampling to reach as many potential respondents as possible, so not all respondents received communication directly from the Principal Investigator or Business Engagement Office Director, only the initial potential respondent tier did. Subsequent respondent tiers, in accordance with established snowball sampling procedures, received their contacts from respondents in preceding tiers. The response rate is unknown because the total number of individuals afforded an opportunity to participate is unknown.

In this case, because this study did not attempted to obtain a representative sample of a precisely defined population, the unknown response rate does not adversely affect the quality of the findings. However, the observed concentrations of respondents in particular economic sectors (Educational Services and Professional, Scientific, and Technical Services constituted 50% of the respondent population; Table 1) may be the result of higher levels of propensity to engage in cooperative ventures with institutions of higher education within some sectors as opposed to other sectors. Both the social and material strengths of the communications networks that respondent referrals are transmitted along may also contribute to where respondent sampling is more and less successful. Similarly the concentration of respondents within certain characteristics in this study presents opportunities for further research. One possible way to investigate populations outside the characteristics dominant in this study would be to apply the same instrument and analytical procedures, but with a sampling methodology that specifically queries respondents defined by different characteristics.

There were both conceptual and mechanical limitations to the data collection instrument. The instrument contained one item focused on the research question that this study investigated that asked respondents to report observed behaviors in reference to the guidelines

provided. The instrument format was intended to elicit responses descriptive of relevant behavior. Responses were reflective of the behaviors significant in the minds of the respondents, as perceived through memory. Mechanically, the instrument was limited by the 5000 character capacity of the response box into that respondents are asked to enter their response (Qualtrics Labs, 2012).

The longest free text response received was 2578 characters (458 words) long, indicating that the 5000 character response box capacity limit imposed by the survey software did not prevent any respondents from answering the applicable survey item completely. The majority of responses received (58 of 107, 54.20%) contained codable critical incidents. Only 23 of 107 responses received (21.50%) were excluded because they either provided incomplete responses, or provided responses that did not contain any critical incident reporting observed employee behaviors. The nature of the findings obtained in this study are consistent with those reported in a broad range of other studies employing critical incident technique (Buchanan et al, 2011; Butterfield et al, 2005; Butterfield et al, 2010; Douglas et al, 2009; Ekaterini, 2011; FitzGerald, et al, 2008; Flanagan, 1954; Gremler, 2004; Hamlin & Sage, 2011; Hamlin, Sawyer & Sage, 2011; Hughes, 2007; Khandelwal, 2009; Patrick et al, 2009; Schluter, Seaton & Chaboyer, 2008; Serenko & Turel, 2010; Silen et al, 2012).

The analytical procedures applied in this study also imposed some limitations. This study employed three human qualitative data coders. All qualitative analysis introduces some margin for human error. However, the analysis procedures also account for this in the employment of multi-coder triangulation (Denzin, 2012), and following the analysis process applied by Hamlin and Sage (2011), and Hamlin, Sawyer, and Sage (2011).

The Research Associate training (Appendix D) and the Research Team Analysis Checklist (Appendix A) both worked effectively to enable all data coders to consistently apply the analysis procedures. The procedures applied in this study maintained high fidelity to those used in comparable studies, investigating other workplace behaviors through similar respondents (Hamlin & Sage, 2011; Hamlin, Sawyer & Sage, 2011). Standards of rigor in qualitative research as described by Ambert, Adler, Adler & Detzner (1995); Caelli, Ray & Mill (2003); Denzin & Lincoln (1994); Elliott, Fischer & Rennie (1999); Fossey, Harvey, McDermott & Davidson (2002); Gephart (2004); Lincoln (2002); Mantzoukas (2004); Pyett (2003); Swanson & Holton (2005); and Tobin & Begley (2004), are fulfilled in this study.

General Conclusions

Understanding how innovative work behavior is manifested in the workplace, and the employee behaviors that are most frequently cited by supervisors are beneficial to Human Resource Development and education practice, but the current understanding requires further development. The most fundamental question to be answered in this regard is to what degree are employee innovative work behaviors and the relative importance of those behaviors generalizable. Answering this question will require study across multiple differentiated populations. While initial behaviorally based research does not directly contradict previous studies, further study is required to more fully understand the relationship between behavioral and attribute perceptions. The present study provides findings that can be applied in the workplace now used as a comparison set for multiple potential subsequent studies.

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APPENDIX A

Research Team Coding ChecklistOpen Coding:

1. Receive password protected file from the Principal Investigator by email; ensure access is restricted to password protected devices.
2. Review responses for affirmative response to informed consent; identify for exclusion any negative informed consent responses.
3. Review responses for affirmative responses to items #1, and #2; identify for exclusion any negative responses to either item #1, or #2.
4. Review responses for all items responded to; identify for exclusion any responses without all items responded to.
5. Review responses for response validity (birth year and tenure duration are viable, free text response is in English and can reasonably be assessed as answering the question posed); identify for exclusion any response assessed as invalid.
6. Isolate Critical Incidents reported within free text responses; assign a descriptive code or short title to each discrete critical incident.

7. Compare current critical incident descriptive code to previous critical incident descriptive codes; group critical incidents together by codes that are the same, similar, or congruent.

Axial Coding:

1. Come to the collaborative session with your list of excluded responses and list of descriptively coded critical incidents, grouped by sameness, similarity, or congruence; ensure that response source identification is preserved.

2. The research team will compare excluded response lists to ensure validity of included responses; included responses are numbered sequentially.

3. The research team will compare individual analysis of each response to validate critical incident isolation and coding; critical incident identifiers are assigned.

4. The research team will compare critical incident descriptive codes to establish collective Behavior Statements.

5. When concluded, axial coding produces a coded list of critical incidents, and a list of Behavior statements with definitions.

APPENDIX B

Data Collection Instrument

Thank you for taking the time to consider participating in this research project. Ethical standards and Federal Law require that your voluntary decision to participate or not participate be made from an informed position. Please take the time to read and understand the information below, before deciding whether or not to voluntarily participate in this research project.

The purpose of this study is to advance a scientific understanding of individuals' innovative work behavior (IWB), or what it is that people actually do when they are innovative at work. Respondents' answers to this survey will be compared to each other to determine what commonalities or trends, if any, are present among the responses, and if commonalities or trends are present, what they are.

In responding to this survey you will not be asked to specifically identify yourself, your organization, or anyone else; in fact you will be reminded not to specifically identify yourself, your organization, or anyone else. All responses are confidential, but the researchers cannot guarantee complete anonymity. Risks associated with participation in this research project are minimal. The primary risk of harm is that an individual may inadvertently be specifically

identified and that either a respondent's comments about that person may be construed as detrimental, or that the respondent's comments may reflect detrimentally on the respondent themselves or their organization.

This risk is primarily mitigated by participants adhering to the prohibition against identifying themselves, their organization, or anyone else. The risks are further mitigated by the online survey software that does not record or report individually identifiable electronic information such as email addresses, user names, or internet protocol (IP) addresses. Only the principal investigator and two research assistants will have access to survey responses. The principal investigator will conduct an initial screening of survey responses for individually identifying information and permanently redact any responses containing such information prior to distribution to research assistants. Responses containing individually identifying information will be redacted before being included in the study.

The anticipated benefit of this study is that an increased understanding of individual innovative work behavior may lead to the development of performance improvement procedures to increase individual and organizational capacity to innovate. There is no penalty for non-participation and you may discontinue participation at any time after you start, until the completed survey is submitted. Once survey responses are submitted they may not be withdrawn because the same procedures that ensure confidentiality prevent linking an individual with a particular response after the fact, even if that individual wishes to withdraw their response.

It is anticipated that between 100 and 300 respondents will participate in this study. Your participation is anticipated to require 15 to 20 minutes of your time. If you have any questions or concerns regarding this research project or participation in it, you may contact the

principal investigator, Samuel Peffers, at speffers@sycamores.indstate.edu, or the project advisor Dr. Foster, at tad.foster@indstate.edu.

I understand that participation in this online survey is participation in a scientific research project.

I have read and understand the purpose and general procedures of this research project.

I have read, understand, and accept the risks and their mitigation involved in participating in this research project.

If I have questions or concerns about this research project or participation in it, I will contact the principal investigator, or project advisor, through the information provided above.

I wish to voluntarily participate in this research project and complete the online survey.

_____ Agree

_____ No

For purposes of this study, innovation is defined as intentionally creating or acquiring new ideas, introducing them, and applying them at work to benefit the organization. Please do your best to apply this definition in your responses to the first and last survey questions.

1. Is innovation important to your organization?

- Yes
- No
- Comments (optional)

2. Are you responsible to evaluate the performance of others?

- Yes
- No
- Comments (optional)

3. From the drop down menu below, please select the classification that best characterizes your organization's activity.

4. In what year were you born?

5. What is your gender?

- Male
- Female
- Other
- Not disclosed

6. To the nearest month, how long have you occupied your current position in your organization?

- Years
- Months

7. How many people are you responsible for evaluating the performance of?

- 1 to 5
- 6 to 10
- 11 or more
- Not Applicable

8. Thinking of the people whose performance you evaluate, consider the person that you would characterize as most innovative; please relate an event or series of events that lead you to that conclusion. Specifically, what actions did the person take, what did they do, that cause you to characterize them as the most innovative? Please do not use your name, the name of your organization, or the names of other people or organizations; please avoid details that would allow someone to, “connect the dots,” and determine personal or organizational identities indirectly. Thank you again for your time and participation.



APPENDIX C

Initial Contact Correspondence

Greetings,

This email is to request your participation and that of your co-workers and colleagues in a research project designed to advance a scientific understanding of innovative work behavior (IWB), or what it is that people actually do when they are innovative at work.

It is anticipated that your total time commitment to participate will be about 30 minutes. Participation is first and foremost strictly voluntary. Participating involves reading this email, forwarding this email to other people whom you know that evaluate the performance of others as a part of their work responsibilities and may be willing to participate in the study (inside or outside your organization), and following the web link embedded at the end of this email to participate in an online survey. The survey itself is expected to require 15 – 20 minutes to complete.

More information about the study methods and objectives is included with the survey that may be accessed by following the embedded web link at the end of this email. This research project is being carried out by an Indiana State University doctoral candidate in the College of Technology's PhD in Technology Management program, under the supervision of

the candidate's dissertation committee. You were selected to receive this request to participate in the study either in consultation with the Director of the Indiana State University Business Engagement Office because you and/or your organization have expressed an interest in innovation and a willingness to collaborate with higher education endeavors, or because a previous recipient thought that you evaluate the performance of others as a part of your work responsibilities and may be willing to participate in the study.

If you have any questions or concerns regarding this research project or participation in it, you may contact the principal investigator, Samuel Peffers, at speffers@sycamores.indstate.edu, or the project advisor Dr. Foster, at tad.foster@indstate.edu.

Thank you for your time and considering participating in this research project. Even if you choose not to participate, please take the time to forward this email to other people whom you know that evaluate the performance of others as a part of their work responsibilities and may be willing to participate in the study (inside or outside your organization).

To participate in this research project, please follow the link below:

[-web link to informed consent and survey instruments-](#)

Sincerely,

Samuel Peffers, Principal Investigator

speffers@sycamores.indstate.edu

Christopher Pfaff, Director Indiana State University Business Engagement Office

chris.pfaff@indstate.edu

Dr. W. Tad Foster, Project Advisor

tad.foster@indstate.edu

APPENDIX D

Additional Instrument Distribution

The survey instrument was also distributed through a variety of topically oriented professional discussion web sites. Those sites are listed here alphabetically by short title with accompanying URL.

Academy of Human Resource Development (AHRD)

http://www.linkedin.com/groups/Academy-Human-Resource-Development-AHRD-1943720?trk=myg_ugrp_ovr

Academy of Management (AOM)

http://www.linkedin.com/groups?gid=102523&trk=myg_ugrp_ovr

AHRD Leadership Special Interest Group

http://www.linkedin.com/groups?gid=3699663&trk=myg_ugrp_ovr

Arizona Professional Networkers

http://www.linkedin.com/groups/Arizona-Professional-Networkers-42480?trk=myg_ugrp_ovr

Arizona Technology Council

http://www.linkedin.com/groups?gid=42689&trk=myg_ugrp_ovr

Arizona Wildcat Biz Network

http://www.linkedin.com/groups?gid=157029&trk=myg_ugrp_ovr

Army Veterans

http://www.linkedin.com/groups/Army-Veterans-47803?trk=myg_ugrp_ovr

Association of Technology, Management, and Applied Engineering (ATMAE)

http://www.linkedin.com/groups?gid=135888&trk=myg_ugrp_ovr

Association of the United States Army

http://www.linkedin.com/groups/Association-United-States-Army-38421?trk=myg_ugrp_ovr

ASTD National

http://www.linkedin.com/groups?gid=48422&trk=myg_ugrp_ovr

Board of Innovation

http://www.linkedin.com/groups?gid=1807116&trk=myg_ugrp_ovr

Central Michigan University - MSA Students and Graduates

http://www.linkedin.com/groups?gid=1596637&trk=myg_ugrp_ovr

Central Michigan University Alumni

http://www.linkedin.com/groups/Central-Michigan-University-Alumni-32404?trk=myg_ugrp_ovr

Central Michigan University inCircle Network

http://www.linkedin.com/groups/Central-Michigan-University-inCircle-Network-116547?trk=myg_ugrp_ovr

CMU Leadership Institute

http://www.linkedin.com/groups/CMU-Leadership-Institute-3788991?trk=myg_ugrp_ovr

Data, Data, Data

<https://plus.google.com/u/0/#communities/102488871779321291176>

Effective and Fun Training Techniques

http://www.linkedin.com/groups?gid=1865152&trk=myg_ugrp_ovr

European Entrepreneurship & Innovation @ Stanford | Silicon Valley

http://www.linkedin.com/myGroups?trk=hb_side_mygrps

GIS & Technological Innovation Forum

http://www.linkedin.com/groups?gid=3731775&trk=myg_ugrp_ovr

Global Academic Innovation Network (GAIN)

http://www.linkedin.com/groups/Global-Academic-Innovation-Network-GAIN-1884571?trk=myg_ugrp_ovr

Good Business

<https://plus.google.com/u/0/#communities/110654793651248504039>

Higher Education Administration

http://www.linkedin.com/groups?gid=82991&trk=myg_ugrp_ovr

Higher Education: Assessment & Process Improvement

http://www.linkedin.com/groups?home=&gid=1171287&trk=anet_ug_hm

Higher Education Management

http://www.linkedin.com/groups?gid=129709&trk=myg_ugrp_ovr

Higher Education Teaching and Learning

http://www.linkedin.com/groups?gid=2774663&trk=myg_ugrp_ovr

Human Resources Training Network

http://www.linkedin.com/groups/Human-Resources-Training-Network-136222?trk=myg_ugrp_ovr

IAVA-Iraq and Afghanistan Veterans of America

http://www.linkedin.com/groups?gid=131088&trk=myg_ugrp_ovr

INNOVAHUB Open Innovation and Crowdsourcing

http://www.linkedin.com/groups/INNOVAHUB-Open-Innovation-Crowdsourcing-1851951?trk=myg_ugrp_ovr

Innovation Excellence

http://www.linkedin.com/groups?gid=1953902&trk=myg_ugrp_ovr

Innovation in Vocational Education and Training

http://www.linkedin.com/groups?gid=40187&trk=myg_ugrp_ovr

Innovation Management Group

http://www.linkedin.com/groups/Innovation-Management-Group-40975?trk=myg_ugrp_ovr

Innovation People Expert Innovators Creative Network

http://www.linkedin.com/groups/Innovation-People-Expert-Innovators-Creative-32614?trk=myg_ugrp_ovr

Linking Together in Yuma County

http://www.linkedin.com/groups/Linking-Together-in-Yuma-County-1861258?trk=myg_ugrp_ovr

Management Innovation Exchange

<http://www.managementexchange.com>

Military Network

http://www.linkedin.com/groups?gid=59436&trk=myg_ugrp_ovr

Philosophy of Mind

<https://plus.google.com/u/0/#communities/102784274669782503763>

Project Manager Community

http://www.linkedin.com/groups/Project-Manager-Community-Best-Group-35313?trk=myg_ugrp_ovr

Rakkasans

http://www.linkedin.com/groups?gid=837937&trk=myg_ugrp_ovr

Science on G+

<https://plus.google.com/u/0/#communities/111298192566988133095>

Science on Google+

<https://plus.google.com/u/0/#communities/101996609942925099701>

Science, Technology & Innovation Forum

http://www.linkedin.com/groups?home=&gid=4427025&trk=anet_ug_hm

Science, Technology & Innovation Policy

http://www.linkedin.com/groups?gid=76119&trk=myg_ugrp_ovr

SHRM (Society for Human Resource Management)

http://www.linkedin.com/groups?gid=42596&trk=myg_ugrp_ovr

Technology in Education

http://www.linkedin.com/groups?gid=84637&trk=myg_ugrp_ovr

Thinkers

<https://plus.google.com/u/0/#communities/11674975085848333099>

TrainingZone - training, learning & development

http://www.linkedin.com/groups?gid=1965996&trk=myg_ugrp_ovr

The University of Arizona

http://www.linkedin.com/groups?gid=1793333&trk=myg_ugrp_ovr

University of Arizona Alumni

http://www.linkedin.com/groups?gid=1010&trk=myg_ugrp_ovr

US Army Infantry

http://www.linkedin.com/groups?gid=2475653&trk=myg_ugrp_ovr

US Military Veterans Network

http://www.linkedin.com/groups?gid=50953&trk=myg_ugrp_ovr

Veterans and Active Duty

<https://plus.google.com/u/0/#communities/117890902027380250438>

APPENDIX E

Research Associate Training

Research Assistant (RA) training took place September 21 – 28, 2012. RA training consisted of: Institutional Review Board (IRB) certification for social science research with human subjects as stated in Indiana State University policy (Indiana State University, 2011); Principal Investigator (PI) led discussions; reading the research proposal abstract for this project; and two practice coding sessions in accordance with the procedures described in the study. The Principal Investigator provided sample data sets with individually identifiable information redacted for the practice coding sessions. RA training success criteria were: RAs fulfilled requirements for and received Indiana State University IRB certification for social science human subjects research, and the practice coding sessions produced intercoder agreement on a triangulated set of behavior statements and definitions from the data set analyzed.

APPENDIX E, ANNEX 1

Principal Investigator Led Discussion Topics

The Principal Investigator led discussions covered:

- Research Assistant requirements, Principal Investigator expectations, time commitment
- Project schedule
- Training requirements and the intended purpose and outcome of each one
- Internal project team procedures, with particular emphasis on data management and storage procedures
- Fundamentals of qualitative research, qualitative data coding, and critical incident technique
- Definitions for: critical incidents, behavior statements, open and axial coding, sameness, similarity, congruence
- Answers to questions posed by the RAs

APPENDIX F

Free Text Responses

The unedited free text responses provided by respondents to the survey instrument that met inclusion and usability criteria are listed below. The associated numbers correspond to the response line numbers from the original complete survey data spreadsheet. The line numbers were retained and used as a means of quick reference by the data coders during the coding process. The portions of each response identified as a critical incident are highlighted in **bold** type and followed parenthetically in *italics* with the corresponding behavior statement code.

3. This person is an engineer who **seeks out opportunities in areas that support the primary manufacturing of products, and not necessarily opportunities within processes that directly manufacture product. This engineer sees opportunity beyond the direct product** (*employee recognizes problems or opportunities*). In my opinion, he has taught me that we sometimes get caught up and blinded by the product itself and fail to see the waste all around the product in areas that support manufacturing. In this regard, his innovational aptitude is exceptional. / Specifically, machine downtime in a process was identified as being influenced by factors that have no direct tie to the machine but indirectly these factors create downtime.

As an example, the machine is not running, but nothing is wrong and the product is good. The operator must spend time accessing or preparing tooling. This engineer has a knack for seeing these influences.

4. **This person actively purposed changes necessary to streamline a portion of the process that he was directly responsible for in coordination with other satellite departments** (*employee promotes ideas to others within the work organization*). **He used his prior experience to bring in new ideas to an old process that needed to be updated** (*employee acquires ideas from outside the immediate work organization*), and he did this very quickly after he started in the position.

5. The individual **used talents learned from previous company and positions to automate a number of manual process** (*employee acquires ideas from outside the immediate work organization*) with in the teams daily workload.

7. my assistant **consistently works toward identifying problem areas in our department** (*employee recognizes problems or opportunities*) and **looking for creative ways to improve or solve these challenges** (*employee generates ideas*). for example, taking an existing office procedure that often resulted in needless time spent on a relatively simple outcome, and **suggesting an improved and quicker way to do it** (*employee promotes ideas to others within the work organization*). the most innovative people I've worked with all have the intellectual curiosity first to understand how something works, then they set about creating a better solution

8. The person I have in mind works very hard at the job . Their livelihood is dependent on **rapidly generating innovative solutions to problems brought to them** (*employee generates ideas*) by the medical industry. When this person innovates to solve an IT related problem they start by learning or reviewing basic concepts. **They make a plan to solve the problem in any possible way and show that it works. Then they seem to attack each step of the process by saying there has to be a better way to do this step and very often they find such a way and it is generally one that has not been thought up, or at least not reported before. The process seems to be, identify how to do the thing/process as best it can be done today, then break the thing/process into steps and make each step better** (*employee applies a systematic approach to their work*). There is a bit of trial and error as I see it unfold but this person gets achieves innovative solutions to problems on a weekly basis.

9. The most innovative person I evaluate is exceptional at **understanding how to leverage processes, technologies, and people that are outside of what he normally controls** (*employee acquires ideas from outside the immediate work organization*). He excells at building "win/win" scenarios and by doing so, he brings resources to his area that would not normally be comitted to his area. Through this, he regularly exceeds expectations, and he does it without compromising anyones else's objectives either.

10. The person I'm considering is eager to try new ideas and methods of accomplishing her tasks. For example, she **created an online access point to our services where none existed before** (*employee introduces new ideas to the work organization*).

12. **Sought out new information, data, and statistics. Applied the new information to client fact patterns** (*employee acquires ideas from outside the immediate work organization*).

Explained it in detail to co-workers and provided examples of how solutions might work for clients. Sought out management/leadership support and help with implementation (*employee promotes ideas to others within the work organization*).

13. In our organization we deal with difficult situations, and difficult consequences, every day.

The most innovative people we have are the ones who **look beyond asking "What if, what else, what now?"** (*employee recognizes problems or opportunities*) They are the people who can use and effectively bring the processes of the organization to bear on a problem. / /

Recent organizational efforts to streamline the amount of personnel, and the types of personnel that will occupy those positions, brought an edict from a higher level about what the organization would look like. This leadership from afar was the wrong answer, and as a result, a **group of individuals came together** (*employee works collaboratively with others*) and **quickly put together an alternate schematic that took into effect the organization's better interests and customer service. Looking past the traditional requirements, this group of individuals innovatively re-organized the positions to better use** (*employee generates ideas*).

Their solution has quickly become the norm because it broke the mold of "tradition" and leveraged technology and common sense as a powerful tool.

15. This individual **frequently communicates with equivalent peers, subordinates, and supervisors from similar organizations** (*employee acquires ideas from outside the immediate*

work organization). This allows the employee to **generate creative solutions to problems** (*employee generates ideas*).

16. Constantly strives to look for new processes to improve the organization; **is on top of and looking into the future of technology** (*employee forecasts future events*). Is not afraid to think differently than others or to express opinions. **Strives to continuously read and learn** (*employee acquires ideas from outside the immediate work organization*).

17. I would say that innovation is shown usually through taking initiative to **trying to solve a problem in a way that is different from the standard** (*employee generates ideas*). Many times people just suggest what has been done before, even if it was done before somewhere else.

21. my present position is to develop innovative education projects in agribusiness, and I evaluate performance but not from a managerial line position. / Case:development of innovative animal housing system, ahead of government regulations, and implement this worldwide. / The person I have in mind has / - knows the world, **sees weak trends that foretell the future, and can be used to shape the future** (*employee forecasts future events*) / - has a moral sense (integrates his ideas with sustainability, environment, labour, animal welfare) / - thinks independently / - is creative / - **combined ideas with entrepreneurial spirit and business mind (profitability in the long run)** (*employee generates ideas*) / - **can promote the image of his enterprise** (*employee promotes ideas to others within the work organization*)

23. **Used visual depiction of data to support theory** (*employee promotes ideas to others within the work organization*)

27. This individual **came up with conceptual ideas to increase the efficiency of a process** (*employee generates idea*). **The individual then communicated his ideas with a corporate IT expert responsible for the software integrated into the process** (*employee promotes ideas to others within the work organization*) and **worked together to implement the ideas. The ideas were executed and deployed across the corporation** (*employee works collaboratively with others*), not only increasing our plant's efficiency, but across the corporation as well.

28. took the initiative to **evaluate the issue and identified the problem, not the symptom** (*employee recognizes problems or opportunities*). **Develop several solutions driven by different factors, cost, quality and time** (*employee generates ideas*). Identified that of these factors was the most important to the overall project and move forward using that factor and basic solution method trying to make it better make it better.

29. Innovative people, in my experience, are people who are always **looking for new and better ways to do the same things they've been doing** (*employee recognizes problems or opportunities*)

30. **Communicate with others the implied task** (*employee promotes ideas to others within the work organization*), I work with engineers in a software company and oft times they live in thier own little work and don't function as a chain

32. This person **developed a new product** (*employee introduces new ideas to the work organization*), **took it through development milestones** (*employee promotes ideas to others within the work organization*), the business case was approved & placed into production with realized commercial results compared to the plan.

34. Being creative and innovative with product range designed for an application yet thinking outside the square & **developing applications & techniques that are quite unconventional** (*employee generates ideas*) yet meet new ways of doing things.

35. Ability to think "out of the box", way of **finding other ways of approaching the solution** (*employee generates ideas*)

36. The most innovative person that I work with is always **coming up with what seem to be obvious answers to problems that no one has noticed** (*employee recognizes problems or opportunities*), even though they affect many people regularly. / / What she does is beyond simple logic. One small example revolved around the loss of keys to study rooms. They were once on lanyards and the patrons often simply put them on and forgot they were wearing them. So, we were always having to replace them. Her solution was to attach them to a dvd case with a lockable keyring. She then created covers for them and printed them out and they are beautiful, funny and informative. The dvd cases and key rings were unused surplus inventory and the printouts were part of her print quota, so they were already budgeted for. / / While this example is small, the contribution has saved us thousands of hours of emails and phone calls to patrons and administration for placing holds on patron's accounts. This also helped with the

cost of replacing the keys, that included a ticket to maintenance and someone with permission who could order, pick up and sign for that key. / / Her ideas happen spur of the moment, and every time I hear her say something, I hear someone else say, "Yeah, why haven't we been doing that all along?" They usually revolve around circumnavigating complex processes and procedures that are as annoying as Rube Goldberg illustrations. It isn't about bending the rules, it is about removing the need for them surrounding such a tiny issue. **She is like a walking talking Ah-Ha! Moment** (*employee generates ideas*).

38. **Asked the questions who, what, why, when where and how** (*employee recognizes problems or opportunities*) and followed this by **seeking solutions** (*employee generates ideas*)

39. **Two people were collaboratively involved** (*employee works collaboratively with others*). **They mathematically described means of identifying "what" a particular process was and "how" that complex process worked, from models and data. From this one particular instance, they were able to abstract a pattern of interaction that identified and could be used as a meta-model for various other phenomena. This lead to a software system and method that could be applied to engineered physical phenomena at the nano and meso-scales** (*employee applies a systematic approach to their work*).

40. they solved a problem by **applying common scientific knowledge in a way that had not previously been tried or had been dismissed** (*employee acquires ideas from outside the immediate work organization*). By not biasing their view of the outcome, they we able to free themselves of conventional thinking or peer pressure.

43. This man **created and implemented a maintenance program** (*employee generates ideas*) for an organization wherein individuals had their vehicles inspected for preventive maintenance. **No one ordered this person to undertake this initiative. He did it of his own volition** (*employee recognizes problems or opportunities*).

44. **Research and study the problem** (*employee acquires ideas from outside the immediate work organization*). **Propose different solution. Communicate next steps to relevant parties and provide direct support to help implement what her proposal** (*employee promotes ideas to others within the work organization*)

45. **thought of an idea that was very different than the other ideas on the table** (*employee generates ideas*)

47. **He proposed an idea that was patentable and could give raise to a valuable innovation/prototyping project** (*employee promotes ideas to others within the work organization*). He proposed it in the form of a concise description with reference to the usable technologies to instantiate it, plus a reference to the state of the art. / / He did this of his own, while the team was in a period of brainstorming about some topic. His idea was a smart joint between a topic we previously tackled and the new one we were just tackling. The constructive position was to avoid emptying his mind of what was done before: we asked him to be innovative in a new field and he tried to do it by building a consistent vision of what we did and what we were now doing.

49. They **used brainstorming, cause and effect diagramming, suggestion circles and the Innovators question list** (*employee generates ideas*)

50. "S" is the most innovative. **He thinks of new product or scientific ideas everyday - he is a fount of ideas** (*employee generates ideas*). Usually, we find that his ideas are brought to market 3-20 years later (we've worked together a long time). Also, he hates to be limited. Anytime someone says, "That is impossible" or "You can't do that" it's like throwing down the gauntlet. Usually within the hour, he's solved the "impossible" problem. People from many disciplines ask him for help, and get it. He's even solved industry-level problems while on a 2-hour plane flight with subject matter experts. The SMs leave the plane with an implementable answer to their problems or at least a firm direction to explore where previously there was none. One of his greatest characteristics is taking responsibility for the problem at hand. Since he can solve it (and if no one else can or doesn't want to) then he'll do it. He is also fearless. Inventive thinking is scary because you don't know where you will end up before you start. It takes courage in innovate. I hope this helps.

53. / The most innovative person has always been the laziest one, with high analytical skills; that one **searching for shortcuts to solve an issue above the average solution** (*employee generates ideas*). /

54. The person actually **connected the dots between loosely related matters** (*employee generates ideas*) (or at least the link between the subjects was not obvious for everyone). It was

his own initiative to develop his thinking around the topic and to push it forward to clarify the potential benefits of the approach. / So initiative, ability to connect the dots, enthusiasm and willingness to contribute, all this coupled to good interpersonal skills seemed key to be identified as an innovative profile in our organization

55. When challenged by a problem, person **seeks multiple avenues from finding solutions-asking for direct input, research, observations - then makes attempts to solve problem** (*employee acquires ideas from outside the immediate work organization*), at times from multiple different angles, if needed. Said person does not give up.

56. **-question standard procedures** (*employee recognizes problems or opportunities*), / **- come up with alternative ways to do things** (*employee generates ideas*), / - eager to **know about other aspects in other functions of the company**, / - eager to learn, to know, / - grabs free moments to experiment, / - **flags outside events, products** (*employee acquires ideas from outside the immediate work organization*)

61. **hallenges current situation reflected in discussion** (*employee recognizes problems or opportunities*). /

62. The individual was developing coursework for a series of courses in manufacturing training. **He researched multiple documents he looked at alternative methods for creating projects** (*employee acquires ideas from outside the immediate work organization*) and created a brand-new process for us to evaluate our students through hands-on projects. The projects

were creatively generated by using some of our existing projects to meet our competency model.

63. In my last position as a Plant Manager one of my employees **came up with a solution for more efficiently removing plastic resins from rail hopper cars** (*employee generates ideas*).

This person determined that a small vibrator attached to the center of the rail car would provide resonate throughout the railcar and material with just enough energy to break up "clumps" and allow for a smoother flow through our vac system.

66. They **used different materials to construct training materials** (*employee acquires ideas from outside the immediate work organization*) that enhanced the value of our training.

69. The Educational Leader who oversees eLearning and teacher capability building, has consistently been innovative in how she engages with teachers. One example is in reshaping the eLearning team so that they could be more responsive to varied emerging technologies. She asked them to restate their KPIs around ANY use of technology to achieve improved results for educational teams. Previously they had been seen as difficult to work with and limited to one learning management system. The difference has been phenomenal, the teaching teams are using a range of technologies and together they are all taking steps into new ways of delivering training in the digital age. She did this by focusing on what the student wants from us, and not what the LMS dictates. She also allowed the eLearning team to utilize their own strengths and areas of expertise to assist the teaching teams. To me, it was about **finding creative solutions to achieve a customer focused end result** (*employee generates ideas*)

72. initiative, **able to describe or better still depict a vision** (*employee promotes ideas to others within the work organization*).

73. Due to personnel cut backs within our organization we were facing closure of one of our subordinate units. This would result in a loss of about 45% to 50% of our student population. I had no financial resources to replace the personnel losses and one of my employees **suggested we go outside of our organization** (*employee introduces new ideas to the work organization*) to see if they would be willing to fund one or two positions permanently. Specifically, this person **arranged meetings with key decision makers and paved the way for productive discussions of the issue** (*employee works collaboratively with others*) by providing "read-ahead" material to all involved. After a few meetings in that we developed our interdependence the organization was willing to replace the employees. This situation has not matured so the outcome is yet to be determined.

76. An innovative person is the one who is able to take the initiative **to anticipate ideas or facts, to create something new or has a visionary character** (*employee forecasts future events*). I new some (not much) collaborators who **suggest new themes to be discussed and try new tools to organize our work** (*employee introduces new ideas to the work organization*). Success guaranteed for me, for the team, for the organization and for the society.

77. Those who have initiative to **take risks and share results** (*employee takes risks*).

81. Condition: Designing a new product / Action of individual: Listened to the brief and **pursued idea through a series of questions 'till he had a very deep insight to what the parameters were** (*employee applies a systematic approach to their work*). / Outcome : **Produced several options** (*employee generates ideas*) and was enthusiastic about each but really want to meet and exceed the brief. He took over the problem. / Behaviour: / Taking hold of the problem, making it his own and producing a solution that was both to his satisfaction and mine.

85. The most innovative person is the one who - unprovoked - **sought out an area in the organization that could be improved upon** (*employee recognizes problems or opportunities*) and then **came up with some viable options** (*employee generates ideas*) to improve it

86. **Coordinated technical team to investigate potential applications for existing technologies** (*employee works collaboratively with others*). **Conducting experiments and research activities to identify applications** (*employee acquires ideas from outside the immediate work organization*) where these **existing technologies could provide competitive advantage** (*employee recognizes problems or opportunities*). **Presented options to the organization for review and consideration** (*employee promotes ideas to others within the work organization*).

90. This is a great question but I need to qualify this response. We worked in an established industry so our business model was proven and most of our efforts were on optimizing our business. I read your definition of innovation and warn you mine response is more in line with

how do you take an idea or opportunity and expand upon it in your business. I never really worked with "creators" or "inventors" - our definition was more how to apply ideas to our benefit. That all said - the most innovative person to work for me was an IT manager in the early 1990's. The guy was a technology genius at the time and it was just in his DNA. He was extremely bright, well read on emerging computing technologies, and always have the mindset of how can computing be part of a solution to an issue or process. I think earlier he worked as a programmer so he knew how to write code. When he worked with us it was all about using PCs and IBM AS400's to provide solutions behind our manufacturing needs. A lot of our improvements were due to technology changes in the computing industry but the most amazing accomplishment I'd like to share is how he took "pain" out of one particular process. First, as a Fortune 500 company we paid suppliers roughly 45-60 days out. This included "farmers" who were our suppliers - by law in many states farmers can demand payment upon delivery - we never could comply with that law and the farmers just acknowledged that. We received millions of units of delivery that are graded for quality, moisture, etc. This IT manager **put together a solution that solved this issue** (*employee generates ideas*) and we were able to cut checks on the spot if a farmer demanded that. The ability to offer payment at delivery - just the "offer" saved our company millions of dollars in commodity costs. Our investment was less than \$20,000 to do this. Our IT guy got everyone from the farmers, commodities procurement, treasury, finance, and IT on board with this. People talked about that project years later - minimal investment, great idea, and leveraged new technologies - and made so many groups happy. I always described that individual as a "thrill seeker" - he was always looking for new projects. Later he accepted a promotion into our corp IT group and later got frustrated with the politics of corporate. Today he runs the computer networks for a large metropolitan hospital

system. We did invest in his continuing education and at the time funded his Microsoft CNE (certified network engineer). Did he create a solution yes. Did he create the technology, no.

92. They did what needed to be done because **they saw it needed to be done** (*employee recognizes problems or opportunities*). Didn't need to be told.

93. A person who created software in order to **solve a problem that he encountered on more than a few occasions** (*employee recognizes problems or opportunities*). / / He **created a software program that would address the problem** (*employee generates ideas*). / / He then **shared the software within the team** (*employee promotes ideas to others within the work organization*) and was provided feedback on how to improve it further.

94. Creative, Competitive and highly motivated to be recognised for positive contribution. Took a field that is new and **did some innovative research** (*employee generates ideas*) like publishing papers in international journals, completed a PhD on a theme that is very different, joined industry rose to a senior position and joined university teaching for sharing and improving self and **attends every major seminar, conference** (*employee acquires ideas from outside the immediate work organization*) helps the organisers in having solutions to the problems with well researched suggestions. I find these deeds highly impressive as he comes from a poor family background(economically, socially & educationally).

97. One employee **took it upon himself to read the manual to a piece of equipment and see that we were not following the recommended maintenance schedule** (*employee recognizes*

problems or opportunities) and he then **created plans and schedule to ammen the missing maintenance needed** (*employee generates ideas*).

99. **Asking around the organization to determine if there were a required set of rules** (*employee recognizes problems or opportunities*). Upon discovering that they were outdated, **created a new set** (*employee generates ideas*) (proposed - later accepted as proposed), updated the requirement, and created a training plan to ensure similar ignorance of requirements (this and others) didn't happen in the future.

101. our graphics designer is the most innovative of the Vietnamese locals on our team. He is very artistic plus has excellent IT skills. What I appreciate about him the most is that he is not afraid or shy to question something or suggest another way of doing something. Early on (he has worked for us 1 year) he **came with a clever idea** (*employee generates ideas*). I could not do what he wanted, but told him, "Don't stop bringing me ideas. Just because I refuse does not mean that your idea has no value." He took me seriously and **keeps coming with ideas** (*employee introduces new ideas to the work organization*). Gradually he is learning the boundaries of what we will or will not do and his ideas keep getting better.

103. The most innovative person in our organization is: deeply educated in the general subject area of our company, open to others ideas, excellent at explaining his own ideas, really enjoys conversations about new ideas and current projects, can both teach and learn from others. He **stays abreast of current research and trends** (*employee acquires ideas from outside the immediate work organization*), and does not hesitate **to reach out to his very extensive**

network for assistance or to share his own ideas (*employee works collaboratively with others*).

104. Very open and curious person. Was **always asking the why question** (*employee recognizes problems or opportunities*). Is very similar like a 3 years old kid. He always wanted to receive more knowledge.

106. My most innovative person was building a set of systems and processes, including policies with me, from nothing. She demonstrated innovation by: **Taking additional coursework outside of her academic field** (*employee acquires ideas from outside the immediate work organization*) to amplify her knowledge base; **Seeking input from me and others on the team to get multiple perspectives; Studying with me and others "corporate culture" to understand what some potential pitfalls, concerns or obstacles might exist; Clarifying the key problems of the project, examining the problems from a variety of perspectives** (*employee works collaboratively with others*), and applying her expertise to setting up systems and the like for project launch, etc.; Being willing to **recommend a change in direction** (*employee introduces new ideas to the work organization*) when early feedback was not positive on project results; Identifying that obstacle resolution could only come about by building relationships with key stakeholders, and building these relationships; and, Remaining highly organized and flexible/open throughout the project, that continues successfully today. The greatest of these was creating something new, being willing to change it, and base these changes in others' input, insights, needs and company goals.

107. Innovative personality people that I supervise often off are **thinking well beyond the problem of today and into the realm of the possibility of changing tomorrow** (*employee forecasts future events*). We were trying to figure out a way to reduce the budget without reduce personnel. Oplan was to downsie personal after we become efficient in our processes and tasks. This person when asked for a way to reduce the amount of processes **suggest that we kill all programs and projects that were not critial to the mission of the organization. He/she suggested that we reduce processes and procedures then when time begin to get better, he/she suggested that we continue to reduce services** (*employee introduces new ideas to the work organization*) becasue the growth was jus a short-term fix to a long term program. It is interesting that he/she could see that far down the road, when the rest of the team is worrying about jobs. This individual concentrated on impoving a process and to further improve on it.

APPENDIX G

Behavior Statement to Response Correspondence

The table below shows the correspondence of coded behavior statements to critical incident occurrence in survey instrument responses. Response identifiers are in the far left column and are derived from the response line numbers in the original survey response data spreadsheet. The line numbers were retained and used as a means of quick reference by the data coders during the coding process. The remaining columns in the table correspond to the behavior statements identified in the table by the short title in the column heading. An 'X' in a cell indicates that the response on the corresponding line contained a critical incident that reported an observation of a behavior that was coded as the behavior statement indicated by the short title in the corresponding column heading.

Response ID	Idea generation	Problem or opportunity recognition	Idea acquisition	Idea promotion	Idea introduction	Collaborative approach	Forecasting	Systematic approach	Risk taking
3		X							
4			X	X					
5			X		X				
7	X	X		X					
8	X							X	
9			X						
10					X				
12			X	X					
13	X	X				X			
15	X		X						
16			X				X		
17	X								
21	X			X			X		
23				X					
27	X			X		X			
28	X	X							
29		X							
30				X					
32				X	X				
34	X								
35	X								
36	X	X							
38	X	X							
39						X		X	
40			X						
43	X	X							
44			X	X					
45	X								
47				X					
49	X								
50	X								
53	X								
54	X								
55			X						

Response ID	Idea generation	Problem or opportunity recognition	Idea acquisition	Idea promotion	Idea introduction	Collaborative approach	Forecasting	Systematic approach	Risk taking
56	X	X	X						
61		X							
62			X						
63	X								
66			X						
69	X								
72				X					
73					X	X			
76					X		X		
77					X				X
81	X							X	
85	X	X							
86		X	X	X		X			
90	X								
92		X							
93	X	X		X					
94	X		X						
97	X	X							
99	X	X							
101	X				X				
103			X			X			
104		X							
106			X		X	X			
107					X		X		