THE RELATIONSHIP AMONG FRONTLINE EMPLOYEES' QUALITY PERFORMANCE,

THEIR PERSONALITY TRAITS, AND THEIR PERCEPTION

OF THE WORK ENVIRONMENT

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ABSTRACT

Although effective management of frontline employees has been commonly considered a key element in quality management in both practice and academia, the predominant focus has been on work force training, development, empowerment, involvement, and incentive systems, without utilizing the benefit of understanding the frontline worker's personality and perception of the work environment. This paper utilized the 16 Personality Inventory (16PF) and Work Environment Scale (WES) to explore the relationship of frontline employee's personality and perception of the work environment to their quality assurance performance ratings in a medium-sized manufacturing company in America. By using 16PF and WES Real Form, *Vigilance* (factor L) and *Work Pressure* were discovered to be positively correlated with the frontline workers' overall quality assurance performance ratings. Caution of generalization of the research result was raised in Discussion section. Recommendations for future research were presented.

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CHAPTER 1

INTRODUCTION

Quality is one of the most essential factors in a company's achievement of success. According to Parasuraman, Zeithaml and Berry (1988) "Delivering superior service quality appears to be a prerequisite for success, if not survival" (p. 13). Customers not only care about the price they have to pay, but also want quality of products and service for that price. In the mid-nineties, Shalowitz (1995) pointed out a demand from customers requiring lower prices yet higher quality for their merchandise. Juran (1995), one of the most influential quality gurus in American history, underscored four major forces that challenged the sufficiency of quality control in the United States: (a) growth of consumerism, "a popular name for the movement to help consumers solve their problems through collective action" (p. 563), (b) growth of litigation over quality, (c) growth of government regulation of quality, and (d) Japanese quality revolution. He predicted that increasing demands would force organizations to make quality assurance a major emphasis. For that reason, he depicted the 20th century as the century of productivity, but the 21st as the century of quality (Miller, 2008). Juran's prediction was proven to be correct by the Toyota recall in the beginning of 2010. While emphasizing expansion with quality management lagging behind, Toyota has experienced massive losses, both financially and in terms of credibility.

To help ensure product quality, many approaches have been developed and adopted world-wide over the past 60 years. Quality-relevant topics were extensively studied in both the academic and practice arenas. These included quality management systems and strategies such as quality control (QC), quality assurance (QA), total quality management (TQM), Zero Defect, Six Sigma, international standardization organization 9000 quality management systems (ISO 9000 QMS), and lean manufacturing.

Deming and Juran, two of the most famous pioneering quality management practitioners and universally recognized as "gurus" (Hoyer & Hoyer, 2001), believed that 85 to 90 percent of all quality problems stemmed from management and organizational systems while the impact of frontline workers was believed to be no more than 15percent (Beckford, 2002). Consequently, with very few exceptions (i.e., Wright 1990), nearly all of the early practitioners focused only on management's role without an evaluation of frontline workers' personality factors and perceptions of the work environment. Paying attention to frontline employees' role and their perceptions of the organization could potentially improve managements' ability to select, develop and supervise for quality assurance.

With their unique philosophies and approaches, focused as they were on broad social factors to the neglect of individual psychological ones, Deming and Juran profoundly impacted contemporary quality management and the type of quality research conducted. The extensive literature review of Sousa and Voss (2002) illustrated the broad social perspective as they summarized the five major domains of product quality management research: (a) quality management definition, (b) product quality definition, (c) the impact of quality management on firm performance, (d) quality management in the context of management theory, and (e) implementation of quality management.

Consequently, the widely-held beliefs that workers contribute only a small amount to quality problems has resulted in limited studying on their role and thus a paucity of research. Even when issues relating to frontline employees have been noted, appropriate research has not followed in the context of quality management. For example, much has been discussed by practitioners, including famous experts like Deming (1982), Juran (1989), and Crosby (1984), about the importance of people issues. But when people issue were researched and discussed in the context of quality management, the focus has been on such areas as commitment (Ahire, Golhar, & Waller, 1996), training (Saraph, Benson, & Schroeder, 1989; Ahire et al., 1996; Chin, Pun, Xu & Chan, 2002; Solis, Rao, Raghu-Nathan, Chen & Pan, 1998), development (Chin et al., 2002; Raghunathan, Rao & Solis, 1997), empowerment (Ahire et al., 1996) and involvement (Saraph et al., 1989; Ahire et al., 1996; Chin et al., 2002; Solis et al., 1998; Tritos & Paul, 2004), recognition (Saraph et al., 1989) and rewards (Chin et al., 2002), and communication (Saraph et al., 1989; Chin et al., 2002), with frontline workers' personality factors excluded. By reviewing literatures comparing quality management and management theory, Sousa and Voss (2002) concluded that the emphasis of quality management was system factors while the emphasis of management theory was person factors. Thus, selection of people who had the right fit for the implementation of quality management, for example, which was advocated by the management theory, was generally not addressed by quality management research. They also claimed that "future research needs to be undertaken to ascertain whether management theory should incorporate insights from quality management or quality principals and prescribed practice should be modified in light of management theory" (p. 104).

While Wright (1990), who worked in the aircraft industry, more directly addressed the importance of frontline workers, in the final analysis he manifested little to no interest in

understanding frontline workers' personality characteristics. He emphasized the significant

importance of selecting and keeping the best people at all levels, including frontline aircraft

assemblers. However, his findings and contribution were limited by his methodology of relying

on one-to-one interviews without the aid of any scientific instruments such as personality

inventories.

Thus, in the final analysis, the various approaches are more akin to a broad-based

management philosophy that does not include the understanding of the personality

characteristics. After an extensive and ongoing literature review, this researcher has found a

limited number of research studies. This leaves many potentially important questions

unanswered.

The absence of research on frontline workers' personality factors occurred at a time when

personality factors had been found to correlate with careers and job performance. It also occurred

at a time when employees' perception of the work environment had been found to contribute to

performance. In a research study using the 16 Personality Factors (16PF) Inventory and the

Work Environment Scale (WES), Roberts (1984) found that less anxiety and a more positive

perception of such work environment factors as *Commitment* and *Supervisor Support*

significantly correlated with the receptivity of employees to new computer technology. She

concluded that "the data confirmed that subjects who tended to score lower on the Sociopathy

scale of the 16PF and who perceived their work environment as promoting involvement are more

receptive to office automation technology" (p. 78).

<div align="center">Statement of the Problem</div>

So far, quality management researchers have not focused on the role played by frontline

employees' personality in quality management. Some quality experts including Deming and

Juran believed frontline employees were motivated and had a very small impact on overall quality management. While there is substantial empirical evidence (Chin et al., 2002; Tritos & Paul, 2004; Ahire et al., 1996) to support the notion that leadership has a significant role in quality management, there is no evidence to support a justification for the neglect of research on frontline workers regardless of how "little" their impact is perceived as contributing to quality management.

The intention of this paper is to explore the neglected and deemed "small" area of the role of frontline workers to quality assurance. The problem this study will explore is the relationship of frontline employee's personality factors and perception of their work environment to their quality assurance performance.

<div align="center">Statement of the Purpose</div>

The purpose of this study is to explore the existence of relationship of frontline employees' personality factors, perception of the work environment to their quality assurance performance rated by the company management.

The research questions are:

1. What are the differences in the personality factors of frontline employees rated high compared with those rated low on quality assurance performance by management?

2. What are the differences in the perceptions of the work environment of frontline employees rated high compared with those rated low on quality assurance performance by management?

<div align="center">Statement of the Need</div>

Despite mounting research about the importance of psychological factors in performance, the quality gurus, who left a deep imprint on the research and practice of quality management, took limited advantage of it. Yet the world-wide persistence of quality issues and the advancing

of personality science in organizations, underscore the need and the opportunity to expand and improve quality management efforts.

This research tried to identify the personality factors that have significant correlation with individual quality assurance performance. This can enable those who are interested in quality management to examine the issue from another angle, so as to enrich the understanding of quality management. Metaphorically speaking, a spark plug may be a very small part of an engine, but a car cannot run without it. Research on spark plugs makes a significant contribution to the operation and efficiency of engines. No one would deny that importance.

Identifying personality and work environment factors that have relationship with quality assurance can provide a basis for further research. It could also benefit both manufacturing organizations and personnel who seek to improve product quality by providing management with the knowledge of: (a) specific personality factors correlated to quality performance ratings, (b) work environment factors correlated to quality performance ratings, (c) scientific selection criteria for frontline employees, and (d) suggestions for individualized supervision strategies for quality performance.

Statement of Assumptions

It was assumed that supervisors and managers had a profound understanding of their supervisees' quality assurance performance. It was also assumed that the Work Environment Scale, Real Form and the 16 Personality Factors Inventory were valid and reliable instruments for this study's purpose.

Statement of Limitations

The primary limitations of this study are threefold. First, since the research was conducted in one medium-sized manufacturing company in the Southern United States, the generalization of findings requires carefulness and caution. Second, the subjects of this research, frontline employees, might feel targeted as the cause of the quality problems, their answers might not be completely truthful. This company has engaged in extensive efforts to solve quality issues over the past decade, including changing the top management several times and replacing most of the equipment in the factory. A good and sufficient explanation of the purpose of the study to participants could minimize the impact of their concern over the research findings. Third, the reading level of some of the frontline workers could be below a fifth grade level or English was not their first language, these participants might have difficulty comprehending items on the personality and work environment instruments. To minimize the potential impact, the researcher and assistant were present to answer questions asked during the data collection.

Statement of Terminology

Quality

Defining quality is challenging, as Kozak and Maness (2001) stated it is "more difficult than it seems" (p. 48). Garvin (1984) attempted to be comprehensive by creating eight categories to incorporate different dimensions of quality, namely, (a) performance, (b) features, (c) reliability, (d) conformance, (e) durability, (f) service ability, (g) aesthetics, and (h) perceived quality or image. In this way, the concept of quality is much more clearly and comprehensively defined.

However, no single definition is accepted. Different people give quality different meanings (Harvey & Green, 1993). Even quality gurus have different views and emphasis for the

concept of quality. Hoyer and Hoyer (2001) categorized their definitions of quality into two types: the first is product focused - to meet the specifications by depending on a set of measurable characteristics, the second is customer focused - to satisfy customers' needs without any dependence on measurement. According to Hoyer and Hoyer (2001), quality gurus including Deming, Feigenbaum and Ishikawa defined quality as the second type, while Crosby defined quality as the first type. Juran (1989) defined quality from both aspects. In this paper, quality is defined from the product perspective with emphasis on achieving the prescribed product manufacturing specifications.

Quality Management

Quality management also means different things to different people. Saraph et al. (1989) might be the first to attempt synthesizing different factors for quality management in a business organization unit.

Among the various quality management strategies, quality control (QC) and quality assurance (QA) are the most common. These concepts have some similar points, as Moreno-Luzon and Peris (1998) argued, and are merely different ways of categorizing various perspectives of quality management although each part has its own emphasis and underlying philosophies. The common point for QA and QC is to reduce quality problems and satisfy customers, though with different emphasis. Harvey and Green (1993) distinguished their difference by noting that QC emphasized inspection and detection for quality and accountability purposes, while QA emphasized prevention by ensuring mechanisms and putting procedures and processes in place so as to ensure the delivery of desired quality. According to Dolmans, Wolfhagen and Scherpbier (2003), QA is a cyclic process, consisting of three steps: (1) measuring, (2) judging and (3) improving. It basically covers the whole process of production

management, from material purchasing to production and inspection. Therefore, the operational

definition for quality management encompasses both quality control and quality assurance.

Factor and Trait

A *factor,* or sometimes referred to as a *trait*, is the description that Raymond Cattell and

his colleagues used to refer to the 16 primary descriptors of the 16PF (Russell & Karol, 1994).

These factors also have alphabetical designations such as A, C, E as well as distinct names, such

as *Warmth* and *Boldness*.

Global Factors

Through factor analysis, the 16 primary factors were found to cluster together into five

groups known as the original Big Five. In the earlier editions of the instrument the five factors

were labeled *Second Order Factors* but with the release of the fifth edition in 1994 they were

labeled *Global Factors* (Russell & Karol, 1994). A list of all 16 factors, the 5 global factors and

their meanings are included in Appendix A.

Work Environment

The frontline employees' perception of work environment was evaluated by Moos' (2008)

Work Environment Scale. There are three dimensions: Relationship Dimensions, Personal

Growth or Goal Orientation Dimensions, and System Maintenance Dimensions. Each dimension

has several subscales. There are totally 10 subscales. The meaning of each subscale is available

in Appendix B

<center>Statement of the Methodology</center>

This research was conducted among frontline employees in a medium-sized

manufacturing company in the Southern region of the United States in 2010. The 16 Personality

Factors Inventory (16PF), Work Environment Scale (WES) Real Form, and a demographic

questionnaire were administered to participating frontline employees. Meanwhile, these participants' supervisors or managers, who were familiar with participants' quality assurance performance, completed a questionnaire which was designed by this researcher, to evaluate participants' quality assurance performance.

Statement of the Hypothesis

The hypotheses for this study are:

1. Frontline employees who are rated high on quality assurance performance by management will have a significant positive correlations to scores on personality factors of *Emotional Stability* (factor C), *Rule-consciousness* (factor G), and *Perfectionism* (factor Q_3).

2. Frontline employees who are rated high on quality assurance performance by management will have a significant negative correlations to personality factors of *Liveliness* (factor F), *Apprehension* (factor O), *Sensitivity* (factor I), *Abstractedness* (factor M).

3. Frontline employees who are rated high on quality assurance performance by management will have significant positive correlations with work environment factors of *Involvement, Peer Cohesion, Supervisor Support, Task Orientation, Clarity,* and *Managerial Control*.

4. Frontline employees who are rated high on quality assurance performance by the management will have a significant negative correlation with work environment factors of *Autonomy, Innovation,* and *Work Pressure.*

CHAPTER 2

REVIEW OF LITERATURE

Frontline Employee Issues In Quality Management Practice

Competition in the 1980's was the first call for Americans to realize the importance of quality. Good-quality overseas products, such as watches and automobiles from Japan, flooded the American market. This resulted in a fiercely competitive market place (Saraph et al., 1989). However, at that time, most American companies had not realized the importance of quality. In fact, a multiyear study conducted by Garvin (1983), compared operations in Japanese and American room air conditioner manufacturers. His result revealed that the average Japanese assembly-line defect rate was almost 70 times lower than that of America, and the average Japanese first-year service call was nearly 17 times better than American competitors.

Quality improvement in the United States was of such concern that it came to the attention of the executive branch of government. President Ronald Regan became involved in promoting the awareness and achievement of quality management. In 1987 he signed into law the Malcolm Baldrige National Quality Improvement Act (1987). This award, continuous to be granted annually by the president, and is presented to organizations in various industries for recognition of their great achievement in quality management. Every year hundreds of organizations apply for this award but only a handful become recipients. Ahire, et al. (1996) stated that the Award resulted in a "stronger interest among organizations from all sectors in

holistic quality management" (p. 23). This is the only quality award presented by the president of

the United States. The fact that quality was widely accepted and its importance recognized led

researchers (Benson*,* Saraph, & Schroeder, 1991; Longbottom & Zairi, 1996) to conclude that

finally quality management was growing and becoming a priority in the United States.

Meanwhile, quality management practice had been embedded into companies' normal operation

and the quality management knowledge became mature (Sousa & Voss, 2002).

Behind the quality management revolution was a group of quality experts, such as

Deming, Juran, Crosby, and so on. They became very influential as they developed their

philosophies and approaches to quality management. Although their philosophies and

approaches branched out with varying degrees of similarities and differences, each influenced

contemporary quality management philosophy.

Deming was the foremost recognized forerunner of quality improvement. Although

Deming was most famous for bringing statistical methods to quality management and repeatedly

emphasizing the importance of managers to understand variance (1982), his focus and

contribution to quality management has reached far beyond merely bringing statistic knowledge

into the quality management. Deming (1991) strongly argued that the western style of

management should be changed and his "14 points", which was his management theory,

provided a basis for this transformation.

Deming listened to workers' talking about stress, frustration, and dissatisfaction with

their supervisors. He (1982, 1991) spoke highly about workers and believed that they were

motivated, self-propelled to move forward and eager to contribute regardless of their frustrations.

Furthermore, he believed that performance evaluation was unnecessary since it brought fear to

employees (1982). Through his analysis, he emphasized that bad management was the cause of

American industry problems. According to Beckford (2002), Deming believed that 94 percent of quality problem responsibilities belong to the management and Modic (1988) stated that Deming believed that 85 percent of quality problems came from the system.

In the "14 points", he listed necessary actions to build a work environment in which everyone could work freely to improve the quality. These actions include ensuring leaders have sufficient knowledge, skill and know what they are supervise (point 7), securing workers from job loss fears so that they can perform at the best level (point 8), encouraging team work (point 9), and removing barriers which deprive both managers and workers from being proud of their workmanship (point 12). One of the key actions Deming listed was to provide training for both workers and managers (point 2). He argued (1991) that one of the reasons that the Japanese were so successful in quality management was due to the complete freedom given to the managers with only one exception, namely, transferring the education and training budget for other uses. His message was widely received so his philosophy and approach to quality management has been utilized in many industries including manufacturing, education, government agencies, medical and transportation (Zhao, 2006).

In 1954, shortly after Deming, Joseph Juran, an American, who had also become a quality guru, was invited to bring his approach to Japan (Juran, 1989). Similar to Deming, Juran (1989) emphasized the responsibility of management for quality and concluded from the studies that 80 percent of quality problems were the responsibility of management. His approach to quality management, known as the Juran Trilogy, focused on three universal processes: planning, control and improvement (Juran, 1989).

First, Juran (1989) stressed the importance of adequate planning by noting the enormously damaging scope of deficient planning, "About a third of the work in the United

States economy consists of redoing what was done previously" (p. 83). For him the backbone of

a structured approach was a road map, which mainly included determining quality goals,

instituting implementation and resource planning, and expressing quality plans. Providing

training to upper management in the concepts, methods, skills and tools of quality planning was

fundamental. The second part of the trilogy is quality control. Control focused primarily on

monitoring performance, determining and closing the performance gap. When discussing the

main purpose of control, he wrote, "all sorts of events can intervene to damage the ability of the

process to meet goals. The main purpose of control is to minimize this damage, either by prompt

action to restore the status quo or, better yet, by preventing the damage from happening in the

first place" (p. 145). Fundamental to quality control was having a manual that clearly spelled out

the process for all employees and management, creating a feedback mechanism for all

performance, and maintaining adaptability to intervening events that could damage operating

goals.

Juran (1989) believed that the third aspect, quality improvement was the least

threatening; therefore he believed it should be implemented first. It involved "the attainment of

unprecedented levels of performance" (p. 28). A quality council is established for each project to

reduce waste and enhance logistics, improve employee's morale and profitability, and satisfy

customers. Juran's quality management theory was widely accepted and therefore laid the

foundation for other quality management methods such as Six Sigma (Beckford, 2002). Like

Deming, Juran consulted numerous American companies regarding quality improvement.

Juran's approach did take into account frontline workers, including recognizing the

importance of their perceptions. He (1989) stated that some of the quality improvements are the

"direct results of upper-management initiative and leadership" (p. 33), but many "takes place at

the initiative of the lower levels of organization" (p. 33). Juran explained that management's responsibility was ensuring that the level of quality meets customers' needs and expectation while workers' responsibility was ensuring that products meet specifications. To maximize receptivity of the frontline workers, Juran (1989) prescribed that "Managers should take *soundings to understand the work force's perceptions and to use those perceptions as an input to the proposed quality-improvement effort* [italic added]" (p. 281). This is apparent from his various approaches to quality improvement. For example, he argued that management should "review progress, give recognition, revise the reward system" and "face up to employee apprehensions" (p.80). With his abundant experience working in corporations, Juran understood the issue of employee resistance to change. Thus he proposed two solutions to this problem: (1) allowing people who might be affected by the change to participate, and (2) giving people enough time to accept change (Beckford, 2002).

Another foundational American expert on quality management was Philip Crosby. He (1984) advocated the concepts of "Do it right the first time" and "zero defects". According to Mckenna (2001), Crosby believed there were two reasons for mistakes: lack of knowledge and lack of attention. Through his concept of "Do it right at the first time", Crosby made it clear that quality should be designed into the product, instead of defects being discovered by inspection after production completed.

Crosby (1984) proposed to achieve quality management through his 14-steps. Crosby's 14-step quality management can be differentiated into two paths. One path involved the techniques which companies can utilize in quality management, such as establishing quality measurement, evaluating cost of quality, and zero-defects planning. The second path focused on a human perspective, such as establishing management commitment, creating a culture that

advocates quality awareness, education, encouraging employees to report obstacles in achieving

defect-free work, and giving recognition to those who contribute. To achieve quality

management required education, which Crosby divided into three categories: (a) executive

education, (b) management education and (c) employee education. Each type of education

highlighted a different purpose, objective, content and length of program, so that people at

different levels would not have an ambiguous understanding about their roles in overall quality

management. When giving recognition to outstanding quality performers, Crosby suggested

allowing employees rather than management to select the employees they perceived as the

standard for quality performance.

Similar to Deming and Juran, Crosby (1984) believed that management should be held

responsible for quality problems because they did not "take the product and service requirements

seriously" (p. 56). Furthermore, he had great concern for de-motivators which were frequently

encountered by employees within the organization. Examples included employees' performance

reviews being conducted by someone whose competence was questionable thus risking a

counterproductive experience; travel expenses being determined by employees' salary level and

position; and company meetings where eloquent managers keep talking while employees are

only assigned the role of being faithful listeners. Crosby dedicated himself to the teaching and

training of countless numbers of managers and entrepreneurs.

Russell Wright (1990), Director and Division Manager of Hughes Aircraft, drawing from

his education and experience, realized the importance of people in quality management. He

concluded that the difference between success and failure in quality management was how

workers were acquired and enabled to do whatever needed to be done. In his book *A Little Bit at

a Time*, he introduced the approach of utilizing people during the quality management process.

Similar with Deming, Juran, and Crosby, Wright agreed that management was the key to product quality. However, what was different for him was his belief that success was due to "the players, not the systems" (p. 6). Here players not only meant those leaders and managers in the organization, but also other employees such as assemblers.

In his approach, Wright (1990) proposed three steps to quality management: (a) getting and keeping only the best people, (b) ensuring an understanding of what needs to be done, and (c) letting people do the job. He loudly proclaimed that "get and keep only the best is an idea whose time has obviously arrived" (p. 9). To support his claim, Wright gave several examples, such as a more sophisticated hiring procedure in the Ford Motor company, the New United Motor Manufacturing Incorporation - the joint venture of General Motors and Toyota, and continual training programs for new hires in the new Mazda plant in Michigan.

In addressing the issue of how to get the best people, Wright (1990) pointed out that companies, which delayed thinking about finding good people to the time when they needed them, was problematic. He believed companies should constantly keep looking for good people and grab them once they were found. He suggested the best way to find good performers was through regular one-to-one meetings with employees and through rotation among different positions. Using these efforts would identify the proper fit within a position. His approach proved effective because unstructured interviews provided the opportunity for important information to be discovered, and because rotation provided more opportunities for employees to find the position that best fits. However, the extent to which he fully understood his people and discerned the accuracy of what he was told is unknown.

While Wright (1990) provided a few examples in his book to illustrate good performers or best people, he did not provide clear or systematic definitions. For example, he characterized

good performers as competent people, who know how to complete the job, remain calm under stress, but who also might be expensive. No doubt his emphasis on the importance of the procurement and development of the best people is a wise strategy. However, because he did not further define terms like competent or specify how to measure such qualities, it is difficult to operationalize his concept of a "good performer".

The Malcolm Baldrige National Quality Award provides criteria to be used by companies to evaluate their quality management situations. These criteria include (a) leadership, (b) strategic planning, (c) customer focus, (d) measurement, analysis and knowledge management, (e) workforce focus, (f) process management and (g) results (Criteria for performance excellence 2009-2010, n.d.). These criteria are established based on the knowledge and experience of quality gurus and other practitioners. However, initially validation studies were not forthcoming. It was not until fifteen years after the establishment of the Malcolm Baldrige National Quality Award that Evans and Jack (2003) conducted a validation study among 307 manufacturing firms and validated its criterion, core concepts, and values.

It is not surprising that the Malcolm Baldrige National Quality Award Criteria for Performance Excellence was formed based on the quality gurus' philosophy and approaches, and thus the employee management strategies they advocated were included. These can be found in the fifth criterion, named "workforce focus". This criterion includes workforce engagement and workforce environment. Workforce engagement focuses on creating a culture featuring open communication, giving recognition, rewards and incentives to people, conducting ethics and ethical business practice, and providing a wide range of development opportunities such as training, education, and coaching. Workforce environment focuses on building an "effective and supportive work environment" (p. 20). It is noteworthy in this point, how to hire, place and retain

new workforce are included as requests for managing the workforce, but only to ensure sufficient staffing to finish the work. There is no direct mention of selecting staff that best fit the given position. That fit was not included in the various quality management measurements developed is a matter to be discussed later in this paper.

Quality management approaches and philosophies have extended well beyond the manufacturing industry to date, permeating almost every industry in the world. These include, but are not limited to, healthcare (Donabedian, 1978), education (De Jager, 2007, Brown & Marshall, 2008), service industry (Longbottom & Zairi, 1996), non-profit organization (Frise, 2004), and community (Duke & Price, 1993).

Organizations that have employed quality management approaches have reported benefits similar to those identified by empirical research such as: (a) sustainable competitive advantage (Reed, Lemak, & Mero, 2000), (b) improved organizational effectiveness (Ugboro & Obeng, 2000), and (c) increased financial performance (Agus, Krishnan, & Kadir, 2000). In his experience-based approach, Wright (1990) highlighted the byproducts of total quality (TQ) as better morale and teamwork spirit.

<div align="center">Frontline Employee Issues In Quality Management Research</div>

As the realization of the criticality of quality increased, the focus of much research turned toward quality management. Garvin (1983) examined why the Japanese could outperform Americans in quality management through his multiyear observation and study of room air conditioning manufactures. He concluded that the Japanese attained better performance in (a) developing and executing quality programs and policies, (b) managing information system, (c) product design, (d) establishing and following production and workforce policies, and (e)

managing vendors. He then argued that in order to close the gap between Japanese and American companies, these functional areas had to be strengthened in American companies.

American companies were not the only ones needing to improve quality, however. The quality emphasis soon captured the attention of companies outside the USA and Japan. With globalization and low-priced products becoming easily accessible worldwide (Bayazit & Karpak, 2007), quality became an issue of concern for the entire world. Subsequently research in quality management has been conducted in Singapore (Quazi, Jemangin, Low, & Chin, 1998), Malaysia (Agus et al., 2000), India (Motwani, Mahamoud, & Rice, 1994), China (Hua, Chin, Sun, & Xu, 2000), Taiwan (Solis et al., 1998), the Netherlands (de Vries & van de Water, 1992), United Kingdom (Longbottom & Zairi, 1996), South Africa (De Jager, 2007), Turkey (Bayazit & Karpak, 2007), Norway (Sun, 1999), and United Arab Emirates (Badri, Davis, & Davis, 1995).

As a result of the world-wide focus, there have been many researchers trying to identify the key elements in planning and executing quality management (Saraph et al., 1989; Ahire et al. 1996; Chin et al., 2002). While the assortment of instruments that resulted from the various research efforts differed in emphasis, they all shared a specific component – managing frontline employees.

Saraph et al. (1989) decided to create a new instrument by synthesizing the literature. They recognized that the various quality gurus had established their approaches to and requirements for quality management based on their own experience and judgment accumulated while working with different organizations. They further recognized there had been no systematically-designed and empirically-proven instruments to assess companies' quality management. They collected 120 quality management items from literature review, and categorized them into eight dimensions: (a) role of management leadership and quality policy,

(b) role of quality department, (c) training, (d) product/service design, (e) supplier quality management, (f) process management, (g) quality data and reporting, and (h) employee relations. With the testing of validity and reliability, the 120 items were reduced to 66. Consequently, they created an instrument that management would be able to utilize to evaluate either their overall perception of the quality management level or specific individual dimensions.

A closer look at the 66 items reveals that in dimensions (c) and (h), some items specifically relate to frontline employees' management. These included (1) providing specific work-skill training to hourly employees, (2) determining the reliability of resources for employee training in the division, (3) measuring the effectiveness of employee involvement programs, and (4) determining the extent to which employees are held responsible for error-free output.

Overtime, the eight-dimension measurement model was utilized to assess the quality management status as well as validity and reliability in three different countries. Motwani et al. (1994) used it in India, Badri et al. (1995) in the United Arab Emirates, and Quazi et al. (1998) in Singapore. Unfortunately, the research in India by Motwani et al. did not support the validity or reliability of the instrument. However, the research in the other two countries did provide evidence for validity and reliability.

Based on their literature review and actual organizational practices, Ahire et al. (1996) developed a 60-item instrument to measure 12 quality management constructs. They tested their instrument at 370 automobile component manufacturing companies. Among these 12 constructs, frontline employee related items are represented in three of the constructs: (a) employee empowerment, (b) employee involvement and (c) employee training. Sample items for the three constructs include:

Employee empowerment example - Line workers are encouraged to fix the problem they

find (p. 55);

Employee involvement example - Cross-functional teams are often used (p. 55);

Employee training example - Resources are available for employee quality training (p.

55).

None of the items are designed to understand frontline workers' individual personality

characteristics or their perception of the work environment.

One year later, Raghunathan et al. (1997) developed their own instrument with 8-

dimensions intended to evaluate quality management designed for use in the United States,

China and India. Their instrument included dimensions in (a) leadership, (b) information and

analysis, (c) strategic quality planning, (d) human resource development, (e) quality assurance,

(f) supplier relationships, (g) quality results, and (h) customer orientation. Their research

revealed that despite the fact that the importance of human resources development in achieving

overall business success was widely espoused, as a practice it received the lowest rating among

all eight management dimensions in all three countries.

Solis et al. (1998) modified the instruments of Raghunathan et al. (1997), and developed

their own instrument in order to compare the quality management of manufacturing with service

companies in Taiwan. As in the earlier research, it was again found that among the eight

dimensions of quality management, human resource development practices received the lowest

score.

Chin et al. (2002) investigated critical success factors affecting the implementation of

total quality management in China. They selected and categorized factors from their review of

current literature into four groups: (a) organizing, (b) culture and people, (c) measurement and

feedback, and (d) systems and techniques. Organizing, culture and people were considered as soft factors while measurement and feedback, systems and techniques were considered as hard data. Each factor contained several sub-factors. Through interviews with quality managers from six state owned enterprises (SOE) and seven foreign joint ventures (FJV), Chin et al. found that for both SOEs and FJVs, soft factors were more significant than hard factors in decisions regarding total quality management implementation.

In contrast to others' (Saraph et al., 1989; Ahire et al., 1996), Chin et al. (2002) identified one additional factor – culture. They defined culture as the collection of people's behavior and thoughts, and argued that understanding one organization's culture was very important to quality management. Later, Najeh and Kara-Zaitri (2007) echoed this argument based upon their research. They compared 32 quality factors to evaluate the impact of culture and how these factors are viewed differently in terms of their criticality and importance in Malaysia, Palestine, Saudi Arabia, Kuwait and Libya. They concluded that in these different countries with different cultures, quality factors are perceived at differing levels of importance. Thus, it was concluded that managers who execute quality management in different countries and cultures, should adjust their approaches and emphasis to the specific country.

A sub-factor in the cultural research of Chin et al. (2002) was human resource development, relating to activities intended to release the full potential of people so as to achieve continuous performance improvement and business success. This was in addition to the education and training sub-factor included in the organizing factor. In their approach, the individual characteristics were not included and studied in the human resource development sub-factor. An effort to release people's full potential without understanding their individual characteristics unnecessarily limits managers' view and the execution of quality management.

Frontline Employee Personality Factors, Organizational Experience and Performance

The review of the quality literature in both practice and academia highlights the important role that management of frontline employees plays in the various approaches to quality management. In concert it was agreed that "companies must develop and realize the full potential of the work force and maintain an environment conducive to full participation, quality leadership, and person and organizational growth" (Raghunathan et al., 1997, p. 194). But thus far in the area of quality management, the frontline employee management issues are mostly viewed from an organizational perspective and evaluated by managements' perception. The fact that when measuring company's quality management, most invited participants were quality managers or top executives, such as general manager, presidents or vice presidents (Saraph, et al., 1989; Solis et al., 1998), succinctly illustrates this point. This might be explained by the profound impact of the quality gurus (such as Deming, Juran) who believe that management and leaders should be held responsible for quality problems (Beckford, 2002).

It is true that management has the greatest single influence on quality, because that is where the bulk of power, control and leadership reside (Beckford, 2002). Agus et al. (2000) explicitly stated that the commitment of top management was pivotal to the success of the implementation of total quality management. Thus, leaders and managers are the driving force in quality management. However, responsibility should be shared by every single individual who is involved in the production process. Beckford (2002) stressed that the responsibility for quality rested upon those who had the power to achieve higher quality. Thus, if the management controls the power, then it is the management that should take responsibility. However, if power is shared throughout the organization, then quality should be everyone's responsibility, including frontline employees.

Understanding frontline workers' personality and perception of the workplace has the potential to inform and enhance management's role and thereby improve quality. The reliance on the perception of management can lead to a bias in the evaluation process. Employees at different levels can view quality management differently. In a study utilizing the Work Environment Scale (WES), Schlueter (1992) compared the perceptions of the current work environment, the ideal work environment and the ideal quality environment among managers, non-managers (participants who did not have subordinates) and non-exempt (participants who qualified for hourly wages) in two different departments of a semiconductor company. She concluded that among different levels of employees in different departments, not only their perceptions of current and ideal work environment differed, but so did their evaluation of the ideal quality environment.

Another example of the importance of the frontline employees stems from the story of Fletcher Challenge Steel China, a Sino-New Zealand joint-venture (Beckford, 2002). It was strongly suggested that quality was more than a technical issue, and that the success of designing and implementing quality programs certainly needed "the whole-hearted commitment and active participation of all those involved in or affected by the programme" (p. 108). However, the interests between upper management and individual workers may conflict. Management's goal is to improve quality, reduce cost, and increase product quality and profit. Workers may be apprehensive that this goal will bring changes and changes will potentially cause loses for them, possibly even job loss. In this situation, there will not be a lot of drive and motivation for the workforce to dedicate to the quality program (Juran, 1989).

From the 1980s, topics about personality and workplace performance have gathered an increasing amount of attention in industrial and organizational psychology (Tett, Steele, &

Beauregard, 2003). Personality inventories have been utilized for various purposes in areas that include family counseling (Cattell & Nesselroade, 1968), stress management (Darling, Hill & McWey, 2004), and medical research (Cattell, 1989). Research into personality and job performance has been conducted as early as the late 1960s (Karson, 1969). At an individual level, they have been used for pre-employment assessment (Shelton, 2004), career assessment (Ward, Cunningham & Wakefield, 1976) and leadership development (Mottram, 1988). At the organizational level, they have been used to explore counterproductive work behavior and organizational citizenship behavior (Spector & Fox, 2002), team work (Peeters, van Tuijl, Rutte, & Reyman, 2006), and job performance (Tett et al., 2003).

Among various personality inventories, the Sixteen Personality Factors inventory (16PF) is one of the most widely used in the world today. The Institute for Personality and Ability Testing (IPAT) has developed an enormous database for the 16PF over the past thirty years. After more than a decade of research, it was first published by Dr. Raymond B. Cattell in 1949 (Conn & Rieke, 1994). Now in its fifth edition, the 16PF is available in 40 languages and widely used in such areas as career development, leadership selection and development, marital and family therapy, and medical research.

Cattell yielded 16 primary personality factors: *Warm* (factor A), *Conceptual Thinking* (factor B), *Emotionally Stable* (factor C), *Assertive* (factor E), *Lively* (factor F), *Rule-Conscious* (factor G), *Socially Bold* (factor H), *Sensitive* (factor I), *Suspicious* (factor L), *Practical* (factor M), *Private* (factor N), *Apprehensive* (factor O), *Open to Change* (factor Q1), *Self-reliant* (factor Q2), *Perfectionistic* (factor Q3) and *Tense/Driven* (factor Q4) (Russell & Karol, 1994). Through factor analysis, Cattell derived five additional factors, which became known as the original "big five." In the fifth edition they are subsumed under the descriptor "global factors". These five

factors are: *Extroverted* (EX), *Anxiety* (AX), *Tough-Minded* (TM), *Independent* (IN) and *Self-Controlled* (SC). The meaning of each factor is provided in Appendix A.

Thus far the 16PF has proven successful in exploring the relationship between personality and workplace factors in a wide spectrum of industries. The 16PF has been utilized to identify personality characteristics of women of distinction (Bachtold, 1976), terminated executives (McLoughlin, Friedson, & Murray, 1983), machine operators (Schuerger, Ekeberg, & Kustis, 1994), United States Air force non-commissioned officers (Allen, 1999), health care executives (Rooney, 1997), air traffic controllers (Oakes, Ferris, Martocchio, Buckley, & Broach, 2001), and medical students (Meit, 2001). It also has been utilized to analyze the relationship between personality and organizational withdrawal (Bernardin, 1977); distinguish communication patterns between pilots and flight attendants (Chircop-Rollick , 2008); identify the different personalities among surgeons, anthesiologists and family practioneers (Borges, 1998); predict career crisis and job fit (Jackson, 2001), successful cabin crew performance (Furnham, 1991), and flight training outcome (Bartram, 1995).

Research results summarized by Schuerger and Watterson (1998) illustrated the relevance of the 16PF to the manufacturing workplace: Franklin (as cited by Schuerger & Watterson, 1998) found that technical personnel like engineers, scored low on *Sensitivity* (factor I). Schuerger et al. (1994) found that among machine operators, scores of global factors of *Extraversion* (EX), *Anxiety* (AX) and *Independency* (IN) were lower than general population average scores while *Self-Control* (SC) and *Practicality* (TM) were higher than general population average scores. Schuerger (as cited by Schuerger & Watterson, 1998) noted that the 16PF personality factor *Liveliness* (factor F) correlated positively with high performance in sales and management while *Social Boldness* (factor H) correlated negatively with production and mechanical workers.

Researchers not only have found a correlation between personality traits and workplace performance, they have also found a correlation between employees' experience of the workplace and their performance. The Work Environment Scale (WES) is one of the measurements used to assess an individual's experience of their workplace. It was developed and published by Dr. Rudolf Moos of Stanford University in 1974 to evaluate the work environment at the Palo Alto Veterans Hospital. Since that time, the WES has enjoyed wide-spread application to numerous organizations and work environments, both in the United States and in many countries around the world. Based on 35 years of research using the WES, Moos (2008) depicted a work climate that promotes morale and performance, one that is very similar to that which would promote quality assurance. He described it as one that is "characterized by strong task focus, opportunities for independent decision making, and clear policies and procedures" (p. 92).

With three separate forms, the WES assesses employee's perception of the work environment from three perspectives: the *Real Form* measures employee's perception of the current work environment; the *Ideal Form* measures employee's perception of the ideal work environment; and the *Expectations Form* measures employee's expectations about the work setting (Moos, 2008). The WES has 10 scales measuring three dimensions of the work environment (Moos, 2008): (1) Relationship Dimensions – *Involvement, Coworker Cohesion* and *Supervisor Support*; (2) Personal Growth Dimensions – *Autonomy, Task Orientation* and *Work Pressure*; (3) System Maintenance and Change Dimensions – *Clarity, Managerial Control, Innovation* and *Physical Comfort*. An introduction of each scale is provided in Appendix B.

The WES has been utilized to measure change in the workplace and the impact of interventions such as increased supervisor support. Several researchers (Sinclair & Frankel,

1982; Taveira, James, Karsh, & Sainfort, 2003) have found that the implementation of quality assurance programs influenced the perception of the workplace. Sinclair and Frankel (1982) found that compared with the control group, the experimental group who participated in quality assurance activities, perceived increased *Supervisor Support* and reduced *Managerial Control* as an effect. Nicholson (1985) found that teams that participated in quality management programs perceived greater *Task Orientation, Innovation* and *Managerial Control* and less *Work Pressure*, *Peer Cohesion* and *Supervisor Support* than those who did not participate in quality management programs.

In their study of 272 registered nurses (RN) of a large county hospital, Hayburst, Saylor and Stuenkel (2005) found that those RNs who stayed in the hospital reported higher *Peer Cohesion, Supervisor Support*, and *Autonomy* and lower *Work Pressure* than those who left the hospital. Although Hayburst et al. did not identify the various reasons why RNs left the county hospital, they did illustrate that in order to retain nurses, leaders should examine these aspects of work environment so as to create a nurturing and supportive workplace. Other studies have found that personality has a mediating effect on perception (Johnston, 1974; Berman, 1989). Johnston (1974) concluded that active people, who had the capacity to "establish and maintain a satisfying and productive relationship with his environment" (p. 623), experienced the organization as open, egalitarian and less problem and constraints while passive people view the organization as chaotic and restricted in upward communication.

Eastburg, Gorsuch, Williamson and Ridley (1994) found a strong negative correlation between burnout and social support when examining the 16 PF *Social Boldness* (factor H), the WES, and the Maslach Burnout Inventory. They also found that nurses who scored higher on the H scale required more social support.

Berman (1989) utilized the16PF as one of his instruments in a textile manufacturing plant to evaluate the relationship between personality and the experience of the work environment. He studied 354 employees, both male and female blue-collar machine operators and administrative/supervisory personnel. He concluded that the "person-climate relationships are of sufficient size that they deserve the attention of organization climate theorists" (p. 108)

While quality experts and subsequent researchers have emphasized the importance of human resource development issues, such as selection, training, and supervision, there is no evidence they have benefited from the scientific advances in personality assessment instruments, such as the 16PF to advance the cause of quality management. Yet as has been discussed, there are ample research findings to support the notion that a closer look at the relationship of frontline workers' personality and workplace perception to their quality assurance performance could contribute to the theory and practice of quality management. Links have already been established between an employee's perception and experience of their workplace, and its impact on their performance. By using the 16PF and the WES, this researcher was seeking to enhance managements understanding of frontline employees' relationship to quality assurance and thereby contribute to the field of human resource development and the approaches of quality management.

CHAPTER 3

METHOD

Famed quality experts in the past have agreed that the major reasons for quality problems stem from organizations' structure, systems and management. These experts also agreed that people issues, including frontline workers, play an important role in quality assurance. They acknowledge the role of frontline employees in quality assurance. Adequate attention has not been paid to issues such as the relationship between the personality factors and organizational experience of frontline employees to their quality performance. Sousa and Voss (2002) concluded that quality management had been focusing on the system factors, while person factors, such as personnel selection, being neglected. However, since research has demonstrated "overwhelming validity evidence" (Ones & Viswesvaran, 1996, p. 612) of a relationship between personality and performance, it indicated that frontline workers' personality traits and experience of the work environment would have a significant relationship to their quality performance.

Participants

The participants of this study came from A Company, a medium-sized pipe manufacturing company located in the southern part of the United States. Comprised of 125 employees, A Company generates around $100 million in annual revenue yet has reoccurring quality issues which inhibit it from moving forward to achieve even higher success. To solve the quality

problem, A Company has taken a serious measurement, including replacing a majority of the manufacturing equipment. These efforts, however, have yielded only intermittent improvement. Moreover, educational and training efforts of frontline employees have resulted in only temporary spikes in quality improvement.

The participants in this study included frontline employees from all three shifts: morning (6am to 2:30pm or 7am to 3:30pm), afternoon (2pm to 10:30pm) and night (10pm to 6:30am) shifts. There were 69 frontline employees, consisting of 47, 12, and 10, respectively for the three shifts. They were employed in various departments including molding, quality control, extrusion, blending, maintenance, packaging and assembly, distribution, tool shop and mold storage.

Direct supervisors of these frontline employees were included in this research to rate their supervisees' quality assurance performance. There were a total of seven direct supervisors. A second rater was selected for each frontline employee, which included (1) managers (2) directors of the respective department, or (3) supervisors of another shift who had some supervision of the employee due to an overlapping period during the changing of shifts. It was hoped that by using two scores, raters' bias could be minimized.

<div align="center">Instruments</div>

Sixteen Personality Factors (16PF) Fifth Edition

The 16PF has 185 questions written at a fifth-grade reading level (Russell & Carol, 1994) with three answering options—"a, b, c" ("b" is "?" meaning I don't know). There are 13 questions at the end of the instrument which measure analytic versus concrete thinking ability. On the profile sheet, each factor is plotted on a 10-point sten scale based upon norms established on a representative US population sample (N= 2,500).

The validity and reliability of the 16PF is well-established. Russell and Carol (1994) stated that:

> Construct validity of the 16PF Fifth Edition demonstrates that the test measures 16
> distinct personality traits. Criterion validity of the 16PF is demonstrated by its ability to
> predict various criterion scores, such as Self-Esteem and Creative Potential. (p. 70)

The test-retest reliability of the fifth edition of 16PF is on average .80 on a two-week interval and .70 on a two-month interval (Conn & Rieke, 1994).

Work Environment Scale (WES) Fourth Edition

The WES has three different forms, namely *Real, Ideal* and *Expectation* forms, to assess employee's perception of the current, ideal and expected work environment. For the purpose of this study, the research was focusing on frontline employees' perception of their current work environment, thus only the *Real Form* was utilized. It has 90 items totally. The test-retest reliability of each subscale ranges from .69 to .83 at a one-month interval (Moos, 2008).

Frontline Employee Quality Performance Rating Form

The frontline employee quality performance rating form was developed by the researcher based upon literature review, an evaluation of Company A's performance evaluation forms, and discussions with the management of Company A. Subsequently a questionnaire was designed with 8 items ranked on a 10-point Likert-type scale. In an attempt to capture relevant performance rating, which might not be included in the eight items, a ninth item, asking raters to rate their supervisees' overall quality assurance performance, was added. On the ranking form, "1" indicates very poor performance while "10" indicates excellent performance. The rating form is available in Appendix I.

Procedure

Through a phone conversation with the president of A Company on March 9, 2009, a verbal agreement was obtained for conducting the research. A letter of agreement (Appendix C) was obtained before the data collection. The frontline employees were asked to voluntarily participate in this research through a request placed on the employee notice board (Appendix D). One administrative employee was designated as a coordinator by A Company to assist in the data collection and ensure the research goes smoothly. However, the coordinator had no access to the data.

Frontline Employee

To encourage frontline employees' to voluntarily participant in the study, an incentive was offered upon their signature on the informed consent (Appendix F). The incentive includes a computer-generated 16PF report with a verbal debriefing in a group setting to enhance their self-understandings and eligibility for a drawing of four $50 cash prizes. The debriefing was conducted by Dr. Thomas L. Needham who had over thirty years of experience in the 16PF. More information about Dr. Needham is included in Appendix G.

In order to ensure confidentiality, all frontline employees were asked to gather in A Company's training center for an introduction to the research. This process was conducted with the assistance of the coordinator. In order to minimize the interruption of the company's working schedule, all frontline employees were divided into seven separate groups with the size ranging from 5 to 17 participants. During those sessions, participants were introduced to the purpose of the research, procedures for ensuring confidentiality, their right to withdraw at any time without any punishment as well as the lucky draw and opportunity to attend a debriefing on the 16PF.

At the time of the assessment, each participant received an assessment package including instructions (Appendix E), a consent form (Appendix F), a demographic survey (Appendix G), the 16PF and WES questionnaires, answer sheets, a pencil, and an eraser. Frontline employees had the choice of staying at the training center to complete all the questionnaires or taking the package home and returning it back to the researcher, completed or uncompleted. This step provided protection of participants' confidentiality.

The demographic survey and answer sheets were coded to ensure privacy and confidentiality. A document with the coding system was saved in the researcher's laptop, safeguarded by password access. The consent form was coded and was collected before participants proceeded with the assessment. Once participants completed and submitted the demographic information and assessment answer sheets, their packets were sealed. Only the investigator knew the identity of the assessment findings.

Supervisors

Each supervisor signed a consent form (Appendix H) unique to their role in evaluating their respective frontline employees. Upon signing the consent, they completed a quality performance rating of the frontline employees for whom they were supervising. A second rater was scheduled from managers and directors of the department, and supervisors of another shift who had some supervision on the ratee, in hopes of diminishing rater bias.

To protect the confidentiality of frontline employees, the rater received quality assurance rating forms with frontline employee's names lightly penciled on the top right corner. Once all forms are collected, the name was immediately removed and replaced by a code.

Data Analysis

First, all frontline employees' answers on 16PF were entered into scoring program to obtain personality factors scores. Their answers on WES were manually scored by the scoring instrument. Then, all information, including demographic information, personality factors scores, and their perception of the workplace environment were entered into SPSS 17.0 program, using the coded numbers rather than names.

Descriptive statistic information was obtained by using SPSS 17.0 program. ANOVA was used to assess whether there was any difference in personality factors and perception of workplace among participants with different gender and from different shift. All these were conducted for the purpose of understanding more about participants.

Spearman correlation was used to assess whether there was any consistent relationship among participants' quality assurance performance ratings, personality factors, and perception of the workplace environment.

CHAPTER 4

STATISTICS

The intent of this study was to explore the relationship of frontline employees'

personality factors and perception of the work environment with their quality assurance

performance. The research questions included:

1. What are the differences in personality factors of frontline employees rated

    high compared with those rated low on quality assurance performance by the

    management?

2. What are the differences in their perception of the workplace of frontline

    employees rated high compared with those rated low on quality assurance

    performance by the management?

The sample of this study involved frontline employees in a medium-sized

manufacturing company located in the Southern United States. The subjects worked in

various departments including molding, quality control, extrusion, blending, maintenance,

packaging and assembly, distribution, tool shop and mold storage. There were a total of

69 frontline employees. An introduction of the research was provided to all frontline

employees in the company's training room prior to the data collection process. Each one

took the research packet and 55 returned their packets. Of the 55 packets received, 49

were qualified for inclusion in the research study. Among the six packets that did not

qualify for inclusion in the research, two were missing the demographic information form and four were missing a completed WES instrument.

A packet of evaluation forms was provided to each direct supervisor and they were requested to rate their supervisees' quality assurance performances. Hoping to minimize rater bias, a second rater was secured for each frontline employee. To maintain the confidentiality of frontline employee, no supervisors were allowed to know which frontline employees actually participated in the research. The first group of raters was selected because they were the direct supervisors for participants. The second group was selected because they were also familiar with particular frontline employees. The second group of raters included, one manager, one senior director, and six supervisors who were the supervisors of another shift which overlapped an earlier or later shift thus providing them knowledge of frontline employees for whom they were not directly responsible. The first and second group of raters provided quality assurance ratings for all frontline employees.

<div align="center">Demographic Information</div>

The demographic information of the 49 frontline employees is reported in Table 1. The breakdown of age shows that, by far the largest age group was in their fifties (51%), while the second largest group was in their forties (26.5%). A small percentage was represented at the two extremes of the sample with 4.1 percent in their twenties and 6.1 percent in their sixties. Only two participants did not provide their age. However, because they completed all other information, they were included in the sample because age was not variable that impacted the outcome of this research project.

Table 1 Participants' Age

	N	%
21 – 29	2	4.1
30 – 39	4	8.2
40 – 49	13	26.5
50 – 59	25	51.0
60 – 69	3	6.1
Missing	2	4.1
Total	49	100

Additional demographic information of the sample included such factors as gender, shift, education, length of service, and whether or not they enjoyed working in A Company. Male employees accounted for 79.6 percent of the participants. The morning shift (6am to 2:30pm and 7am to 3:30pm) had the largest group with 35 participants. The afternoon shift (2:00pm to 10:30pm) had 8 participants; while the night shift (10pm to 6:30am) had 6 participants.

Table 2 presents the education background of participants. A majority of the frontline employees (57.1%) indicated they were high school graduates. The percentages that had a primary school education and indicated "Others" were both 16.3. Among those who indicated "Others", four of them completed some college coursework, two completed vocational school education and two held technical college certificates. When asking participants whether they were happy working in the current company, slightly more than seventy-five percent (75.5%) of the participants indicated they were.

The average length of employment at Company A was 10.2 years, with a range varying from 2 months to 33 years. The average length of time in the current position

Table 2 Education Background of Participants

	N	%
Primary	8	16.3
High school	28	57.1
Associate Degree	3	6.1
BS/BA	2	4.1
Others	8	16.3
Total	49	100

was 7.7 years, with a range varying from 1 month to 17 years.

Descriptive Data on the Independent Variables

The ranges, means, and standard deviations for each factor on the 16PF are presented on Table 3. It shows that the means, on the 10-point sten scale, range from a low of 3.94 (*Warmth*) to a high of 7.35 (*Tough-Mindedness*).

Table 4 reveals the mean of each scale on the WES, on a 9-point scale, along with the range of scores. It also shows the means ranging from a low of 3.41 (*Innovation*) to a high of 5.92 (*Managerial Control*).

An independent t-test was conducted to evaluate the difference between male and female participants' personality factors and their perceptions of the workplace. Results with significant mean difference were presented in Table 5. It can be seen from the table that compared with female participants, male participants were significantly more *Tough-Minded* (TM), *Tense* (factor Q4), less L*ively* (factor F), and less *Sensitive* (factor I) on the 16PF. On the WES, female participants perceived significantly more *Involvement, Peer Cohesion, Supervisor Support,* and a higher level of *Managerial Control*.

Table 3 Descriptive Statistics for 16PF.

	Range	Lowest	Highest	Mean	SD
Extraversion	6	1	7	4.29	1.646
Anxiety	8	2	10	6.06	1.676
Tough-mindedness	5	5	10	7.35	1.316
Independence	7	2	9	5.04	1.471
Self-control	5	4	9	6.18	1.380
Warmth (A)	6	1	7	3.94	1.478
Reasoning (B)	7	1	8	3.98	1.876
Emotional stability (C)	7	1	8	5.02	1.450
Dominance (E)	8	1	9	5.02	1.639
Liveliness (F)	7	2	9	4.71	1.780
Rule-consciousness (G)	6	3	9	6.04	1.369
Social boldness (H)	6	2	8	4.71	1.500
Sensitivity (I)	7	1	8	4.18	1.481
Vigilance (L)	5	5	10	7.18	1.629
Abstractedness (M)	8	2	10	5.18	1.704
Privateness (N)	6	3	9	6.14	1.443
Apprehension (O)	7	2	9	5.20	1.581
Openness to change (Q_1)	6	1	7	4.27	1.366
Self-reliance (Q_2)	8	2	10	6.22	1.545
Perfectionism (Q_3)	6	3	9	6.08	1.656
Tension (Q_4)	7	2	9	5.49	1.721

Table 4 Descriptive Statistics for WES

	Range	Lowest	Highest	Mean	SD
Involvement	9	0	9	3.86	2.515
Peer cohesion	7	1	8	4.37	1.749
Supervisor support	7	0	7	4.16	1.993
Autonomy	7	1	8	4.61	1.565
Task orientation	9	0	9	4.93	2.231
Work pressure	9	0	9	5.80	1.826
Clarity	8	0	8	3.92	1.835
Managerial Control	8	1	9	5.92	2.139
Innovation	9	0	9	3.41	2.432
Comfort	7	1	8	3.79	1.800

Table 5 Difference between Male and Female Participants' 16PF and WES Scores

	Male n=39		Female n=10		t	df	Sig. (2-tailed)
	Mean	SD	Mean	SD			
16PF							
Tough-Minded	7.615	1.290	6.3	.823	3.055[*]	47	.004
Liveliness (factor F)	4.46	1.745	5.7	1.636	-2.026[*]	47	.048
Sensitivity (factor I)	3.79	1.301	5.7	1.16	-4.214[**]	47	.000
Tension (factor Q_4)	5.77	1.495	4.4	2.171	2.347[*]	47	.023
WES							
Involvement	3.35	2.286	5.85	2.473	-3.041[**]	47	.004
Peer Cohesion	4.06	1.755	5.55	1.165	-2.527[*]	47	.015
Supervisor Support	3.82	1.918	5.5	1.78	-2.504[*]	47	.016
Managerial Control	5.54	2.175	7.4	1.174	-2.598[*]	47	.012

[*] $p < .05$. [**] $p < .01$.

By using ANOVA, six personality factors were discovered to be significantly different among frontline employees in three shifts. These six factors were *Extraversion*, F (2, 46) = 4.128, p = .022, η^2 = .152; *Tough-Mindedness*, F (2, 46) = 3.946, p = .026, η^2 =.146; *Independence*, F (2, 46) = 4.301, p = .019, η^2 = .158; *Warmth,* F (2, 46) = 4.63, p = .015, η^2 = .168; *Privateness,* F (2, 46) = 3.401, p = .042, η^2 = .129; and *Openness to Change, F* (2, 46) = 7.43, p = .002, η^2 = .244.

Utility of Two Groups of Raters

An application of the Spearman correlation coefficient revealed the relationship between the ratings of the first and second groups of raters for each of the 9 items on the quality assurance performance rating form. Table 6 shows the correlation coefficient for each item. Gravetter & Wallnau (2009) stated that r^2, the coefficient of determination, could be used to "evaluate the size of strength of the correlation" (p. 534). They stated that an r^2 value of 0.01 indicated a small correlation, 0.09 a medium correlation, and above 0.25 a large correlation. Therefore, the correlation coefficients in Table 6 can be considered as small to medium correlation. This low-to-moderate size correlation for the two groups of rates resulted in their average scores proving of no utility. Thus after a review of the literature on multiple raters, only the scores of the first group of raters, the direct supervisors, were utilized. Sundvik and Lindeman (1998) provided support for this approach in their findings that raters who knew the ratees well could make accurate evaluations. In Chapter 5, this issue will be discussed in more detail.

Table 7 shows the significant inter-correlations of the 9 items used to rate quality assurance performance (Appendix I). Moreover, the significant correlations between the

overall performance rating item (item 9) and the other eight rating items indicates that

item 9 captures most of the behaviors measured on all the other eight rating items.

Table 6 Correlation Coefficient between First and Second Groups Raters

Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9
.331*	.446**	.383**	.360*	.388**	.474**	.346*	.282*	.331*

* $p<.05$. ** $p<.01$.

Table 7 Quality Assurance Performance Measurement Scale

	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9
Item 1	$.932^{**}$	$.726^{**}$	$.718^{**}$	$.757^{**}$	$.581^{**}$	$.610^{**}$	$.655^{**}$	$.737^{**}$
Item 2		$.809^{**}$	$.809^{**}$	$.833^{**}$	$.657^{**}$	$.680^{**}$	$.709^{**}$	$.836^{**}$
Item 3			$.896^{**}$	$.900^{**}$	$.843^{**}$	$.869^{**}$	$.874^{**}$	$.905^{**}$
Item 4				$.845^{**}$	$.871^{**}$	$.843^{**}$	$.882^{**}$	$.864^{**}$
Item 5					$.817^{**}$	$.879^{**}$	$.822^{**}$	$.911^{**}$
Item 6						$.891^{**}$	$.930^{**}$	$.817^{**}$
Item 7							$.913^{**}$	$.852^{**}$
Item 8								$.859^{**}$

* $p<.05$. ** $p<.01$.

Table 8, which exhibits the mean, standard deviation and range of scores for each

of the 9 quality performance rating items, further illustrates how the means cluster

together. It also illustrates the moderate rating of the 49 frontline employees since the

greatest mean on the 10-point Likert-type scale was item 2 at 6.531. The high frequency

of average ratings is illustrated by an analysis of item 9 (M=6.512). When the scores are

divided into three categories (low = 1-3; average = 4-7; high= 8-10), by far the largest

category is the average range. There were 69.4 percent participants rated in the 4 to 7

range, 26.5 percent received a high rating of 8 or above, and 4.1 percent were rated in the

1 to 3 range.

Table 8 Descriptive Statistics for Quality Assurance Ratings

	Lowest	Highest	Mean	Std. Deviation
Item 1	4.00	10.00	6.306	1.805
Item 2	3.00	10.00	6.531	1.970
Item 3	3.00	9.00	6.225	1.585
Item 4	3.00	9.00	6.510	1.356
Item 5	3.00	9.00	6.265	1.753
Item 6	3.00	9.00	6.408	1.567
Item 7	3.00	8.00	6.306	1.446
Item 8	3.00	9.00	6.408	1.513
Item 9	3.00	9.00	6.512	1.392

Findings of the Study

By using only the direct supervisors' ratings, several significant positive

correlations were discovered with *Sensitivity* (factor I) and *Vigilance* (factor L). Table 9

presents the correlations.

However, the 16PF factors *Emotional Stability* (factor C), *Rule-Consciousness* (factor G), and *Perfectionism* (factor Q₃) did not have significant positive correlation with any of the 9 quality assurance items. Therefore, hypothesis one was not supported.

Hypothesis two was not supported either. A significant negative correlation was found between the first item of the quality assurance performance rating form and *Tough-Mindedness* (r = -.242, n = 49, p < .05). This indicates that those who scored lower on *Tough-Mindedness*, thus exhibiting more flexibility tended to have a higher score. *Liveliness* (factor F), *Apprehension* (factor O), *Sensitivity* (factor I), and

Table 9 Significant Correlation between Personality Factors and Items on Quality Assurance Performance Rating Form

Sensitivity (factor I)	R
Item 1. Uses the appropriate amount of raw materials according to company specifications	.292*
Item 2. Strictly follows working procedures as required	.247*
Vigilance (factor L)	
Item 3. Timely and adequately completion of documentation	.241*
Item 5. Proactively ensures the machinery is in the best operating condition	.263*
Item 9 Rate the overall quality performance for this frontline employee	.264*

*P<.05.

Abstractedness (factor M) did not have a significant negative correlation as hypothesized to any of the items in the form.

As Table 10 indicates, there were several significant correlations between quality assurance ratings and WES scale: *Work Pressure* positively correlated with the overall

quality assurance performance rating (item 9); *Managerial Control* positively correlated

with both the first and second items on the form – use the appropriate material according

to company specifications and follow strictly the work procedures as required,

respectively. *Involvement, Peer Cohesion, Supervisor Support, Task Orientation,* and

Clarity did not obtain significant positive correlations with any of participants' quality

assurance performance ratings as hypothesized. Therefore, hypothesis three was only

partially supported.

Table 10 Significant Correlation between WES Scales and Items on Quality Assurance

Performance Rating Form

Sub-dimensions	Item 1	Item 2	Item 3	Item 6	Item 7	Item 8	Item 9
Supervisor Support	-	-	-.245*	-.248*	-.243*	-.245*	-
Work Pressure	-	-	-	-	-	-	.273*
Managerial Control	.249*	.276*	-	-	-	-	-

Note. Item 1 is "use the appropriate amount of raw materials according to company specification"; item 2

is "strictly follows working procedures as required; item 3 is "timely and adequately completion of

documentations"; item 6 is "communicates in a timely manner to the supervisor(s) regarding

manufacturing problems(s) or perceived potential problem(s); item 7 is "when a problem has occurred,

actively and timely gives suggestions or recommendations to the supervisor(s); item 8 is "takes initiatives

with peers in quality problem solving"; item 9 is the overall score for quality assurance performance.

*p<.05.

Table 10 also shows that *Supervisor Support* had a significant negative

correlation with the item 3, 6, 7, and 8 on quality assurance performance rating forms.

This indicated that frontline employees who perceived lower supervisor support scored higher on these four particular items. *Autonomy, Innovation,* and *Work Pressure* did not significantly negatively correlate with any items on the quality assurance performance forms as hypothesized. Instead, *Work Pressure* had a significant positive correlation with the overall quality assurance performance rating (item 9). Thus, hypothesis four was not supported.

Conclusion

The purpose of this chapter was to present the results of the data gathered and to explore the relationship among frontline employees' personality factors, workplace experience and their quality assurance performance ratings. The Sixteen Personality Factors Inventory (16PF) and Workplace Environment Scale (WES) Real Form were administered to frontline employees. Among all frontline employees, 49 returned with all questionnaires completed. Supervisors rated their supervisees' quality assurance performance on 9-item, 10-point Likert-type scale. Then the supervisor's ratings of 49 employees were deemed usable for correlation purposes.

ANOVA and an independent *t*-test were used to analyze the difference between participants when grouping them according to two different criteria, namely gender and shift. Differences on several personality factors and perceptions of the workplace were discovered.

Then the Spearman correlation coefficient was used to explore the relationship of frontline employees' personality factors and perceptions of the workplace environment to their quality assurance performance. The low-to-moderate size of the correlation between

first and second groups of raters resulted in only using the direct supervisors' ratings for statistical analysis.

In summary, hypothesis 1, 2, and 4 were not supported and hypothesis 3 was partially supported. The answers to the research questions raised in Chapter 1 are:

1. As measured by the 16 Personality Factors inventory, frontline employees who scored higher on overall quality assurance performance had higher scores on *Vigilance* (factor L). Furthermore, another two factors including *Tough-Mindedness* (TM) and *Sensitivity* (factor I) were found to be significantly related with two particular quality assurance performance items respectively.

2. As measured by the Work Environment Scale Real Form, frontline employees who perceived more *Work Pressure* were rated higher by their direct supervisors on their overall quality assurance performance. Furthermore, *Supervisor Support* and *Managerial Control* were found to be significantly related with four and two quality assurance performance items respectively.

CHAPTER 5

DISCUSSION

Restatement of the Problem

The purpose of this research was to explore the role of frontline workers in quality management. Thus far, quality researches have primarily focused on the importance of management and leadership in achieving quality assurance. Consequently there has been limited research on quality management from the perspective of the contribution of frontline employees. The problem this research explored was the relationship of frontline employee's personality factors and perception of their work environment to the ratings of their quality assurance performance.

Restatement of the Purpose

The purpose of this study was to explore the existence of a relationship of frontline employees' personality factors and perception of the work environment to their quality assurance performance ratings.

The research questions were:

1. What are the differences in personality factors of frontline employees rated high compared with those rated low on quality assurance performance by management?

2. What are the differences in the experience of the work environment of

frontline employees rated high compared with those rated low on quality assurance performance by management?

The research hypotheses were:

1   Frontline employees who are rated high on quality assurance performance by management will have a significant positive correlations to scores on personality factors of *Emotional Stability* (factor C), *Rule-consciousness* (factor G), and *Perfectionism* (factor Q_3).

2   Frontline employees who are rated high on quality assurance performance by management will have a significant negative correlations to personality factors *Liveliness* (factor F), *Apprehension* (factor O), *Sensitivity* (factor I), *Abstractedness* (factor M).

3   Frontline employees who are rated high on quality assurance performance by management will have significant positive correlations with work environment factors *Involvement, Peer Cohesion, Supervisor Support, Task Orientation, Clarity, and Managerial Control.*

4   Frontline employees who are rated high on quality assurance performance by the management will have a significant negative correlation with *Autonomy, Innovation,* and *Work Pressure.*

<div align="center">Discussion</div>

Modification of the Rating Procedure

The research was initially designed so that the quality assurance rating for each frontline employee would be derived from the average score of two raters. It was believed this was necessary to minimize rater bias. However, due to the low-to-moderate

size correlation between the two groups of raters, this procedure was not utilized. Instead only the rating scores from the first raters, the participants' direct supervisors, were utilized in the statistical analysis.

There are several possible explanations for the occurrence of the low-to-moderate size of the correlation between the group of first raters and second raters. First, it could be attributed to a limited opportunity and time for direct observation by the secondary rating supervisor. In this case, the supervisor would rely, in part of, on other sources such as the opinions of other employees or supervisors. This could lead to a distortion of the ratings. This explanation was supported by A Company's human resource director. In their study of acquaintanceship and discrepancy between supervisor and self-assessment, Sundvik and Lindeman (1998) concluded that supervisors were able to make more accurate assessments of employees when they knew them better.

A second possible explanation that might contribute to the low-to-moderate size correlation between the two groups of rater is the different positions they hold within the organization. The first raters consisted of frontline supervisors, while the second raters included not only people at the supervisory level, but also those in higher positions such as department manager and director. Pulakos, Schmitt and Chan (1996) concluded that raters at different organizational levels might rate subordinates differently because they were evaluating different factors.

In addition to differences in position contributing to variances in rating, Borman (1979) concluded that raters' personalities also had an impact: accurate raters tend to be less apprehensive, more confident and detail-oriented. Wexley and Youtz (1985) determined that beliefs about human nature might also impact ratings. They found that

raters with a positive view of human nature rated more leniently. They also found that

raters, who believed people differed greatly from one another, provided more accurate

evaluations.

Raters' attitudes about the research can also impact the rating process. How the

raters interpreted the purpose of the research (Guscia, Harries, Kirby, & Nettelbeck, 2006)

and whether or not they would be held responsible for explaining their scores to ratees

(Mero, Motowidlo, & Anna, 2003) could impact the manner in which they rated. While it

is difficult to evaluate the extent to which the former might impact this rating process, it

is unlikely that the latter would be a problem since anonymity and confidentiality were

emphasized multiple times.

To determine which of these factors contributed to the second rater group having

a low-to-moderate correlation with the direct supervisor's ratings is beyond the scope of

this study. The accuracy of the direct supervisor's rating is assumed (Sundvik &

Lindeman, 1998), and thus justifiable for statistical analysis of the correlation between

frontline employees' personality factors and perception of the work environment to their

quality assurance performance.

Hypothesis One

Hypothesis one stated that frontline employees who were rated high on quality

assurance performance would have a significant positive correlations to scores on

personality factors of *Emotional Stability* (factor C), *Rule-consciousness* (factor G), and

Perfectionism (factor Q_3).

The application of the Spearman correlation to the data collected in A Company

revealed no statistically significant positive correlation between the rating of each item in

the quality assurance performance form and *Emotional Stability* (factor C), *Rule-consciousness* (factor G), and *Perfectionism* (factor Q_3) of the 16 Personality Factor inventory and thus did not support the hypothesis. This would indicate that frontline employees who scored higher on *Emotional Stability*, *Rule-consciousness* and *Perfectionism* would not tend to have higher scores on quality assurance ratings when compared with those who scored low on these three factors.

With Company A frontline employees' mean of 5.02 on *Emotional Stability*, which is slightly below the mean of 5.5 (10-point scale) and therefore leaning toward the less stable side, the current research subjects vary from previous studies on mechanical-oriented occupations. Conn and Rieke (1994) concluded that individuals in a mechanical type of vocation scored high on *Emotional Stability.* Schuerger (as cited by Schuerger & Watterson, 1998) also found *Emotional Stability* was positively correlated with production and mechanical workers.

While Company A's frontline employees' scores on *Rule-consciousness* and *Perfectionism* did not support the hypothesis of positively correlating to quality assurance performance ratings, they were nonetheless consistent with previous findings on mechanical and technical occupations (Schuerger & Watterson, 1998). With means of 6.04 and 6.08 respectively, greater than the average 5.5 mean score, the subjects manifested a similar respect for rules and striving to perform well as in Schuerger and Watterson's normative sample (1998).

Though not predicted, the application of the Spearman correlation revealed that *Vigilance* (factor L) had a significant positive correlation with frontline employees' overall quality assurance performance (item 9), r = +.264, n = 49, $p < .05$, one tail. With

a mean of 7.18, this factor was at the high-end of average and much higher than the 16PF

Sten mean of 5.5. The higher the score on this factor the more difficulty an individual has

in trusting and the more energy they put into vigilance in interpersonal interactions. On

the one hand, vigilance might be associated with some aspect of positive performance.

From this perspective, vigilance and suspiciousness may lead to a more cautious attitude

and approach with a greater investment of attention and time given to quality assurance.

On the other hand, it may be associated with counter productive work behaviors. This

was suggested by Schuerger (as cited by Schuerger & Watterson, 1998) that *Vigilance*

might have "a generally detrimental effect on employee behavior, especially at high

levels" (p 10).

Hypothesis Two

Hypothesis two stated that frontline employees who were rated high on quality

assurance performance would have a significant negative correlations to personality

factors *Liveliness* (factor F), *Apprehension* (factor O), *Sensitivity* (factor I),

Abstractedness (factor M). This hypothesis was rejected. A significant negative

relationship was only found between *Tough-mindedness* (TM) and the first item on the

quality assurance performance rating, which is using the appropriate amount of raw

materials according to the company's specification.

The mean of 4.71 for *Liveliness* (factor F) was in the expected direction. This

reflects seriousness and attention to detail. This finding was consistent with that of

Schuerger and Watterson (1998) who found it negatively correlated for production and

mechanical workers. Some samples of these types of workers had scores just above 4.0.

Though this factor was in the expected direction, there was no significant correlation between *Liveliness* and quality assurance performance ratings.

Similar results were found for *Sensitivity* (factor I) and *Abstractedness* (factor M). Schuerger (as cited by Schuerger & Watterson, 1998) found these two personality traits were negatively correlated for production and mechanical workers. The mean for Company A frontline employees on *Sensitivity* and *Abstractedness* was 4.18 and 5.18 respectively. This is consistent with the expected direction for frontline employees. Nevertheless, there was no significant negative relationship found between these two personality factors and quality assurance performance ratings.

Hypothesis Three

Hypothesis three stated that frontline employees who were rated high on quality assurance performance by management will have significant positive correlations with work environment factors *Involvement, Peer Cohesion, Supervisor Support, Task Orientation, Clarity,* and *Managerial Control*.

The application of Spearman correlation revealed that among these WES scales hypothesized, only *Managerial Control* had significant positive correlations to the first (use the appropriate amount of raw materials according to company specifications) and second item (strictly follows working procedures as required) of the quality assurance form. Thus, hypothesis three was only partially supported.

Though not predicted, the *Work Pressure* scale, which measures the extent to which employees perceive work demands and time pressure driving the workplace (Moos, 2008), was positively correlated with the overall quality assurance performance (item 9). One study, supporting the notion of this positive correlation, found that *Work*

Pressure positively correlated with *Drive* - an inner pressure leading employees to increase dedication and work longer hours (Johnstone & Johnston, 2005). However, this result differs from previous research findings whereby participants who provided higher quality service (Sinclair & Frankel, 1982) and those in a quality improvement programs (Nicholson, 1985) reported lower work pressure. Furthermore, work pressure has been found to be associated with such negative effects as quick turnover. For example, Hayburst et al. (2005) found that nurses who left the hospital in eighteen months or less, experienced high work pressure. Therefore, caution should be exercised in interpreting workplace pressure as a positive factor.

In this study, *Managerial Control* was the most significant perception of the work environment (M = 5.92, n = 49). This indicates the extent to which "management uses rules and procedures to keep employees under control" (Moos, 2008, p. 9). The finding that *Managerial Control* positively correlated with two items on the quality assurance rating form lends some support to the previous quality expert's opinion and research findings that management plays a key role in quality assurance (Saraph et al., 1989; Raghunathan et al., 1997; Augs et al., 2000). Also according to the WES manual (Moos, 2008), having *Managerial Control* as the most significant characteristic is typical for employees in realistic occupations.

The finding that there was no significant positive relationship between *Involvement* and any of the items on the quality assurance performance form is puzzling. The participants' mean for *Involvement* is 3.86 (n = 49, SD = 2.52), which according to the WES manual (Moos, 2008), is "well below average". The importance of employee involvement is widely accepted as an important criterion for quality management. It is

considered very important and is included in the Criteria for Performance Excellence (2009) for the Malcolm Baldrige National Quality Award. This has also been supported through the research of Ahire, et al. (1996) that determined involvement was one of the most important constructs in quality management.

Hypothesis Four

Hypothesis four stated frontline employees who were rated high on quality assurance performance by the management will have a significant negative correlation with *Autonomy, Innovation,* and *Work Pressure.* The hypothesis was rejected. As shown on Table 10 in Chapter 4 that only *Supervisor Support* has significant negative relationships with four items on the quality assurance performance form. This, to a certain extent, is consistent with Nicholson's finding (1985) that participants in quality improvement programs reported a lack of supervisor support. It differs though from the research of Sinclair and Frankel (1982) where participants in quality assurance programs reported higher supervisor support. In the current research, the negative correlation between *Supervisor Support* to some of the items on the quality assurance rating form might be due to participants seeking less help from their supervisors because they know what to do and how to do it, and thus report less perceived *Supervisor Support.*

<div align="center">Implications</div>

This study supports the notion that management can benefit in the promotion of quality assurance by ascertaining, through scientific measures, the personality and perception of frontline employees. The study further demonstrates the applicability of personality psychology and perception to human resource development. Sousa and Voss

(2002) also recommend further research to determine the interrelationship between management theory and quality management.

The personality and perceptions of Company A's frontline employees provide important information for designing interventions to improve quality assurance. First, the negative correlation between *Supervisor Support* as measured by the WES and quality assurance performance ratings, suggests four aspects requiring training and/or supervisor mentoring. This conclusion is based upon the fact that frontline employees who perceived a higher level of supervisory support received a lower rating on (a) Timely and adequate completion of documentation; (b) communicates in a timely manner to the supervisor(s); (c) when a problem has occurred, actively and in a timely manner, gives suggestions or recommendations to the supervisor(s); and (d) Takes initiative with peers in problem solving. These deficiencies indicate a need for human resource development programs to equip frontline employees with the necessary attitudes, knowledge and skills to ensure quality assurance.

Second, the study underscores the opportunity for Company A to evaluate the implications of the role and function of the personality trait—*Vigilance* on quality performance. With a mean of 7.18 on a 10-point scale, *Vigilance* among all participants was much higher than the norm group. Important questions include: Are the *Vigilance* scores a result of the external environment - global financial crisis? Are they the result of distrust of the supervisors of the company? Did the frontline employees bring this factor to the workplace?

These are important questions to consider since as Schuerger and Watterson (1998) pointed out high suspiciousness might lead to a detrimental effect on employee

behavior. So while it may now be associated with a quality assurance, it could result in problems in peer relationship and cohesion, which lead to a negative workplace milieu.

Similarly, *Work Pressure,* another potentially negative force, ranked as the second most significant perception. Moreover it significantly positively correlated with the overall quality assurance performance rating, $r = .273$, $n = 49$, $p < .05$, one tail. This finding shows that frontline employees whose quality assurance performance was rated high by management tended to perceive more demands and pressure in the workplace. While work pressure is not necessarily a negative force, when viewed from the perspective of all the perceptions of the workplace, important questions emerge including: (1) is work pressure a dominating motivation force in quality assurance? (2) what is the most effective coping strategy for the employees? (3) what other perceptions need to be addressed to shift motivation to a more positive perspective? At a minimum, the implication seems to call for increased supervisor support.

Fourth, results from the 16PF and WES show the need and challenge in developing a committed and cohesive workforce. Despite the average tenure at A Company being about 10 years, *Involvement* is one of the lowest scores on the WES. In fact the mean of 3.86 falls into the category of "considerably below average" (Moos, 2008). When combined with a similarly low score on *Clarity* and a below average score on *Peer Cohesion,* it might explain why *Managerial Control* was perceived as the prime motivating force.

A decision to moving to a more self-motivated workforce would encounter many challenges. Typically, individuals in *Realistic*-oriented occupations (such as production workers) are less inclined to emotional and social interaction so they tend to have less

Involvement, Cohesion, Support, Autonomy, and *Innovation* but perceive more

Managerial Control (Moos, 2008)*.* The challenge is further intensified because the

subjects tend to be very self-reliant, private and vigilant. Again, increased supervisor

support would be very helpful.

Fifth, frontline employees' scores on certain personality traits, as measured by the

16PF, support previous research findings. These personality traits include *Liveliness*

(factor F), *Rule-consciousness* (factor G), *Sensitivity* (factor I), *Abstractedness* (factor M),

Apprehension (factor O), and *Perfectionistic* (factor Q3). Schuerger (as cited by

Schuerger & Watterson, 1998) concluded that factor F, I, M, and O were negatively

correlated with mechanical and production workers. In the current research, the mean of

these four traits is 4.71, 4.18, 5.18, and 5.20, respectively, which is below the average

score of 5.5 and thus consistent with the direction of the scores previously obtained.

Similarly, the means of 6.04 for *Rule-consciousness* (factor G) and 6.08 for

Perfectionistic (factor Q3) in the current research is consistent with Schuerger's (as cited

by Schuerger & Watterson, 1998) finding that these two traits are positively correlated

with production and mechanic workers.

Limitations

There are several potential limitations to the current research. As stated in

Chapter 1 there are three primary limitations of this study. First, since the research was

conducted in one medium-sized manufacturing company in the Southern United States,

the generalization of findings are limited. The sample size is small and may not be

representative of other industries or geographical regions. Furthermore, since Company

A has reoccurring quality problems, the generalization of the findings must take that into

consideration. Second, if any of the subjects of this research felt targeted as the cause of the quality problems, or if they were unsure about their confidentiality, they may not have been totally truthful. Third, if the reading level of some of the frontline workers was below a fifth grade level, or if English was not their first language, they may have had difficulty comprehending items on the personality and work environment instruments. An attempt was made to mitigate comprehension problems by providing a clear explanation of the research purpose and by the researcher and her assistant being available to answer questions during the data collection process.

Another limitation may have resulted from the sampling process. Twenty frontline employees chose not to participate in the research. This may have resulted in not obtaining a representative perspective on Company A. Second, the results generated from this research are preliminary and may not be appropriately generalized to other companies. Third, the data was collected at the beginning of February 2010, shortly after the beginning of the 2009 global financial crisis. Many companies were downsizing and recruiting was stopped. This economic climate might have impacted the participants' perception of the company, their anxiety level and ability to trust. Previously, some researches (Schlueter, 1992; Shelton, 2004) encouraged caution when data collection occurred in a particular economic environment.

<div align="center">Recommendation for Future Study</div>

This research focused on the relationship of frontline employees' personality factors and perceptions of the workplace to their quality assurance performance ratings. Future research is recommended for several reasons:

First, future research should focus on the development of a quality assurance measure with items that are more discriminating and with lower inter-correlations than the one developed and utilized in this research. This would include developing items relative to specific work skills and tasks. Second, providing training for the raters could help to reduce the drift to the mid-point of the rating scale.

Third, if possible, future research should be conducted in a different economic environment. As indicated above, the external economic environment of the global financial crisis could have been a factor impacting participants' ratings. Fear of job loss and/or fear of inability to find a new job may change participants' responses. Future research could attempt to address this concern.

Fourth, since A Company is a moderate sized manufacturing company, replication studies should be conducted in companies from different industries and size. Fifth, other instruments could be utilized to explore how employee's quality assurance performance relates to their personalities and management style.

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APPENDIX A: DESCRIPTION OF EACH PERSONALITY FACTOR MEASURED BY 16

PERSONALITY FACTORS

Primary Factors	Description of Low Score	Description of High Score
A - *Warm*	Reserved, Impersonal	Warm, Outgoing, Attentive
B - *Conceptual Thinking*	Concrete	Abstract
C - *Emotionally Stable*	Reactive, Changeable	Emotionally stable, Mature
E - *Assertive*	Deferential, Cooperative	Dominant, Assertive
F - *Lively*	Serious, Restrained	Lively, Animated
G - *Rule-Conscious*	Expedient, Nonconforming	Rule-conscious, Dutiful
H - *Socially Bold*	Shy, Threat-Sensitive	Socially Bold
I - *Sensitive*	Unsentimental	Sensitive
L - *Suspicious*	Trusting, Unsuspecting	Vigilant, Suspicious
M - *Practical*	Practical	Abstracted, Imaginative
N –*Private*	Forthright, Genuine	Private, Non-disclosing
O - *Apprehensive*	Self-assured, Complacent	Apprehensive, Self-doubting
Q1 - *Open to Change*	Traditional	Open to Change
Q2 - *Self-reliant*	Group-oriented	Self-reliant
Q3 - *Perfectionistic*	Flexible, Tolerate Disorder	Perfectionistic, Organized
Q4 - *Tense/Driven*	Relaxed	Tense, High Energy, Impatient

Global Factors

EX - *Extroverted*	Introverted	Extraverted
AX - *Anxiety*	Low Anxiety	High Anxiety
TM - *Tough-Minded*	Receptive, Open-minded	Tough-minded, Resolute
IN - *Independent*	Agreeable, Accommodating	Persuasive, Willful
SC - *Self-Controlled*	Unrestrained, Follows Urges	Self-controlled

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APPENDIX B: DESCRIPTION OF WORK ENVIRONMENT SCALE

Relationship Dimensions

1.	Involvement	The extent to which employees are concerned about and committed to their jobs
2.	Coworker Cohesion	How much employees are friendly and supportive of each other
3.	Supervisor Support	The extent to which management is supportive of employees and encourages employees to be supportive of one another

Personal Growth Dimensions

4.	Autonomy	How much employees are encouraged to be self-sufficient and to make their own decisions
5.	Task Orientation	The emphasis on good planning, efficiency, and getting the job done
6.	Work Pressure	The degree to which high work demands and time pressure dominate the job milieu

System Maintenance and Change Dimensions

7.	Clarity	Whether employees know what to expect in their daily routine and how explicitly rules and policies are communicated
8.	Managerial Control	How much management used rules and procedures to keep employees under control
9.	Innovation	The emphasis on variety, change, and new approaches
10.	Physical Comfort	The extent to which the physical surroundings contribute to a pleasant work environment

APPENDIX C: LETTER OF AGREEMENT

Cao Yichun, M.S. student in Human Resource Development at Indiana State University, would like to conduct research for her master thesis. Her study is focusing on the relationship among frontline employees' individual personality characteristics, perceptions of the work environment and quality performance.

We are manufacturing plant in the southern United States and we are willing to allow the research to be conducted in our facility with our frontline employees. During the research process, Robert Lambert, Director of Human Resource, will be present to provide information about the appropriateness for our frontline employees. To ensure confidentiality and protect our employees' privacy, during the research process, only Cao Yichun and Dr. Thomas Needham, her research assistant will be allowed to collect data. I understand that both have completed the research ethics training for the Institutional Review Board (IRB) of Indiana State University. I further understand that no employee from our company will be involved in the data collection process.

We understand that at the end of her research, we will be provided a summary of the results generated by the study and a copy of her thesis. We understand that we will not be able to retrieve any specific individual employee's information, due to constraints of confidentiality.

_____

(Title)

APPENDIX D: RESEARCH PARTICIPATION REQUEST

Technicians * Operators * Machinists * Order Pickers

If you are interested in learning about your personality traits as measured by one of the world's leading instruments (16PF), and contributing to the advancement of knowledge about quality management, you will be interested in this project!

I am planning a study focusing on the relationship among frontline employee's personality traits, the perception of the workplace, and quality performance. I will conduct the research at your facility from February 1 to 4. Detailed times and locations will be posted soon. All you need to do is complete 3 questionnaires. Refreshments will be served. **All of your responses will be confidential.**

As a token of appreciation for your participation and contribution, you will be able to receive a computer-generated report on your personality. By the end of the study, regardless of whether you have completed all the questionnaires, you will be invited to participate in a small group debriefing to learn more about the different personality factors on the 16PF and related workplace performance. Dr. Thomas Needham, who has over 30 years of experience in interpreting the 16PF, will conduct the debriefing and answer any of your questions. Furthermore, once I receive your signed consent form to participate in the research study, you will have an opportunity to win one of four "lucky draw" $50 cash prizes.

I look forward to your participation! Your contribution is very important to the understanding of quality assurance and the important contribution of front line employees! If you would like to inquire further, please feel free to contact me at mandycyc@gmail.com.

Thank you!

Cao Yichun (Mandy)

M.S. student of Human Resource Development @ Indiana State University

APPENDIX E: INSTRUCTION

Thank you for your interest in participating in this research study!

In this packet, you will find the (a) consent form, (b) demographic information form and (c) two questionnaires and two answer sheets. Before proceeding to complete any of the questionnaires, you must carefully read the consent form, and if after reading it, you decide to participate in this study, please sign and return it to the researcher. Then, you can start completing three questionnaires. You may withdraw your consent and participation at any time during the process.

Since each package is coded, please don't exchange any of the documents inside with your peers.

There are a total of three questionnaires included in this study: a demographic information form, the 16 Personality Factor (16PF) inventory, and the Work Environment Scale (WES). You are encouraged to complete them according to the sequence below:

For the demographic information survey:

Please select the appropriate answer for you or write down the answers in the appropriate place. Do not put your name on the form because it has been coded to protect your confidentiality.

For the 16PF:

There are a total of 185 questions. Please place your answers on the answer sheet and do not mark on the questionnaire booklet.

(1) You will notice that the answer sheet has a code number in the name section. Please <u>do not</u> put your name on the answer sheet. The substitution of the code for your name is one of the many steps to protect your confidentiality and privacy.

(2) You <u>do not</u> need to put your age on the answer sheet because you have already provided that on the demographic information form.

<u>For the WES:</u>

(1) You will note that the answer sheet has a total of 2 pages. You <u>do not</u> need to provide any of the demographic information requested on the first page. You need only place your answers on the second page.

(2) You will notice that you are completing Form R. This is one of three different forms and the "R" means the real situation in the workplace as you see it.

(3) You will notice that the answer sheet has a code number in the name section. Please <u>do not</u> put your name on the answer sheet. The substitution of the code for your name is one of the many steps to protect your confidentiality and privacy.

Please read each question carefully before you respond. Should you have any questions regarding the instrument or a specific item, please discuss it with the researcher.

You will be able to complete the questioners in a maximum of 90 minutes. Once you completed all three questionnaires, please place the documents back into the envelope, seal the envelope and return it the researcher.

Thanks again for your participation!

APPENDIX F: CONSENT FORM FOR FRONTLINE EMPLOYEES

Participation:

I understand that I am invited to participate in this research because I am working as a frontline employee in the company.

Title of This Study:

The relationship among frontline employees' quality performance, personality traits, and the perception of the work environment.

Purpose of this study:

I understand the purpose of this research is to study the relationship among frontline employees' quality performance, personality factors and their perception of the work environment. The result of the study might be helpful to improve the quality management in the future. It might also be able to assist in the development of training and supervision strategies for quality management.

Cao Yichun (Mandy), M.A. student of Human Resource Development at Indiana State University is conducting this project as part of her master degree thesis.

Confidentiality:

I understand that all my answers to the questionnaires and the contents of my computer-generated report will be kept confidential from my employer. I also understand that the data I provide will be statistically compiled with that of other research participants without any

identification to me or any other participant. None of my supervisors or company management will have access to my answers or scores.

I understand that there are two options to complete all the questionnaires. The first option is to complete them now in the company's meeting room after this brief introduction of the research purpose. I can also complete all questionnaires at home, returning them back to the researcher by mail within two weeks. I further understand that if I remain to complete the questionnaires in the group setting that confidentiality as to my participation in the research cannot be guaranteed since my peers will observe my participation in the research study.

I understand that the second option, taking the packet of documents home and then returning them by a stamped self-addressed envelope to the researcher, will guarantee my confidentiality of participation.

Procedure:

This research involves completing a demographic information form and two questionnaires: the 16 Personality Factors (16PF) and Work Environment Scale (WES). Before proceeding to complete the demographic information form and the two questionnaires, this Consent Form needs to be signed and returned to the researcher. The time required is approximately 90 minutes.

I also understand that my supervisors will rate me on various quality assurance performance measures.

Incentives:

I understand there are two incentives for voluntarily participation in this research project: (1) After signing this Consent Form, I become eligible to win one of four "lucky draw" $50 cash prizes; and

(2) Upon completion of the questionnaires, I can choose to receive a computer-generated 16

personality factor report. I will also be able to choose to attend a 90-minute debriefing session

with my peers to learn more about the 16 PF and raise any question I might have regarding my

16PF results. I can utilize this opportunity to enhance the understanding of myself and my career.

Even if I choose to withdraw from the process, I still can participate in the debriefing session.

Do you want to receive a computer-generated 16PF report?

__Yes   __No

If you choose Yes, please indicate below where you would like the report sent to:

_____(mailing address/email)

Benefits:

I understand that there is no direct benefit for participating in this research study.

However, my participation might be able to increase the understanding of the relationship among

frontline employees' personality traits, perception of the company's work environment to quality

performance and aid management in providing the training, supervision and work environment

necessary for quality management.

Potential Risks:

I understand that during the completion of the questionnaire, I might feel tired, or there

might be some questions that make me feel uncomfortable. The possibility of fatigue or

discomfort is very small, however. I further understand that I can stop my participation at any

time and simply return the packet of documents to the researcher without any penalty.

I Understand That:

1. My participation shall in no way influence my employment in the company, including salary,

performance appraisal, bonus, etc.

2. The 2 answer sheets and the demographic information form will be coded so only the researcher will have access to the data I provide and the report generated based on my data. My data, however, will be calculated with other peers' data and utilized in statistical analysis to study the relationship among employees' personality traits, perceptions about the work environment and quality performance. The results of this study might be published in professional journals or assessment technical manuals.

3. I have the right to withdraw from participation at any time during the process. If I have any concern about this research, I can contact the principal investigator at cindy.crowder@indstate.edu or to the Indiana State University Institutional Review Board, at 812-237-8217, IRB@indstate.edu.

_____

Signature & date

APPENDIX G: DEMOGRAPHIC SURVEY

Please answer each question:

1. Gender

    a) Female   b) Male

2. Age _____

3. How long have you been working at the Company? _____years

4. How long have you held your current position? _____years

5. Which shift are you currently working in? _____

6. Please indicate your highest level of education:

    a) Primary

    b) High school

    c) Associate degree

    d) BS/BA

    e) Others? Please specify _____

7. Does anyone else in your family work in the same industry?

    a) Yes   b) No

8. Do you aspire to move up in the Company?

    a) Yes   b) No   c) Yes, but don't think there is an opportunity for me

9. Do you enjoy working at the Company?

    a) Yes, I am happy here

b) Sort of. I just want to make a living

c) No. I don't like working here. I am considering leaving

APPENDIX H: SUPERVISOR'S CONSENT FORM

Participation:

I understand I am invited to participate in this research because I am working as a supervisor/manager in the company.

Title of this study:

The relationship among frontline employees' quality performance, personality traits, and the perception of the work environment.

Purpose of this study:

I understand the purpose of this research is to study the relationship among frontline employees' quality performance, personality factors and their perception of the work environment. The result of the study might be helpful to improve the quality management in the future. It might also be able to assist in the development of training and supervision strategies for quality management.

Cao Yichun (Mandy), M.A. student of Human Resource Development at Indiana State University is conducting this project, as a part of her master degree thesis.

Confidentiality:

I understand that my evaluation of frontline workers will be kept confidential. I also understand that the data I provide will be compared to each respective frontline worker's personality and perception of the workplace. None of my subordinates, supervisors or company management will have access to my ratings.

Procedure:

This research involves completing a brief questionnaire to rate the quality assurance performance of frontline employees. The rating of each employee will take no more than 5 minutes.

Benefits:

I understand that there is no direct benefit for my participation in this study. However, it might increase the understanding of the relationship among frontline employees' personality traits, perception of the company's work environment to their quality performance. I further understand the study may contribute to the enhancement of supervision, training and understanding the work environment both at our company as well as other companies.

I understand that:

1. My participation shall in no way influence my employment in the company, including salary, performance appraisal, bonus, etc.

2. The form will be coded so only the researcher and her assistant will have the access to the data I provide. My data, however, will be calculated with other peers' data and utilized in statistical analysis to study the relationship among employees' personality traits, perceptions of the work environment and quality performance. The results of this study might be published in professional journals or assessment technical manuals.

3. I have the right to withdraw from participation at any time during the process. If I have any concern about this research, I can contact the principal investigator at cindy.crowder@indstate.edu or to the Indiana State University Institutional Review Board, at 812-237-8217, IRB@indstate.edu.

_____

Signature & date

APPENDIX I: FRONTLINE EMPLOYEE QUALITY PERFORMANCE RANKING FORM

Name of the employee you are evaluating_____

Please rate each specified quality performance for the employee you are evaluating. Choosing score of "1" indicates a very poor performance, "10" indicates an excellent performance.

		Very poor							Excellent		
		1	2	3	4	5	6	7	8	9	10
1	Uses the appropriate amount of raw materials according to company specifications										
2	Strictly follows working procedures as required										
3	Timely and adequately completion of documentation										
4	Once incorrect performance is pointed out, he/she will correct immediately										
5	Proactively ensures the machinery is in the best operating condition										
6	Communicates in a timely manner to the supervisor(s) regarding manufacturing problem(s) or perceived potential problem(s)										
7	When a problem has occurred, actively and in a timely manner, gives suggestions or recommendations to the supervisor(s).										
8	Takes initiative with peers in problem solving										
9	Finally, please rate the overall quality performance for this frontline employee:										

APPENDIX J: RESEARCH ASSISTANT INTRODUCTION

The research assistant, Dr. Thom Needham, who will be providing the interpretation of the 16PF to the frontline employees, is founder and President of Global Executive Resources. He serves as an executive coach, consultant, psychotherapist, and conducts employment assessment for multi-national companies worldwide. He began his career as a psychotherapist to celebrities, professional athletes and executives in Hollywood while teaching part-time at the Alfred North Whitehead School of Business at the University of Redlands. For nine years, he served as Associate Professor and Associate Dean at the Graduate School of Psychology at Fuller Seminary in Pasadena. His teaching assignment included teaching and training M.A./PhD students in psychological assessment. He has also served as adjunct professor of clinical psychology at Azusa Pacific University and adjunct professor of counseling psychology at Dominican University of San Rafael, California. He has conducted over 5,000 assessments and is recognized as a leading expert on the Sixteen Personality Factors instrument (16PF), which is utilized worldwide (40 languages) in employment screening and career counseling. He has trained Singapore government psychologists in the advanced use of the 16PF for selection of military officers and pilots, taught for the Cambridge University graduate management program in Beijing, and for several years assessed and trained executives at Singapore's SIM University. Thom has a doctor's degree in developmental and counseling psychology.