AN EMPIRICAL STUDY OF THE INTERFACE BETWEEN HEALTHCARE FACILITY DESIGN AND HUMAN RESOURCE MANAGEMENT

A Dissertation

by

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ABSTRACT

Expected growth in healthcare needs resulting from the Affordable Care Act and growing population of older citizens is challenging owners and operators of hospitals to improve quality of care and reduce operational costs. Although many factors drive hospital operating expenses, this study looked specifically at human resource-related expenses.

Previous studies have shown that implementing human resource practices improves performance outcomes at individual and organizational levels. Organizational psychologists suggest that human resource practices improve employee motivation and performance because they convey the message that an organization values employees' contributions and cares about their well-being, which can be reciprocated with higher levels of motivation and commitment toward the organization. Healthcare environmental studies also suggest that a safe and high-quality work environment sends a similar message to employees.

More than 700 healthcare professionals from 10 acute-care hospitals participated in this cross-sectional study. Structural equation modeling found that employees' satisfaction with their physical work environment and human resource practices reduced their job-related anxiety and improved their job satisfaction and organizational commitment. Perceived organizational support mediated part of these relationships. The author also found a small but positive interaction effect between the physical work environment and human resource practices.

Examination of different spaces within a facility showed that work spaces and staff rest areas had a considerable influence on job attitudes of employees, while the impact of patient areas was negligible. Multigroup analysis indicated that the influence of the physical work environment on employees newer to the facility and the organization and on nightshift staff members was stronger. Results also highlighted the importance of attention to caregiver needs for a safe and comfortable work environment. Among the 27 different environmental features investigated in this study, finishing materials and indoor air quality had the highest levels of association with employees' overall evaluation of their environment, regardless of their individual characteristics. Additionally, employees highly valued furniture design and thermal comfort. In comparison, features that addressed the visual quality of the work environment, such as window views and pieces of artwork, were found to have smaller associations with employee evaluations.

DEDICATION

I dedicate my dissertation work to my parents, my brother, and my sister.

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NOMENCLATURE

AHA	American Hospital Association
AIC	Akaike Information Criterion
AMOS®	Analysis of Moment Structures
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
BE	Built Environment
BTS	Bartlett Tests of Sphericity
CBE	Center for the Built Environment
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CIBSE	Chartered Institution of Building Services Engineers
CMS	Centers for Medicare & Medicaid Services
DF	Degrees of Freedom
EBD	Evidence-Based Design
EBD	Evidence-Based Medicine
ECVI	Expected Cross-Validation Index
GB	Green Building
HPWS	High-Performance Work System
HR	Employees' Evaluations of Human Resource Practices
ICU	Intensive-Care Unit

IEQ	Indoor Environmental Quality
JRA	Job-Related Anxiety
JS	Job Satisfaction
KMO	Kaiser–Meyer–Olkin
LEED	Leadership in Engineering and Design
M	Mean
NICU	Neonatal Intensive Care Unit
OC	Organizational Commitment
OPBY	Open Bay
PCA	Principal Component Analysis
POS	Perceived Organizational Support
PWE	Employees' Evaluations of Their Physical Work Environment
RBV	Resource-Based View of Firms
RMSEA	Root Mean Square Error of Approximation
SHRM	Strategic Human Resource Management
SPSS®	Statistical Package for the Social Sciences
S	Standard Deviation
SBS	Sick Building Syndrome
SEM	Structural Equation Model
SFR	Single-Family Room
TLI	Tucker-Lewis index
USGBC	United States Green Building Council

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CHAPTER I

INTRODUCTION

Purpose of the Study

The overall purpose of this study was to understand how healthcare organizations can use facility design and operation as human resource management tools for sustainable improvement of their performance. The theoretical framework of this research was developed using findings of previous organizational management studies in which the mediating role of employees' job attitudes and behaviors in the relationship between human resource management and performance outcomes at individual and organizational levels is demonstrated. Focusing on job-related attitudes and feelings of caregivers, this study investigated the interaction between human resource management and hospital design and operation from the organizational sustainability perspective.

Significance of the Study

Statistics show that healthcare is one of the biggest sectors of the United States economy. According to the American Hospital Association (AHA), healthcare spending in the United States accounted for 17.9% of the Gross Domestic Product (GDP) in 2011 (AHA, 2013) , which was a larger share of GDP than in any other major industrialized country. According to the Centers for Medicare and Medicaid Services (CMS), in 2012 U.S. health care spending increased 3.7% to reach $2.8 trillion, or $8,915 per person (CMS, 2013). In the coming years, a growing population of older citizens with chronic health conditions will translate into a greater need for health care services as more of the U.S. population

enters advanced age and higher life expectancy. Moreover, improving economic conditions and the Affordable Care Act (ACA) coverage expansions are expected to drive faster projected growth in health spending in 2014 and beyond. CMS has projected an average annual projected growth of 6.2% per year between 2015 and 2022, which will result in health spending accounting for 19.9% of the GDP by 2022 (CMS, 2013a).

Among the different sectors of the health care market in the U.S. shown in Figure 1 (physician and clinical services, prescription drugs, nursing home and home health, and dental care), hospital care accounted for the largest portion (33.4%) of national health expenditure in 2012 (AHA, 2013) and is projected to remain the largest national health expenditure until 2020 (CMS, 2013a).

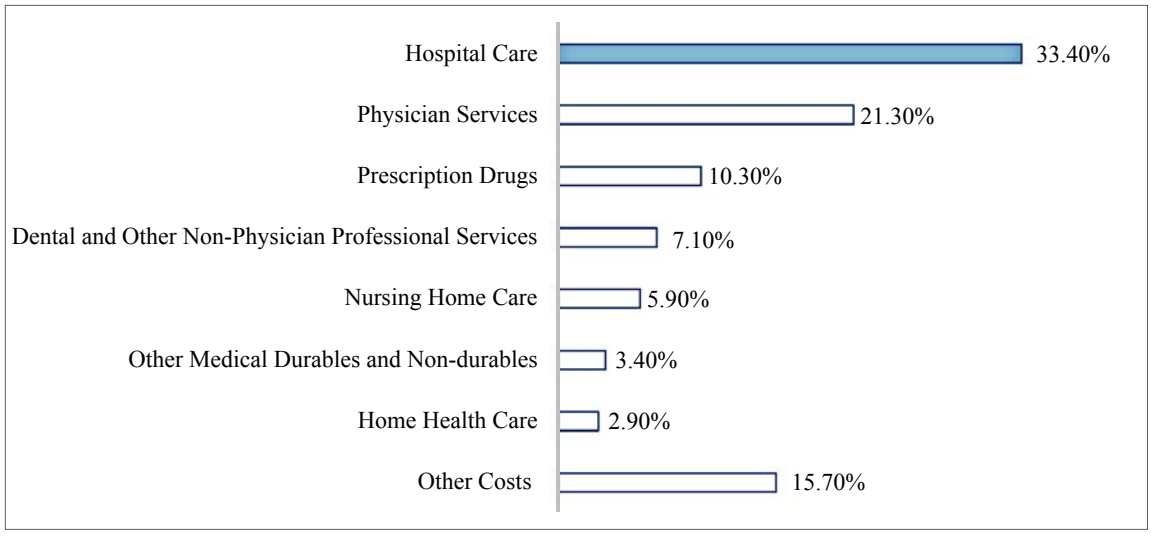

Figure 1. National expenditures for health services and supplies by category, excluding medical research and medical facilities construction. "Other Costs" includes net cost of insurance and administration, government public health activities and other personal health care. *Note:* From *AHA (2013). Trendwatch Chartbook 2013, Trends in the Overall Health Care Market* Retrieved January, 28, 2014, from http://www.aha.org/research/reports/tw/chartbook/ch1.shtml

The AHA annual survey of U.S. hospitals in 2012 showed that registered hospitals totaled 5,723 facilities containing 920,829 staffed beds (AHA, 2013). Expected growth in healthcare needs will likely result in the building of new hospitals, and experts forecast that between 2014 and 2017, the U.S. will spend more than $200 billion on healthcare construction, with construction project costs that could exceed $55 billion per year by 2017 (Giggard, 2013). Expected growth in healthcare needs challenges owners and operators of hospitals to improve quality of care and reduce operational costs. This challenge can be partly addressed by improving the way hospitals are designed, constructed, operated, and maintained. Improving managerial practices for running and operating existing facilities and designing and constructing new facilities can result in significant savings in the overall cost of hospital care services.

Although many factors drive hospital operating expenses, this study focused specifically on human resource management. As Figure 2 shows, wages and benefits for healthcare employees represent 60% of total spending on hospital care, which is higher than all other essential expenses collectively, including medication, devices, and other supplies, as well as improvements to treatment facilities, installation of or upgrades to health information technologies, utilities, and liability coverage (AHA, 2011). Figure 3 shows data from a recent report by the AHA on share of cost growth explained by key components of hospital expenses. This report suggests that between 2004 and 2008 increase in labor costs was the most important single driver of spending growth for hospitals, accounting for about 35% of overall growth (AHA, 2012) .

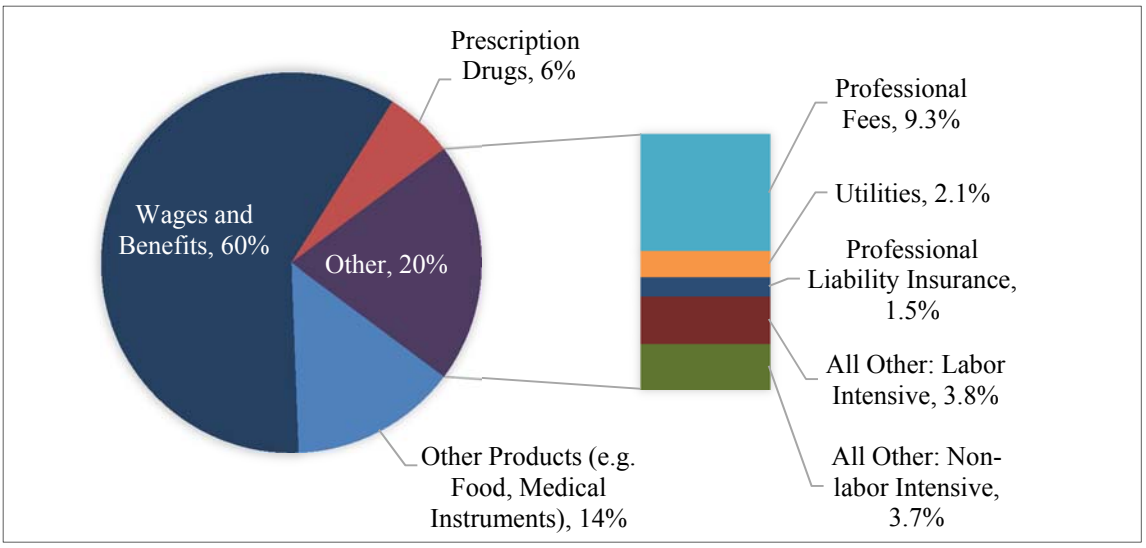

Figure 2. Percent of hospital costs (excluding capital) by type of expense. *Note.* From AHA (2011). *The Cost of Caring: Drivers of Spending on Hospital Care* Retrieved January, 28, 2014, from http://www.aha.org/aha/research-and-trends/index.html

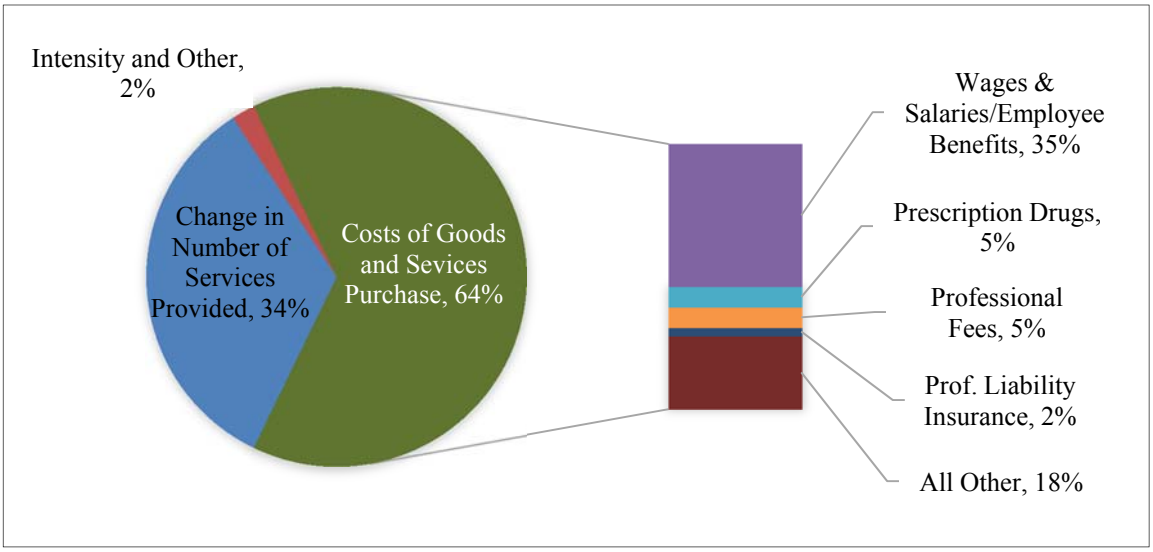

Figure 3. Share of hospital cost growth explained by various factors. *Note.* From AHA (2012). *The Cost of Caring: Sources of Growth in Spending on Patient Care in Hospitals* Retrieved January, 28, 2014, from http://www.aha.org/content/00-10/10costofcaring.pdf

Apart from its financial implications, human resource management in healthcare organizations can significantly impact the quality and safety of care. How employees feel at work and what they think of their organization impacts their motivations and the way they treat patients.

Contents

This document is organized into six chapters. Chapter II explains the theoretical framework of this study and reviews literature related to strategic human resource management, a resource-based view of firms, evidence-based design, and green building to develop the framework of this study. Chapter II also discusses how a safe and high-quality work environment can be used to improve job attitudes and behaviors of healthcare professionals. All possible attitudinal and behavioral variables, as well as performance outcomes at the organizational and individual levels, are introduced. Because studying all attitudinal and behavioral variables is not achievable in a single study, this research focuses on the impact of human resource management and the physical work environment on job-related attitudes and feelings of caregivers. To empirically investigate this impact, the authors used a cross-sectional study design and examined self-reported data of employees' evaluations of their physical work environment and human resource practices, as well as their job-related feelings and attitudes. More than 700 healthcare professionals from 10 acute-care hospitals participated in this study.

Chapter III contains a description of the structural equation modeling used to test whether employees' evaluations of their physical work environment and human resource practices were significantly associated with lower job-related anxiety, higher job

satisfaction, and higher organizational commitment. The chapter also discusses the mediating role of perceived organizational support (POS), a construct used in organizational psychology studies. Specific hypotheses examined in Chapter III are as follows:

- *Hypothesis 1:* Perceived organizational support (POS) mediates the relationship between employees' evaluations of their physical work environment (PWE) and job attitudes.
- *Hypothesis 2:* Perceived organizational support mediates the relationship between employees' evaluations of human resource practices (HR) and job attitudes.

POS is influenced by both human resource management and facility design; thus, it can be used to investigate the interaction between these two factors. As a result, the third hypothesis of this study is as follows:

- *Hypothesis 3:* Employees' evaluations of the physical work environment (PWE) moderate the relationship between human resource practices (HR) and perceived organizational support (POS).

Chapter IV examines how employees' evaluations of important spaces within a facility (patient areas, staff work spaces, staff rest areas) impact job-related attitudes and feelings. This chapter includes a comprehensive review of previous healthcare environmental studies on staff members, a brief review of common approaches for subjective and objective measurements of the indoor environment, and an introduction to

important dimensions involved in evaluating the hospital physical environment by staff members. Chapter IV focuses on answering the following questions:

- How are evaluations of patient areas, staff work spaces, and staff rest areas associated with employees' perceptions of organizational support, job-related anxiety, job satisfaction, and organizational commitment?
- Is there any significant difference in the relationship between the physical work environment and employees' job-related attitudes across different demographic groups (age, number of years worked in the facility, work shift, and job title)?

Although various aspects of the physical environment were covered in measuring employees' evaluations of their work environment, Chapter V looks at the overall evaluation of the environment in different spaces. Previous studies have shown that because activities performed in different spaces within a hospital are different, spaces within a facility influence employees' perceptions of their workplace differently, and the relative importance of various dimensions of the physical work environment might be different across different spaces. Accordingly, Chapter V focuses on answering the following questions:

- What is the relative importance of major environmental dimensions involved in evaluating important spaces within a hospital (patient areas, staff work spaces, staff rest areas) by healthcare professionals?

- Is there any significant difference in employees' perceptions of the physical work environment across different demographic groups (age, number of years worked in the facility, work shift, and job title)?

To answer these questions, the author used self-reported data of employees' perceptions of 27 different architectural and physical features in patient areas, work spaces, and staff areas. Architectural and physical features included building layout (availability of space and visual privacy); furniture and finishing materials (quality, color, and texture of flooring, furniture, and surface finishes); thermal comfort (temperature and the ability to control it); lighting (amount of natural daylight and electric lighting, visual comfort of daylight and electric lighting, and controllability of lighting); acoustic environment (speech privacy and the level of distracting noise in building from interior and exterior sources); indoor air quality; cleanliness and maintenance (floors, walls, furniture, toilets and showers, plumbing and lighting fixtures, accessibility of hand-washing stations and alcohol-based hand-rub dispensers before and after each patient contact); and window views.

The dissertation concludes by summarizing important findings of the study, explaining its limitations, and discussing the overall direction for future studies in Chapter VI.

CHAPTER II

CORPORATE SUSTAINABILITY: THE ENVIRONMENTAL DESIGN AND HUMAN RESOURCE MANAGEMENT INTERFACE IN HEALTHCARE SETTINGS*

Synopsis

The purpose of this study was to provide healthcare organizations with a new perspective for developing strategies to enrich their human resource capabilities and improve their performance outcomes. To accomplish this objective, this study focused on leveraging the synergy between organizational management strategies and environmental design interventions. This chapter proposes a framework for linking the built environment with the human resource management system of healthcare organizations. The framework focused on the impact of the built environment regarding job attitudes and behaviors of healthcare workers. Research from the disciplines of strategic human resource management, resource-based view of firms, evidence-based design, and green building were utilized to develop the framework.

The positive influence of human resource practices on job attitudes and behaviors of employees is one mechanism to improve organizational performance outcomes. Organizational psychologists suggest that human resource practices are effective because

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they convey the organization values employee contributions and cares about their well-being. Attention to employee socio-emotional needs can be reciprocated with higher levels of motivation and commitment toward the organization. In line with these findings, healthcare environmental studies imply that physical setting and features can have a positive influence on job attitudes and the behavior of caregivers by providing for their physical and socio-emotional needs. Adding the physical environment as a complementary resource to the array of human resource practices creates synergy in improving caregivers' job attitudes and behaviors and enhances the human capital of healthcare firms.

Introduction

Corporations can be seen as business entities that form the economic system of a society. Corporations can also be viewed as social artifacts composed of institutionalized activities. As such, when it comes to enterprises, the term sustainability represents two separate but interrelated concepts; (1) creating an enduring competitive advantage for companies to stay in business (2) meeting their responsibilities toward the sustainable development of the society in which they conduct their activities. As suggested by Baumgartner and Ebner (2010), Dyllick and Hockerts (2002), and Khan (1995), to succeed in these two aspects, organizations need to obtain and use a wide array of resources, including economic, social, and ecological capital. This article dealt with the first aspect of corporate sustainability which is the way organizational resources are used for creating an enduring competitive advantage.

One approach for study of sustainability of competitive advantages is the Resource-Based View of firms (RBV) first proposed by Wernerfelt (1984). He described

how creating the bundle of valuable resources can result in a competitive advantage for organizations and argued that differences in firm performance come from the differences in the resources they own. As advocates of RBV, Barney (1986), Rumelt (1984), and Wright, McMahan, McWilliams (1994) suggested that in order for an organization to have an enduring competitive advantage, it has to acquire different type of capital (economic, social, and ecological), and combine them to create value-generating resources often referred to as an organizational resource bundle.

Organizational resource bundles contribute to performance advantage to the extent that they are rare, costly to imitate, and non-substitutable (Armstrong & Shimizu, 2007; Barney 1991; Dyllick & Hockerts, 2002; Sirmon, Hitt, & Gove, 2008). According to Barney (1991), the firm's competitors should not possess the same resource bundle, not be able to easily recreate its value, nor be able to generate the same outcome by using an alternative resource bundle. This chapter proposes a model for linking the human resource management system of organizations with their facilities for enhancing the three characteristics described above to increase the sustainability of competitive advantages. The proposed framework focused on the influence of physical features of the work environment on job attitudes of healthcare professionals and was developed by adopting key findings from studies on strategic human resource management, resource-based view of firms, evidence-based design, and green buildings.

Healthcare organizations should give attention to the synergy between organizational management intervention and environmental design interventions. Limiting expenses and ensuring quality services are each imperative to a healthcare

organization's corporate sustainability. As stated in Chapter I, according to the American Hospital Association, approximately 60 cents of every dollar of expenditures goes to caregivers and other hospital workers (AHA, 2011). As a result, human resource related expenses are primary targets of cost-containment strategies when funding becomes limited. However, as Filipova (2011) notes, strategies that require lowering staff levels may not ultimately be worth the tradeoff and organizations must find alternative ways to optimize expenditures without sacrificing the quality of service. From an organizational management viewpoint, this study provides healthcare organizations with an alternative perspective for developing cost avoidance strategies based on managerial and architectural design solutions to improve employees' job attitudes and enrich organizational capabilities.

Another important characteristic of healthcare organizations is that healthcare service delivery is physically and emotionally demanding for caregivers, and because of that, these organizations experience severe challenges in terms of employee burnout, strain, job satisfaction, absenteeism, and turnover. Such challenges highlight the importance of recognizing an employees' socio-emotional needs as a critical cost-avoidance strategy and emphasize the role of the built environment in achieving that objective.

The organization of this paper begins with a review of the literature related to job satisfaction as well as the influence of the built environment on employees' job attitudes. The theoretical background of the study is described after a review of job satisfaction theories. This section explains how firms' resources contribute to the sustainability of

competitive advantages and identifies the significance of human resources. Moreover, the mechanism through which human resource practices influence performance outcomes at individual and organizational level is described. How the built environment functions in a similar manner is also discussed. To demonstrate this, a framework for linking the human resource management system of organizations to the built environment is proposed. Next, different elements of the model are explained and the hypothesized relationships between them are discussed. The contribution of this study to the existing literature on corporate sustainability is also presented.

Literature Review

Job Satisfaction

A traditional theory for understanding job satisfaction is Maslow's (1954) hierarchical model of human needs. The model suggests a five-level hierarchy spanning from physiological needs, safety, and social needs to self-esteem and self-actualization. Maslow's work was adopted by Herzberg (1959) who developed a two-factor job satisfaction theory. Herzberg suggested that satisfaction and dissatisfaction are two separate, or at times, unrelated constructs which are influenced by different factors. Whereas job satisfaction is mostly influenced by factors intrinsic to the nature and experience of the work (e.g., the work itself, achievement, recognition, and responsibility), job dissatisfaction results from factors outside the job (e.g., organizational policy, supervision, salary, interpersonal relations and working conditions). Herzberg calls these hygiene factors.

According to Spector (1997), these two models became less popular with increase in the emphasis on underlying cognitive processes of job satisfaction rather than underlying needs. For example, Hulin and Judge (2003) proposed that job satisfaction is a multidimensional psychological response of individuals to their job and has cognitive (evaluative), affective (emotional), and behavioral components. Affective and cognitive indicators of job satisfaction are also addressed in other definitions of job satisfaction (e.g., Brief & Weiss, 2002; Davis, 2004; Harrison, Newman, & Roth, 2006). Affective Event Theory developed by Weiss and Cropanzano (1996) included affective and cognitive components. The authors emphasized that job satisfaction is a positive or negative evaluative judgment about one's job, and is a combination of the person's beliefs about his or her job, and partly results from his or her emotional experiences at work. They suggested that long-term behaviors, such as turnover and retirement stem from stability features and the structure of the job environment, while short term behaviors, such as lateness or helping others stem from spontaneous job events. As the literature on environmental psychology suggested, as a stable feature and structure of job environment, the built environment may influence long-term behaviors of employees.

Multi-dimensional studies on job satisfacation, such as those conducted by Locke's (1969), and Skalli, Theodossiou, and Vasileiou (2008) show that by placing new values on different facets of the job, a person may maintain his or her satisfaction when certain aspects of it change. Studies of workers' attitudes conducted by organizational psychologists often support this concept. For example, Greenberg (1989) found that employees attempted to compensate for financial underpayments by altering their

perceptions of the physical environment where they were working. More specifically, he concluded that when employees were underpaid, they expressed higher levels of satisfaction with their work environment, showing that they were trying to cognitively alter their perceptions of the physical work environment (Greenberg, 2011)

Although the built environment theoretically fits as a factor of job satisfaction, it is absent in the research conducted for healthcare settings. In their review of the 21 studies related to hospital nurses' job satisfaction, 14 of which were carried out in the United States, Utriainen and Kyngas (2009) found interpersonal relationships (e.g., with other members of the nursing staff and with medical staff) and patient care (e.g., seeing patients get better and patient satisfaction) as two themes most significant to nurses' job satisfaction. In addition to these two factors, Utriainen and Kyngas also stated that organizing nursing work (e.g., work–family relationship, working time, balanced workload, autonomy) is another significant predictor of nurses' well-being at work. In an earlier but more comprehensive study reviewing more than 50 studies of job satisfaction among nurses, Lu, While, and Louise Barriball (2005) listed factors such as working condition, social interaction, and job security as complementary sources of job satisfaction.

To identify the relationships of specific variables with nurses' job satisfaction two meta-analyses were conducted by Blegen (1993) and Zangaro and Soeken (2007). Blegen's analysis of nurses working in patient care settings found that job satisfaction had the strongest correlation with job stress (r = - 0.61), and was moderately correlated with communication with supervisor (r = 0.44), autonomy (r = 0.42), and communication with

peers (r = 0.44). Similarly, Zangaro and Soeken indicated that job satisfaction had the strongest negative correlation with job stress (r = -0.43), and the strongest positive correlation with nurse–physician collaboration (r = 0.37). They also found that autonomy had a moderately positive correlation with job satisfaction (r = 0.39).

As stated, the built environment is notably absent among the factors that influence job satisfaction in studies of healthcare professionals. A review of the literature related to healthcare environmental design suggested that the built environment is not listed among the *direct* sources of job satisfaction because of its indirect influence through other factors such as job stress and improvements in working conditions. The following section introduces and summarizes the literature on the indirect influence.

Influence of Environmental Design on Job Attitudes of Employees

The link between the built environment and human behavior is a key concept of environmental psychology for understanding how the behavior and development of people are influenced by their physical environments (Holahan, 1986). This body of research constitutes an important part of the literature related to architectural and urban design theories, and is often used to support informed decision-making by design professionals. Gibson (2008) argued that ecological psychology is a pivotal, but underused body of work when considering the organization-physical space relationships.

One of the most extensive bodies of work and knowledge base on the relationship between the physical design of buildings and key organizational outcomes exists in the healthcare design domain, which is commonly known as Evidence-Based Design (EBD). In essence, the focus of EBD is the influence of architectural and interior design of

healthcare facilities on key outcomes such as patient safety (e.g., hospital-acquired infections, medical errors, and falls), patient outcomes (e.g., pain, stress, length of stay, and the perceived quality of care), and staff outcomes (e.g., injury, stress, work effectiveness, and satisfaction). For instance, Ulrich et al. (2008) conducted a comprehensive evaluation of the scientific research on evidence-based healthcare design, and one of their conclusions was that well-designed physical settings play an important role in making hospitals a better workplace. Berry et al. (2004) also noted that healthcare facility design has a critical role in earning employee commitment, of employees, and that "facilities tell employees a great deal about management's concern for them" (p. 5). Other studies, such as Coile's (2002) forecast of healthcare trends also pointed to the effectiveness of healthcare facility design in employee recruitment and retention.

Berry, Parish, and Shun Yin (2008) studied differences in nurses' perceptions of their job, hospital, and building features six month before and six months after opening of a new hospital wing and found significant differences in employees' perceptions of quality of patient rooms, safety, pleasantness, quality of workspace, job stress, job satisfaction, and service quality. Another before-after study of nurses in single-room maternity care versus traditional birth settings by Janssen, Harris, Soolsma, Klein, and Seymour (2001) found that nurses working in new units reported better scores for room size, lighting, and noise levels and also reported higher job satisfaction. Furthermore, studies that examined different facets of job satisfaction, such as those conducted by Kotzer and Arellana (2008), Kotzer, Koepping, and LeDuc (2006), Halford and Leonard (2003), suggested that nurses are generally not satisfied with their physical work environment and as a result, the built

environment can be a source of job dissatisfaction. These findings follow the basic principles of the two-factor theory regarding job satisfaction because negative extrinsic factors, such as working condition (including workplace), can cause job dissatisfaction.

Altogether, this collective body of work provides compelling evidence that improving attributes of the built environment can enhance the general job satisfaction of nurses. However, as Djukic and Kovner (2009) noted, a review of job satisfaction models does not provide significant evidence for supporting the idea that the built environment has a strong *direct* effect on enhancing nurses' job satisfaction. These authors examined the effect of multiple combined features of the physical work environment on nurses' job satisfaction and controlled for multiple covariates of satisfaction. The general conclusion they made was that the effect of the physical work environment on job satisfaction is not direct and is probably mediated through other factors such as work attributes and job attitudes that directly impact satisfaction. This paper describes how these mediating variables can be used to study the interaction between human resource practices and the built environment. To accomplish that, an examination of the theoretical background of the model is required.

Theoretical Background

Firm's Resources and Sustainability of Competitive Advantage

As previously identified, in order to be a competitive advantage, an organizational resource needs to be rare, costly to imitate, and non-substitutable. Barney (1991) noted that in generating values from organizational resources, complex phenomena are often involved. He maintains that to ensure the sustainability of competitive advantages, the link

between a firm's resources and competitive advantage should not be fully understood by competitors. Barney, Wright, and Ketchen (2001) argued that building strategies on intangible assets that meet such criteria result in higher performance than building strategies only on tangible assets that are easy to imitate by competitors, such as natural resources and technology.

In addition to the characteristics of organizational resources, the process needed for achieving a sustainable competitive advantage is well documented. For example, Makadok (2001) pointed out two distinct causal mechanisms where an enduring competitive advantage can be created from resources. The first mechanism was called resource-picking and refers to obtaining outstanding resources. An alternative mechanism was called capability-building, that focuses on enhancing the productivity of existing organizational resources. Makadok also pointed to the synergy that may occur when a newly obtained resource achieves higher productivity when combined with pre-existing resources.

Importance of Human Resources and Human Resource Management System

The literature related to resource-based view of firms (RBV) considers the stock of employees' knowledge, skills, and abilities (Barney 1991; P. Wright, Dunford, & Snell, 2001) as well as their motivation and loyalty (Dyllick & Hockerts, 2002) to be a part of the human capital of organizations. Additionally, formal and informal relations among employees and between employees and the organization are considered to be part of social capital of organizations. Wright et al. (2001) noted that RBV shifted emphasis away from external factors of competitive advantage toward internal firm resources mentioned above;

as such it brought legitimacy to the human resource's assertion that people are strategically important to firm success.

The importance of human resources in creating a sustaining competitive advantage is part of the strategic leadership and management literature. Hitt and Duane (2002) looked at human capital through the lens of RBV and pointed out that human capital is significant in terms of creating competitive advantages, because it is often the firm's most unique resource and the mechanisms used for creating and managing it are likely to be complex. The importance of human resource management system as a mechanism for creating competitive advantage from human capital is also documented. Regarding imitability of organizational resources, Barney (1991), Wright, et al. (2001), and Becker and Gerhart (1996) pointed to the importance of the human resource management system as an invisible asset embedded in the organization. Barney, et al. (2001) further argued that human resource management systems and routines that develop over time can be unique to a particular firm and may contribute to the creation of a specific human capital pool.

Human Resource Management and Firm's Performance

The relationship between human resource management and a firm's performance is studied in the Strategic Human Resource Management (SHRM) field of organizational theory, which according to Wright et al. (2001) is devoted to exploring the role of human resources in supporting business strategies. The impact of human resource practices on business growth, financial performance, and workers' productivity is also shown in the SHRM literature (Evans & Davis, 2005; Gittell, Seidner, & Wimbush, 2010). Furthermore, an important question and the subject of many studies in organizational

theory has been the mechanism through which the effect of human resource practices is transferred to performance outcomes. Different mediating variables have been studied, including functional flexibility, behavioral flexibility, relational coordination, flexibility in personnel skills, shared goals, shared knowledge, mutual respect, enhanced communication, improved social exchange, organizational citizenship behavior, work satisfaction, lower job stress, and quality of information (Beltrán-Martín, Roca-Puig, Escrig-Tena, & Bou-Llusar, 2008; Evans & Davis, 2005; Gittell, et al., 2010; Kalleberg, Marsden, Reynolds, & Knoke, 2006; Messersmith & Guthrie, 2010; Preuss, 2003; Takeuchi, Chen, & Lepak, 2009; Tyagi & Sawhney, 2010). Gittel et al. (2010) noted that these mediating variables can be classified into two general pathways: (a) changes in employees' knowledge, skills, and abilities; and (b) changes in employees' attitudes (e.g., motivation and commitment) and behaviors (e.g., discretionary efforts). They also note that these two pathways are not mutually exclusive and human resource management can contribute to performance through both pathways.

The Mechanism for Influence of Human Resource Management

Researchers such as Huselid (1995), Becker and Gerhart (1996), Evans and Davis (2005), and Takeuchi, Lepak, Heli, and Takeuchi (2007) studied the attitudinal and behavioral pathway and note that one explanation for why human resource practices, such as incentive compensation and employee involvement and empowerment, are effective is because they carry the message that the organization values their contributions, cares about their well-being, and in general supports them. What these authors suggested is very similar to the findings of studies in the broader area of strategic human resource

management conducted by researchers such as Eisenberger, Armeli, Rexwinkel, Lynch, and Rhoades (2001) and Eisenberger, Huntington, Hutchison, and Sowa (1986), who showed the positive influence of human resource practices on perceived organizational support (POS). According to Eisenberger, et al. (1986), POS is "an experience-based attribution concerning the benevolent or malevolent intent of the organization's policies, norms, procedures, and actions as they affect employees" (p. 42). An overview of social exchange theory is required to understand the mediating role of POS.

According to Cropanzano and Mitchell (2005), social exchange theory is one of the most influential conceptual paradigms for understanding workplace behaviors. These authors explain that social exchange in this theory refers to a series of interactions between two sides of a relationship with a potential to generate obligations. As Gouldner (1960) put it, obligation is created as a result of the norm of reciprocity that obliges the return of favorable treatment. Cropanzo and Mitchell (2005) also explained that norms of exchange are the guidelines used in exchange processes and one of the best known rules of exchange is reciprocity or repayment in kind. Eisenberger et al. (2001) suggested that the reciprocity norm may apply to the relationship between employees and employer by obliging employees to return advantageous treatment they receive by acting in ways valued by the organization.

In summary, social exchange theory suggests that employees consider the organization as an entity with which they have exchange relationships to explain why human resource practices have positive influence on employees' attitudes. Reciprocation norm explains that as the organization gives special attention to employees' needs, a sense

of obligation is developed in employees to care about the welfare of the organization and help it achieve its goals (Eisenberger, Aselage, Sucharski, & Jones, 2004; Hellman, Fuqua, & Worley, 2006; Rhoades, et al., 2001; Wayne, Shore, & Liden, 1997). In this study, the concept is adopted to add architectural and physical features of the workplace to the array of resources used in the exchange relationship between employees and their employer.

Proposed Model

The proposed framework focused on the influence of physical features of the work environment on employees' job attitudes. In reviewing the literature related to the influence of environmental design on job satisfaction of healthcare workers, it was found that the effect of physical work environment on job satisfaction is mediated through other factors that directly impact satisfaction. This statement is consistent with what Ulrich, Zimring, Quan, Joseph, and Choudhary (2004) posited in their study regarding the role of the physical environment, suggesting that design solutions such as improved ventilation, ergonomic design, better designed nursing stations, improved lighting, and floor plans can reduce staff stress and improve their health and safety, the factors that are known to be positively related to job satisfaction.

The present study considered POS as another important mediating variable in the relationship between architectural/physical features of the workplace and job attitudes. As Eisenberger et al. (1986) noted, employees have a tendency to assign humanlike characteristics to their organization, and because of this personification, they view favorable or unfavorable treatment as an indication that the organization favors or disfavors them. Rhoades and Eisenberger (2002) suggested that resources voluntarily

provided by the organization are welcomed as indications the organization values and respects its employees and cares about their well-being. For example, when a hospital increases the ventilation rate or installs High-Efficiency Particulate Air (HEPA) filters, to improve indoor air quality and potentially reduce airborne infections, may be perceived by employees as a voluntary action showing the organizations' mindset in putting higher emphasis on their needs, especially when they know that other facilities do not go beyond minimum requirements set by occupational health and safety codes. Providing a healthy environment with a high indoor environmental quality offers substantial inducements to employees that can be reciprocated with higher levels of motivation and commitment towards the organization. Accordingly, the first hypothesis is:

- *Hypothesis 1:* Perceived organizational support mediates the relationship between architectural/physical features of the workplace and job attitudes.

Perceived organizational support is influenced by both human resource management system and environmental design, and because of that it can be studied to understand the role of environmental design in management of human resources. According to Wicker (1992), physical objects along with people are the main components of small-scale social systems that impact activities within specifiable time and place boundaries. He called these small-scale social systems behavior settings. In this study, the authors used Wicker's argument regarding the influence of physical settings on occupants' attitudes and behaviors and focused on the attitudinal and behavioral pathway that influences organizational performance. Principles of Affective Event Theory also suggest

that as a stable feature and structure of job environment, the built-environment may influence long-term behavior of employees.

As Table 1 shows, a negative message to employees is sent when an organization has a weak human resource management system, where employees are not involved in decision-making, do not receive adequate training, and are not compensated based on their performance. If the organization also fails to provide a high-quality work environment, the combined negative environmental factors will have a detrimental effect on employees' attitudes (Cell 1 in Table 1). In contrast, when the organization has a strong human resource management system, and at the same time provides a high-quality built environment, the combined positive factors will have a synergistic effect on improving employees' attitudes (cell 4 in Table 1). Finally, in a situation when one factor is high and the other one is low, they neutralize each other, assuming that they have similar effect (cell 2 and 3 in Table 1). However, the existing literature does not suggest a strong direct effect for the built environment, specifically when it is compared with the bundle of human resource practices. As such, the second hypothesis is:

- *Hypothesis 2:* Satisfaction with architectural or physical features of the workplace moderates the relationship between human resource management system and perceived organizational support.

Table 1 Influence of the built environment and human resource system on employees' attitudes as suggested by the social exchange theory

		Human Resource Management	
		Weak -	Strong +
Quality of the Built Environment	Low -	(1) - -	(2) Neutral
	High +	(3) Neutral	(4) + +

Job-Related Attitudes and Feelings of Employees

Elements of the Model

Figure 4 shows a general framework linking human resource management practices and architecture features to employee- and organizational-level performance outcomes, through individual and collective measures of attitudinal and behavioral variables.

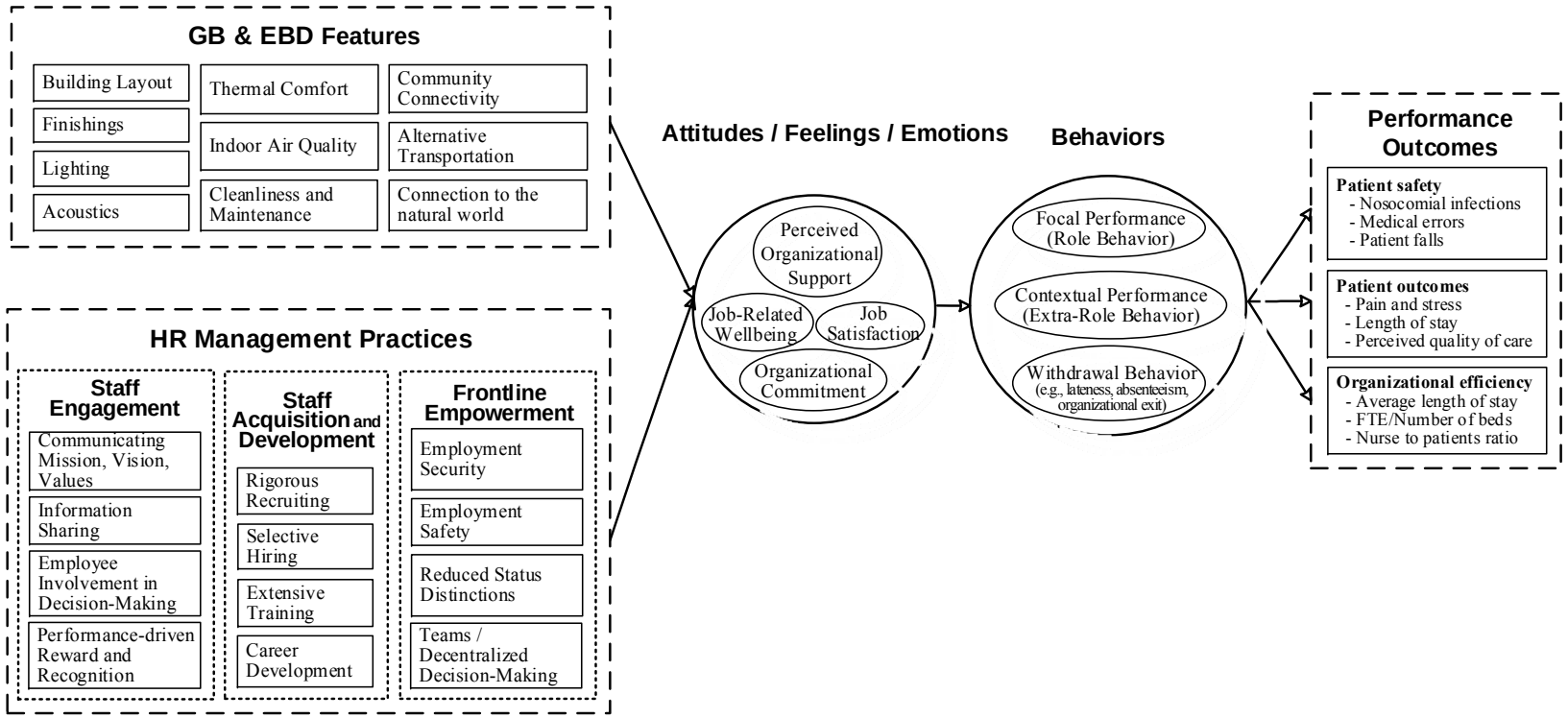

Figure 4. The proposed framework for linking architectural and physical features of physical environment with human resource practices as they influence job attitudes and behaviors of healthcare workers

High-Performance Work System and Architectural Features

High-Performance Work System (HPWS) consist of practices related to selection and staffing, training, employee involvement and empowerment, reward and compensation, performance measurement and appraisal, and career planning and promotion. HPWS practices incorporated in the model shown in Figure 4 are adopted form the study by German et al, (2011) where they developed a conceptual model of HPWS practices for healthcare organizations on the basis of prior research.

The architectural features shown in Figure 4 are adopted from Ulrich et al's (2008) evaluation of the scientific research on evidence-based healthcare design, as well as green building features identified by the U.S. Green Building Council's (USGBC) Leadership in Engineering and Design (LEED) for healthcare. Well-being and health are important criteria associated with the green building movement (Kibert, 2008). For office buildings and workplaces in general, using green-building features can send the message to employees that senior management cares about their well-being and health. For example, green building techniques such as improving indoor environmental quality may decrease physiological health issues (e.g., asthma and respiratory allergies) and psychological health problems (e.g., strain and anxiety) (Cirla, 2005; Corr, 2000; Fisk, 2000; Goe et al., 2004; Joseph, 2006a; Rashid & Zimring, 2008; Ulrich, et al., 2008).

In a study of physiological health issues, Smedbold et al. (2002) analyzed clinical data for 115 females who worked at 36 geriatric nursing departments, and concluded that poor indoor environmental quality, such as high temperature, low relative humidity, and low carbon dioxide levels may affect the nasal mucosa of nursing personnel and cause

nasal mucosal swelling. Regarding psychological health problems, in a study of 141 nurses in a university hospital, Alimoglu and Donmez (2005) found that at least three hours a day exposure to natural light can lead to less stress and higher satisfaction at work. Furthermore, Pati, Harvey, and Barach's (2008) study of relationships between exterior views and stress among 32 nurses on 19 different units at two hospitals found that visual relief improved short-term alertness and sharpened the focus of nurses, which in turn may enhance their job satisfaction and long term retention. Fjeld and Bonnevie (2002) also examined the impact of installing 23 groups of green plants along with full spectrum fluorescent bulbs in examination rooms of a radiology ward. The rooms had no windows or natural light and were used by 48 employees. The research found 10% reductions in sick leave, 32% in fatigue, and 45% in headaches after the intervention, all statistically significant.

Attention to employees' health and well-being is particularly important in healthcare settings where employees are exposed to higher health and safety-related risks at work. Workers in hospitals have to deal with patients and often use many highly toxic chemicals (e.g., pesticides, cleaners, and disinfectants). Ulrich et al's (2008) literature review suggested that sick building syndrome (SBS) is generally high in hospitals buildings and health-related complaints are higher in hospitals with SBS. Moreover, according to the U.S. Bureau of Labor Statistics (2007), the rate of occupational injuries and illnesses in hospitals is 8.1 cases per 100 full-time workers, which is about 80% higher than the rate for all of the private industry (4.6 cases per 100 full-time workers).

Job Attitudes, Emotions, and Feelings

As Figure 4 shows, attitudinal variables are the first group of outcomes in the series of mediating variables between the built environment and organizational performance outcomes. Attitudinal outcomes are also the key to understanding the interaction between the built environment and human resource management system. The influence of these two factors on behavioral variables and organizational performance are transferred through attitudinal variables.

A review of the literature related to EBD suggests that nurses report higher job satisfaction when physical features of the work environment, including lighting, view and unit layout are improved (e.g., Adams & Bond, 2000; Alimoglu & Donmez, 2005; Janssen, et al., 2001; Norbeck, 1985; Parish, et al., 2008; Shepley, Harris, & White, 2008). To understand how this happens, this study suggests that the impact of POS and job-related anxiety should be a topic of additional research. The relationship between POS and attitudinal and behavioral outcomes has been considered in the SHRM literature. Rhoades and Eisenberger's (2002) meta-analysis found that the relationship between POS and job satisfaction is significant (r = 0.59). In another meta-analysis, Riggle et al. (2009) concluded that job satisfaction exhibits a strong positive relationship with POS (r = 0.61). Consistent with these findings, in her cross-sectional survey of 656 nurses in 100 facilities in Midwestern states of the US, Filipova (2011) found that POS positively predicted nurse job satisfaction.

Job-related anxiety is the second attitudinal outcome that mediates the relationship between the built environment and job satisfaction. The negative effect of physical

stressors in the workplace such as noise, light, heat, vibrations, and chemical and toxic substances are studied in the EBD and green building literature, suggesting that environmental intervention through architectural design can play an important role in reducing employees' anxiety and increasing job satisfaction (e.g., Alimoglu & Donmez, 2005; Ampt, Harris, & Maxwell, 2008; Bayo, García, & García, 1995; Janssen, et al., 2001; Joseph & Ulrich, 2007; Leppamaki, Partonen, Piiroinen, Haukka, & Lonnqvist, 2003; Shumaker & Pequegnat, 1989; Sonnentag & Frese, 2003; Topf & Dillon, 1988; Tyson, Lambert, & Beattie, 2002).

- *Hypothesis 3:* There is a direct negative relationship between the perceived quality of the built environment and nurses' job-related anxiety and depression

In addition to this direct negative relationship between the quality of the built environment and job-related anxiety and depression, the literature related to organizational support theory suggests that POS may reduce job-related anxiety as it conveys to employees that the organization will provide resources such as physical assistance and emotional support (e.g., Hochwarter, Witt, Treadway, & Ferris, 2006; Witt & Carlson, 2006). To investigate the role of POS in the relationship between the quality of the work environment and job-related anxiety the following two hypotheses are suggested for further consideration in future studies:

- *Hypothesis 4:* Perceived organizational support mediates part of the relationship between the perceived quality of the built environment and nurses' job-related anxiety and depression.

Another important attitudinal variable incorporated in the model is organizational commitment. Social exchange theorists such as Eisenberger et al. (1990) and Eisenberger et al. (1986) suggested that employees are prone to exchange their commitment for the supports they receive from their employers. This idea is supported in the meta-analysis study by Rhoades and Eisenberger (2002), as they found a significant and positive relationship between POS and desire to remain ($r = 0.59$). The meta-analysis by Riggle et al. (2009) also shows that overall organizational commitment has a strong positive relationship ($r = 0.71$) with POS. In summary, as social exchange theory suggests, providing a high-quality work environment has the potential to be perceived by employees as an indicator of the benevolent intent of the organization and may create an affective bond between employees and the organization. In this regard, the following two hypotheses are suggested for future studies:

- *Hypothesis 5:* There is a positive relationship between the perceived quality of the built environment and nurses' organizational commitment.
- *Hypothesis 6:* Perceived organizational support mediates the relationship between the perceived quality of the built environment and nurses' organizational commitment

Behavioral Outcomes

The effect of the built environment and the human resource management system on behavioral outcomes is transferred through attitudinal variables. As such, the next group of variables in the framework shown in Figure 4 is individual-level behavioral outcomes. The influence of improvement in work attitudes on employees' performance have been

investigated by both organizational psychologist and healthcare environmental researchers.

In the organizational psychology literature, several meta-analyses exist that link attitudinal variables to behavioral variables such as in-role performance and extra-role performance (e.g., Blegen, 1993; Combs, Liu, Hall, & Ketchen, 2006; Harrison, et al., 2006; Meyer, Stanley, Herscovitch, & Topolnytsky, 2002; Riggle, et al., 2009; Tett & Meyer, 1993; Zangaro & Soeken, 2007). In-role performance, also known as focal performance or role behavior, refers to work behaviors that are prescribed by formal job roles (e.g., administering medication and updating patient records, providing instructions for care at home) and extra-role performance, also known as contextual performance, refers to discretionary work behaviors that are beyond one's formal job roles (e.g., staying late to help patients, making suggestions to improve the overall quality of the care provided in the department). For example, the meta-analysis by Harrison et al. (2006) of studies published between 1983 and 2004 found that organizational commitment is negatively correlated with turnover (r = -0.22), and job satisfaction is positively correlated with focal performance (r = 0.30). Furthermore, the Meyer et al. (2002) meta-analysis of 155 studies involving 50,146 employees found that affective organizational commitment is positively correlated (r = 0.32) with organizational citizenship behavior.

The impact of the built environment on behavioral outcomes of non-physician staff and physicians has been studied by healthcare environmental researchers. For example, Joseph (2006b) suggested that spatial transparency (i.e., being able to see and hear what others are doing from individual workspace or when moving around their workspace) may

promote teamwork and enhance communication as it provides more opportunities to interact with team members. In their theoretical framework capturing the current domain of EBD in healthcare, Ulrich, Berry, Quan, and Parish (2010) pointed out the influence of the built environment on participant outcomes, including nonphysician staff and physicians. More specifically, they posited there are converging findings from multiple rigorous studies indicating that safety enhancement solutions reduce absenteeism among nurses. Among nonphysician staff outcomes, Ulrich et al. (2010) suggested job-related injuries, workspace social support, and team work within units as topics for future research.

Performance Outcomes

Performance outcomes comprise the final element of the proposed framework. In a comparative study of 77 nurses working in single-occupancy versus multi-occupancy rooms in acute care environments, Chaudhury, Mahmood, and Valente (2006) found that nurses favor single occupancy rooms with regards to ease of patient examination and interaction with or accommodation of family members. Moreover, France et al. (2009) surveyed clinicians working in a children's hospital replaced with a family-centered care designed facility and found that the percentage of nurses who gave higher ratings on efficiency of work flow increased by 12%. They also found that the percentage of nurses that gave better ratings on the effect of unit layout on patient monitoring increased by 22%. As Ulrich et al. (2008) noted, these examples demonstrate that architectural and interior design of healthcare facilities have influence on staff outcomes such as medical errors, work effectiveness, and communication with patients and families. Ulrich et al.

(2010) conceptual framework for an EBD domain in healthcare provided a list of organizational outcomes for future studies, where the impact of audio and visual environments, as well as safety enhancements on facility costs, revenue, and market share are suggested areas for future research.

Considerations for Future Studies

In their study of environmental sources of satisfaction among hospital patients, Harris, McBride, Ross, and Curtis (2002) distinguished between three relevant dimensions of the physical environment, including relatively permanent characteristics such as the spatial layout of a hospital and room size (architectural features), less permanent elements such as furnishings, colors, and artwork (interior design features), and ambient features such as lighting, noise levels, odors and temperature. The same three dimensions should be considered in the study of caregivers. The key consideration for assessments involving POS is defining the high-quality work environment, because in addition to indoor environmental quality features (e.g., thermal comfort and indoor air quality), other attributes of the built environment influence one's perception of the quality of workplace, such as a feeling of connection to the natural world, feeling of cleanliness, and the amount of privacy afforded by the building. Measuring these criteria is challenging as individuals' perception and responses to their impacts may be contradictory or change over time.

To address this issue, judgmental measures, where respondents use survey questionnaires to rate various physical features, are commonly used for measuring the perceived quality of the built environment. For an employee-level analysis, the perspective adopted in this study, this approach is advantageous as some direct physical measures do

not translate into employees' perceptions of the environment (Michael, Beard, Choi, Farquhar, & Carlson, 2006). For example, a physical measure of the size and number of indoor plants is not sufficient for evaluating the "connection to the natural world" regarding indoor spaces, given that an individual's perception may depend on factors such as the spatial arrangement of the plants. Judgmental measures may be more helpful when it comes to such attributes as feelings of cleanliness that vary from person to person. However, as Araya et al. (2006) noted, it is important to control for individual characteristics, such as age and gender, to ensure the variance of outcome variables is explained by place-based (i.e., different medical departments) rather than individual differences. It is also important to note that the subjective nature of judgmental measures brings into question whether the findings actually represent the quality of the built environment. If measuring actual quality of the built environment is needed, judgmental measures should be supplemented with objective data audit measures collected by trained individuals. A more detailed discussion regarding the use of subjective versus objective measures is provided in Chapter IV.

In employee-level studies, individual-level characteristics such as age, tenure, education, and personality traits should be considered as well. For example, according to Djukic and Kovner (2009), age, educational level, and tenure might be positively related to autonomy and negatively related to job stress, both of which are important predictors of job satisfaction. Additionally, Rhoades and Eisenberger (2002) noted that positive or negative affectivity alter the way employees interpret organizational treatment as

benevolent or malevolent. Chapter III provides additional information regarding the use of individual-level characteristics in this study.

Contribution to Literature

In describing the characteristics of resources in creating competitive advantage, the importance of a human resource management system as an invisible asset embedded in the operational system of the organization has been presented. In addition, as a human resource management system develops over time, it becomes unique to a particular firm and creates a specific human capital pool. The proposed framework of this chapter suggested that as a behavior setting that offers substantial inducements to employees, the built environment can be added to the array of human resource management tools for enhancing the complexity and uniqueness of the mechanism from which the human capital pool of the firm is created. Furthermore, the principles of RBV suggest that the value generated by a rare, unique, and complex resource pool is difficult for competitors to imitate or reproduce.

This study demonstrated that the built environment, combined with the human resource management system, can be used for internal development of resources and for extending current organizational capabilities. By accepting the role of the built environment as a human resource management tool, an extensive body of the knowledge in human resource management literature becomes available to healthcare environmental researchers that can be used for strengthening the case for investing in facility design.

More specifically, in line with Sirmon et al.'s (2008) statement on enriching organizational capabilities, this study suggests that the physical environment (i.e.,

facilities) can be added as a complementary resource to the current resource bundle (i.e., human resource management practices) for enriching organizational capabilities (i.e., improving employees' job attitudes and behaviors) and creating synergy. The proposed framework adopts the concept of the synergy proposed by Makadok (2001), because it suggests that organizations can achieve higher productivity when they use their human resource management system in combination with their facilities. Furthermore, in line with the argument made by Hamilton, Orr, and Raboin (2008), and Zimring, Augenbroe, Malone, and Sadler (2008) the proposed framework offers a mechanism for leveraging the synergy between organizational management interventions and environmental design interventions.

Conclusion

Differences in firm performance originate from differences in the resources they own. To have an enduring competitive advantage, firms need to obtain a wide array of resources, including economic, social, and ecological capital, and combine them to create a value-adding resource bundle. The value generated by a rare, unique, and complex resource pool is difficult for competitors to imitate or reproduce. Human capital and the human resource management system can be significant sources for a competitive advantage. Human capital (the stock of employees' knowledge, skills, and abilities, as well as their motivation and loyalty) is often the firm's most unique resource and the mechanism involved with creating and managing it is likely to be complex. Human resource management routines developed over time, are embedded in the operational system of the organization, and are

unique to each firm. The value generated by a rare, unique, and complex resource pool is difficult for competitors to imitate or reproduce.

Human resource management efforts to improve job attitude and employee behavior can have a positive impact on the performance outcomes of the organization. Studies regarding this attitudinal and behavioral pathway suggest that human resource management practices are effective because they send a message to employees that the organization values their contributions and cares about their well-being. Employees can develop a sense of obligation, care about the welfare of the organization, and help it achieve its goals when the organization gives attention to employee needs.

Because caregivers are exposed to higher health and safety-related risks, attention to their health and well-being is particularly important. Providing a healthy environment with a high indoor environmental quality offers substantial inducements to employees that can be reciprocated with higher levels of motivation and commitment towards the organization. As a behavior setting that offers substantial inducements to employees, healthcare firms should add the built environment to the array of human resource management tools for enhancing their human capital.

CHAPTER III

THE INFLUENCE OF FACILITY DESIGN AND HUMAN RESOURCE MANAGEMENT ON JOB-RELATED ATTITUDES AND FEELINGS OF HEALTHCARE PROFESSIONALS*

Synopsis

Cost control of healthcare services is a strategic concern for organizations. To lower costs, some organizations reduce staffing levels. However, this may not be worth the tradeoff, as the quality of services will likely be reduced, morale among healthcare providers tends to suffer, and patient satisfaction is likely to decline. This chapter investigated the potential synergy between human resource management and facility design and operation to achieve the goal of providing cost containment strategies without sacrificing the quality of services and the commitment of employees.

About 700 healthcare professionals from 10 acute-care hospitals participated in this cross-sectional study. The authors used structural equation modeling to test whether employees' evaluations of their physical work environment and human resource practices were significantly associated with lower job-related anxiety, higher job satisfaction, and higher organizational commitment. The analysis found that employees' evaluations of their physical work environment and human resource practices influenced their job-related

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feelings and attitudes. Perceived organizational support mediated this relationship. The study also found a small but positive interaction effect between the physical work environment and human resource practices. The influence of physical work environment was small, mainly because of the high predictive value of human resource practices and strong confounding variables included in the analysis. This chapter specifically showed the role of facility design in reducing job-related anxiety among caregivers.

This chapter provides preliminary evidence that facility design can be used as a managerial tool for improving job-related attitudes and feelings of employees and earning their commitment. Providing a healthy and safe work environment can be perceived by employees as an indication that the organization respects them and cares about their well-being, which might be reciprocated with higher levels of motivation and commitment toward the organization.

Introduction

As discussed in Chapter I, the need for quality and affordable healthcare in the United Sates is amplified and cost control of healthcare services is a strategic concern for hospitals. To lower costs, hospital organizations often reduce staffing levels; however, the research regarding tradeoffs such as quality of service impacts, morale among healthcare providers, and patient care is limited. To achieve the goal of providing cost-containment strategies, this research investigated the potential synergy between human resource management and facility design and focused on the influence of these two factors on staff members.

Although determinants of job-related attitudes and feelings of caregivers have been studied extensively by both environmental psychologists (Joseph, 2006b; Ulrich et al., 2008) and organizational psychologists (Gittell, et al., 2010; Utriainen & Kyngas, 2009), this study is one of only a few efforts to investigate the interaction between healthcare facility design and human resource management. This study looked at the underlying processes that affect job-related attitudes and feelings and focused on the socio-emotional aspects of human resource management and facility design and operation as factors for improving caregivers' perceptions of organizational support, decreasing job-related anxiety, and enhancing job satisfaction and organizational commitment.

As explained in Chapter II, the theoretical framework of this study relied on organizational psychology theories, in which the influence of human resource management on a firm's financial performance and workers' productivity is demonstrated (Evans & Davis, 2005; Gittell, et al., 2010). Many studies have also focused on determining the mediating variables through which the effect of human resource practices is transferred to performance outcomes. Gittel et al. classified these mediating variables into two general categories: (1) changes in employees' knowledge, skills, and abilities; and (2) changes in employees' attitudes (e.g., job satisfaction), feelings (e.g., anxiety, motivation, and commitment), and behaviors (e.g., discretionary efforts). They also noted that these two pathways are not mutually exclusive, and human resource management can contribute to performance through both pathways.

Studies on employees' attitudes, feelings, and behaviors have indicated that human resource practices are effective partly because they carry the message that senior

management values employees' contributions, cares about their well-being, and in general supports them (Becker & Gerhart, 1996; Huselid, 1995; Takeuchi, et al., 2007). In line with these findings, organizational psychologists suggest that employees consider the organization as an entity with which they have an exchange relationship, and when the organization gives special attention to employees' needs, a sense of obligation is developed in employees to care about the welfare of the organization and help it achieve its goals (Rhoades, et al., 2001). Eisenberger, Huntington, Hutchison, and Sowa (1986) used a construct called perceived organizational support (POS) as the key mediating variable for explaining the positive influence of human resource practices. This study considered POS as an important mediating variable in the relationship between the physical work environment and job attitudes and feelings of healthcare professionals.

Conceptual Framework

Findings of studies on the healthcare physical environment suggest that well-designed physical settings play an important role in improving the health and safety of staff, increasing effectiveness in providing care, and improving job satisfaction (Joseph, 2006b; Ulrich, et al., 2008). In a quasi-experimental study, Folkins, O'Reilly, Roberts, and Miller (1977) studied two groups of employees and found that the staff members who moved to new facilities reported significantly higher satisfaction with the physical environment and higher overall job satisfaction. Similarly, in a before-after study of nurses in single-room maternity care versus traditional birth settings, Janssen, Harris, Soolsma, Klein, and Seymour (2001) found that nurses in new units reported higher overall satisfaction with the work environment and higher job satisfaction.

In addition to job satisfaction, job-related stress and burnout related to healthcare physical environment has been the subject of previous empirical studies. In a study of nurses' burnout, Alimoglu and Donmez (2005) reported that nurses who were exposed to more than 3 hours of daylight in a work shift reported lower work-related stress than those exposed to less daylight. Shepley, et al. (2008) studied the medical staff in two facilities, one with single-family rooms (SFRs) and the other with a combination of open-bay infant stations and SFRs, and found that staff members in the facility with SFRs had more satisfaction with the spaces provided and reported lower stress than those in the open-bay unit.

Although the studies summarized above provide support for the role of the physical work environment in improving job-related attitudes of caregivers, management studies often do not recognize the physical work environment as a factor for improving job-related attitudes of caregivers. As noted by Dendaas (2011), previous studies related to hospital work environments have focused on social and organizational dimensions, and the physical dimension has received less attention. Utriainen and Kyngas (2009) reviewed 21 studies related to hospital nurses' job satisfaction, 14 of which were carried out in the United States, and concluded that interpersonal relationships with other team members and patient care (seeing patients get better and patient satisfaction) are two themes most significant to nurses' job satisfaction. Utriainen and Kyngas also stated that organizing nursing work (work–family relationship, working time, balanced workload, and autonomy) is another significant predictor of nurses' well-being at work. In an earlier study, Lu, et al., (2005) reviewed more than 50 nursing studies and listed working

condition, social interaction, and job security as complementary sources of job satisfaction.

Chapter II showed that the literature related to healthcare environmental design suggested that the built environment is not listed among the direct sources of job satisfaction because of its indirect influence through other factors. Djukic, Kovner, Budin, and Norman (2010) and Ulrich et al. (2008) also noted that the effect of physical work environment on job satisfaction is mediated through factors such as stress, health, and safety of caregivers. In this study, POS was considered an important mediating variable in the relationship between physical work environment and job satisfaction. As Eisenberger et al. (1986) noted, employees have a tendency to assign humanlike characteristics to their organization, and because of this personification, they view favorable or unfavorable treatment as an indication that the organization favors or disfavors them. If the organization gives special attention to employees' needs, they care more about the welfare of their organization and might be more motivated to help it achieve its goals. In this study, it was proposed that providing a healthy environment with a high indoor environmental quality offers substantial inducements to employees that can be reciprocated with higher levels of motivation and commitment toward the organization. Accordingly, the first hypothesis of this study was as follows:

- *Hypothesis 1*: Perceived organizational support (POS) mediates the relationship between employees' evaluations of their physical work environment (PWE) and job attitudes.

As stated previously, POS has been used by organizational psychologists as a mediating variable to understand the relationship between human resource management and employees' job attitude. In line with the findings of previous studies, the second hypothesis of this study was as follows:

- *Hypothesis 2*: Perceived organizational support mediates the relationship between employees' evaluations of human resource practices (HR) and job attitudes.

POS is influenced by both human resource management and facility design; thus, it was used in this study to understand the interaction between these two factors. However, as noted by Djukic et al. (2010) and Ulrich et al. (2008), the existing literature does not suggest a strong direct effect for the physical work environment, specifically when it is compared with the human resource management system. Thus, the third hypothesis was:

- *Hypothesis 3*: Employees' evaluations of the physical work environment (PWE) moderate the relationship between human resource practices (HR) and perceived organizational support (POS).

In other words, PWE affects the strength of the relation between HR and POS. As previous studies suggested, a positive message is sent to employees when an organization has a strong human resource management system (where employees are involved in decision-making, receive adequate training, and are compensated based on their performance). At the same time, if the organization also provides a high-quality work environment and employees are satisfied with their physical work environment, the

combined positive factors (strong human resource management and satisfactory work environment) will have a synergistic effect on improving POS.

The outcome variables in this study were job satisfaction, job-related anxiety, and organizational commitment. Job satisfaction represents employees' subjective response to working in a specific job and organization (Cammann, Fichman, Jenkins, & Klesh, 1983). Two meta-analyses, one by Rhoades and Eisenberger (2002) and another by Riggle, et al. (2009), found that the relationship between POS and job satisfaction is positive and significant ($r = 0.59$ and 0.61, respectively). In a cross-sectional survey of 656 nurses in 100 facilities in the United States, Filipova (2011) also found that POS positively predicted job satisfaction.

Job-related anxiety, as used in this study, is defined as psychological or subjective job-related well-being of employees and reflects how they feel at work in response to their work conditions and experiences (Warr, 1990). POS may reduce job-related anxiety, as it conveys to employees that the organization will provide resources such as physical assistance and emotional support (Wallace, Arnold, Edwards, Frazier, & Finch, 2009). Finally, organizational commitment reflects an affective bond with the organization, developed as a result of emotional involvement or recognition of the value of being associated with it (Meyer, 1993). Eisenberger et al. (1986) noted that employees are prone to exchange their commitment for the supports they receive from their employers. Any action that is perceived by employees as an indicator of the benevolent intent of the organization might create an affective bond between those employees and their organization. Rhoades and Eisenberger's (2002) meta-analysis found a significant and

positive relationship between POS and desire to remain (r = 0.59), while Riggle et al.'s (2009) meta-analysis showed that overall organizational commitment has a strong positive relationship (r = 0.71) with POS.

Regarding the relationship between job satisfaction and organizational commitment, in a study of withdrawal behavior, Tett and Meyer (1993) noted that commitment develops from job satisfaction. Previous studies of job stratification among caregivers also found that job satisfaction decreases as job-related anxiety increases. Figure 5 provides an overview of the proposed relationships between the variables of this study.

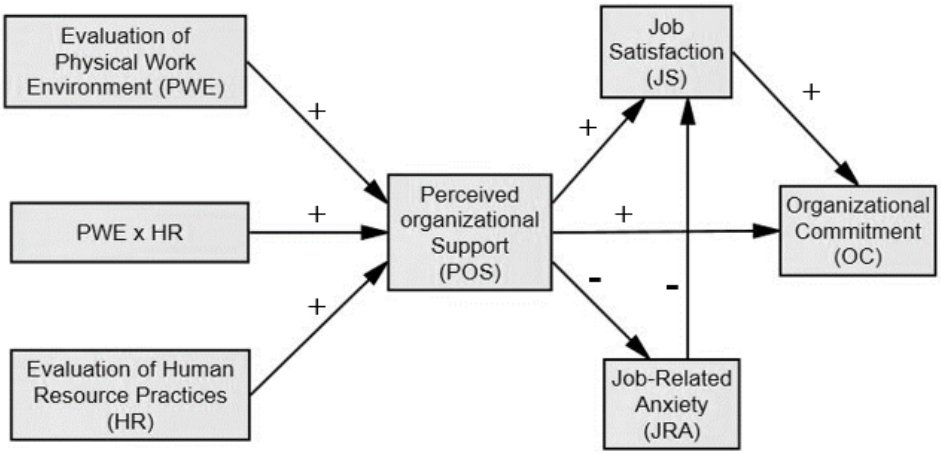


Figure 5. Overview of proposed study relationships.

Methods

Study Participants

Ten short-term acute-care hospitals run by three nongovernment and nonprofit organizations in one Midwestern state and one Southern state in the U.S. participated.

Table 2 summarizes characteristics of the study sites. Full-time employees involved in delivering care services directly to patients were the subject population. As Appendix B shows, an invitation letter with a web-link to an anonymous, voluntary survey questionnaire was sent by the Chief Nursing Officer of each hospital to employees who met selection criteria. Approximately 2,800 individuals were invited to participate in the study (1,800 registered nurses and 1,000 other professionals, such as technologists and therapists). As shown in Table 3 a total of 698 usable surveys were received, resulting in a response rate of 25.50% for registered nurses and 24.20% for other healthcare professionals (the overall response rate was 24.93%).

Measures

The authors used self-reported data comprised of employees' evaluations of their physical work environment and human resource practices as well as their job-related feelings and attitudes.

Table 2 Characteristics of the study sites

Study Site	Year of Establishment	Number of Beds	Number of Responses Received
Facility 1	1958	369	74
Facility 2	1973	271	59
Facility 3	2008	249	61
Facility 4	1952	772	191
Facility 5	1965	68	21
Facility 6	1954	33	10
Facility 7	1971	159	49
Facility 8	1976	428	93
Facility 9	1987	222	54
Facility 10	1965	365	89

Table 3 Demographic characteristics of survey participants

Demographic Groups	Number of Responses
Age	
29 or under	69
30-39	121
40-49	201
Over 50	307
Number of years worked in the building	
6-11 months	19
1-2 years	60
3-5 years	160
5-10 years	172
More than 10 years	287
Employment duration	
6-11 months	13
1-2 years	44
3-5 years	111
5-10 years	151
More than 10 years	379
Gender	
Female	652
Male	46
Ethnicity	
White	592
Asian	47
Hispanic	15
African American	42
Pacific Islander	2
Education	
High school diploma	39
Associated' degree	240
Bachelors' degree	333
Masters' degree	74
Doctorate	12
Number of working hours per week	
12 hours or less	4
12-23 hours	18
24-34 hours	92
35-40 hours	459
More than 40 hours	125
Work shift	
Day shift (6 am to 7 pm)	493
Evening shift (2pm to midnight)	29
Night shift (6 pm to 8 am)	129
Rotating shifts (combination of above)	47
Job title	
Nurse	456
Therapist/Technologist / Technician	185
Nurse Assistant / Physician Assistant	45
Physician	12

Explanatory Variables

The architectural features included in this study were adopted from Ulrich et al.'s (2008) evaluation of the scientific research on evidence-based healthcare design, Center for The Built Environment's (CBE's) standardized occupant survey for healthcare facilities (CBE, 2013) , occupant survey of LEED-certified health centers developed by Hill (2009), and green building features identified by the USGBC's LEED for Healthcare (USGBC, 2009). Specifically, 36 different architectural and physical features shown in Figure 6 were measured. Detailed information regarding inclusion of these features in the survey instrument is provided in Chapter III.

In terms of human resource management, 11 different practices covering staff engagement (communicating mission and vision, information sharing, employee involvement in decision-making, and performance-driven reward), staff acquisition and development (selective hiring, extensive training, and career development), and frontline empowerment (employment security, employment safety, reduced status distinction, and decentralized decision-making) were measured. Human resource practices were adopted from studies by Garman, McAlearney, Harrison, Song, and McHugh (2011) and McAlearney et al. (2011), in which the researchers developed a conceptual model of high-performance work system practices for healthcare organizations on the basis of prior research. To develop and format questions measuring employees' evaluations of human resource practices, the authors used survey questionnaire developed by Scotti et al., (2003) for measuring high-involvement work systems.

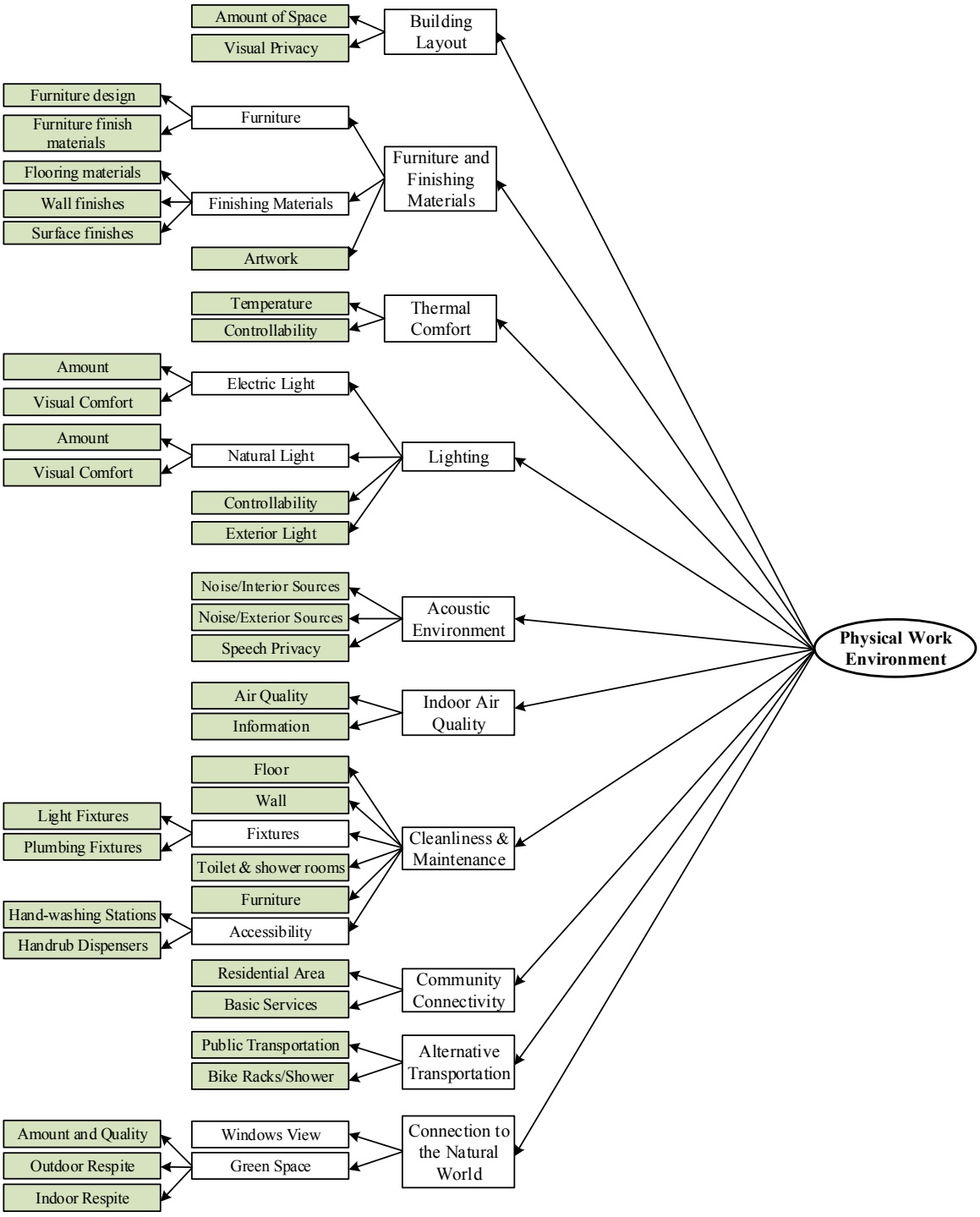


Figure 6. Breakdown of environmental features studied in Chapter III

Outcome Variables

The authors used standardized instruments commonly used for measuring employees' job-related attitudes to measure perceived organizational support, job-related anxiety, job satisfaction, and organizational commitment. Table 4 summarizes the background information about each survey instrument.

Table 4 List of survey instruments used for measuring job-related attitudes

Variable Name	Survey Author(s)	Coefficient Alpha	Description
Perceived organizational support	Eisenberger et al. (1986)	0.90	Eight items are used to measure two different dimensions of POS definition: evaluation of employees' contributions and care about employees' well-being.
Overall job satisfaction	Cammann et al. (1983)	0.67 to 0.95	Three items are used to describe an employee's subjective response to working in the specific job and organization.
Organizational commitment	Meyer (1993)	0.82	Six items are used to measure affective organizational commitment, which reflects an affective bond with the organization, developed as a result of emotional involvement or recognizing the value of being associated with it.
Job-related anxiety	Warr (1990)	0.80 to 0.92	Six items are used to describe psychological or subjective job-related well-being, which reflects one's feelings developed in response to his/her work conditions and experiences. Each item measures the frequency of the time respondents' jobs have made them feel tense, worried, uneasy, miserable, depressed, and gloomy.

Control Variables

The authors included age, education level, employment duration, number of years worked in building, and number of working hours per week as control variables, based on previous studies. For example, as Djukic et al. (2010) noted, age, educational level, and tenure might be positively related to autonomy and negatively related to job stress, both of which

are important predictors of job satisfaction. In addition, other previous studies, such as the meta-analysis by Rhoades and Eisenberger (2002), reported that supervisor support was the second strongest predictor ($\beta = .32$, $p < .01$) among different antecedents of POS, while Zangaro and Soeken's (2007) meta-analysis found that among different antecedents of job satisfaction, nurse–physician collaborations had the strongest positive correlation with job satisfaction ($r = 0.37$, $p < .01$). Accordingly, employees were asked to use a 7-point scale and report their level of satisfaction with working relationships they had with their immediate supervisor, the physician(s) with whom they worked, and other members of their work group. A composite score representing employees' overall satisfaction with their working relationships was calculated and added to the analysis.

The first section of the survey addressed background and demographic information. In the second section, employees rated their satisfaction with features of the physical work environment using a 7-point scale (1 = *very dissatisfied*, 2 = *mostly dissatisfied*, 3 = *somewhat dissatisfied*, 4 = *neither satisfied nor dissatisfied*, 5 = *somewhat satisfied*, 6 = *mostly satisfied*, 7 = *very satisfied*). For example, question 10 of the second section focused on connection to the natural world and asked respondents to indicate how satisfied they were with availability of window views, amount and visual quality of vegetated open spaces, availability and suitability of outdoor spaces as places of respite, and suitability of interior atriums, greenhouses, and solaria as places of respite.

The third part of the survey asked employees to indicate their degree of agreement or disagreement with statements regarding the organization's effort to implement each human resource practice listed previously, again using a 7-point scale (1 = *strongly*

disagree, 2 = *disagree*, 3 = *somewhat disagree*, 4 = *neither agree nor disagree*, 5 = *somewhat agree*, 6 = *agree*, 7 = *strongly agree*). For example, the first question of section three of the questionnaire asked respondents to indicate level of agreement/disagreement with the following statement: Managers communicate the organization's scope and mission to employees, and let employees know how their work contributes to the organization's mission and goals. In the subsequent sections of the survey, the standardized instruments listed in Table 4 were used to measure the outcome variables.

To ensure the usability of the survey instrument, three staff registered nurses, two healthcare environmental researchers, two nurse researchers, one graduate nursing student, and four graduate civil engineering students reviewed the draft questionnaire and pilot-tested the online survey. Based on the comments provided by these individuals, minor adjustments were made to the wording of some of the questions. To ensure the consistency of respondents' interpretations, sections two and three of the survey provided definitions of important terms along with more information about environmental features and examples for human resource as web links, to be shown in separate pop-up windows if needed. The final version of the online survey questionnaire is provided in Appendix B, and is also accessible using the following link: https://www.surveymonkey.com/s/THR2.

Analysis Approach

The authors used a multivariable path analysis to simultaneously test and estimate the relationships between the predictor variables (HR and PWE), mediating variable (POS), and outcome variables. The unit of analysis for the study was the individual caregivers. SPSS AMOS with maximum-likelihood estimation was used to perform structural

equation modeling for the multivariable path analysis. The authors used the strictly confirmatory approach proposed by Jöreskog (1993), since the main objective of the analysis was to evaluate a potential mechanism by which PWE and HR may influence outcome variables (increasing employees' perceived organizational support) rather than to examine the fit of alternative models. As used in previous studies of mediation and moderation effects (e.g., Eisenberger et al. 2001), the authors calculated and used unit-weighted composite scores for all the variables and estimated the model from the covariance matrix with pair-wise deletion of cases for dealing with missing data.

Findings

Preliminary Analysis and Scale Reliability

All variables had acceptable skewedness (lower than 2.0) and kurtosis (lower than 7.0) values for analysis with maximum-likelihood estimation (Curran, West, & Finch, 1996). To verify the discriminant validity of the constructs measured in this study, the authors first examined the distinctiveness of HR from POS, JRA, JS, and JRA. The fit of five nested models ranging from a single-factor model to the hypothesized five-factor model were evaluated using chi-square difference test (James, Mulaik, & Brett, 1982). The models were estimated from the covariance matrix with pair wise deletion of cases for dealing with missing data. Table 5 summarizes the results of this comparison and indicates that relative to the hypothesized five-factor model all the other alternative models fit the data significantly worse. Table 6 shows standardized factor loadings and descriptive statistics for items measured in the study. Table 6 also shows that the reliability coefficients (Cronbach's alphas) for all five scales were higher than 0.70 recommended by Nunnally

and Bernstein (1995), and except for one item (OC2), all Items loaded significantly on their respective construct at 0.50 or above, providing support for convergent validity (Hair, Black, Babin, Anderson, & Tatham, 1998).

The authors performed a separate analyses to determine the factor structure and verify the validity and reliability of the measurement instrument used for measuring caregivers' evaluations of the physical work environment. Results of this analysis is presented in Chapter V. In summary, the analysis found that all the subscales used in the measurement model had acceptable reliability coefficients (Cronbach's alpha >.83) and the measurement model also had an acceptable fit.

Table 5 Comparisons of measurement models

	χ^2	*df*	$\Delta\chi^2$	*RMSEA*	*TLI*	*CFI*	*AIC*	*ECVI*
One-factor model	3264.29	230	-	.134	0.61	0.68	2687.13	4.62
Two-factor model	2547.13	229	717.16*	.117	0.70	0.75	4074.77	3.65
Three-factor model	2165.09	227	382.04*	.108	0.75	0.79	3394.40	3.14
Four-factor model	1431.40	224	733.69*	.086	0.84	0.87	1581.40	2.15

Note. One factor model incorporated all four constructs; two-factor model included POS (Factor 1) and combined JRA, JS, and OC (Factor 2); three-factor model included POS (Factor 1) and OC (Factor 2) as separate factors and combined JRA and JS (Factor 3); four factor model comprised all constructs individually.

df= degree of freedom; *RMSEA* = root-mean-square error of approximation; *CFI* = comparative fit index; *TLI* = Tucker-Lewis index; *AIC*= Akaike information criterion; *ECVI*= Expected cross-validation index

* Significant at $p<0.01$

Table 6 Confirmatory factor-item loadings

Item	Cronbach's Alpha	Standardized Factor Loadings	M	SD
HR1		0.83	3.71	1.162
HR2		0.80	3.50	1.220
HR3		0.78	3.17	1.272
HR4		0.71	3.10	1.334
HR5		0.80	3.38	1.169
HR6	.948	0.74	3.26	1.224
HR7		0.74	3.32	1.223
HR8		0.82	3.50	1.109
HR9		0.85	3.51	1.171
HR10		0.79	3.36	1.265
HR11		0.75	3.51	1.137
POS1		0.86	4.85	1.593
POS2		0.61	4.31	1.813
POS3		0.68	4.70	1.698
POS4	.929	0.85	4.60	1.628
POS5		0.64	4.51	1.754
POS6		0.82	4.53	1.649
POS7		0.73	4.62	1.709
POS8		0.84	4.61	1.650
JS1		0.93	5.38	1.451
JS1	.894	0.76	5.67	1.396
JS3		0.89	5.62	1.334
OC1		0.85	5.28	1.528
OC2		0.45	4.05	1.636
OC3	.892	0.75	4.93	1.604
OC4		0.76	5.04	1.534
OC5		0.77	4.97	1.583
OC6		0.75	4.97	1.567
JRA1		0.73	3.27	0.909
JRA2		0.62	3.62	0.933
JRA3	.901	0.76	3.75	0.959
JRA4		0.81	4.25	0.886
JRA5		0.84	4.36	0.863
JRA6		0.87	4.28	0.891

Note. HR: employees' evaluations of human resource practices; POS: perceived organizational support; JS: job satisfaction; OC: organizational commitment; JRA: job-related anxiety

Finally, to assess the possible impact that the age of facilities might have on job-related attitudes and feelings, the authors performed a separate analysis and compared average values of outcome variables across the hospitals participating in this study. The analysis found no meaningful relationship between the age of facilities and job-related attitudes and feelings, as age is not necessarily a good indicator for a facility's environmental condition since hospitals typically perform frequent renovations and additions and have different maintenance practices.

Factor Correlations

Table 7 shows the relationships among the measures and indicates that the pattern of relationships satisfied Kenny, Kashy, and Bolger's (1998) first three conditions for mediation, which state that the initial variables (PWE and HR) should be related to the outcome variables the initial variables should be related to the mediator (POS), and the mediator should be related to the outcome variables. To fully demonstrate mediation, it was also necessary to show that the associations between the initial variables and the outcome variables decreased when the mediator was included in the predictive model and that the mediator predicted the outcome variables (Kenny et al., 1998).

Testing the Mediating Role of POS

For the subsequent steps of testing the mediating role of POS, the authors created three models as shown in Figure 7:

- Model I without POS, with direct paths from initial variables to outcome variables

Table 7 Means, standard deviations, and correlations among study variables

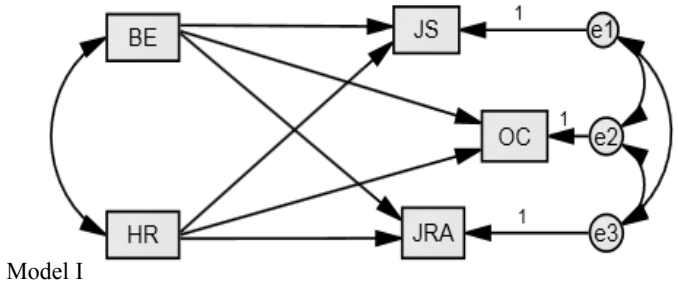
Variables	*M*	*SD*	PWE	HR	PWExHR	POS	JS	JRA	OC	C1	C2	C3	C4	C5	C6
PWE	4.45	1.14	1												
HR	3.39	0.98	.513**	1											
PWExHR	0.49	1.05	.090*	.171**	1										
POS	4.59	1.38	.477**	.807**	-.087*	1									
JS	5.55	1.26	.453**	.614**	-.149**	.671**	1								
JRA	2.08	0.74	-.422**	-.460**	.179**	-.517**	-.574**	1							
OC	4.87	1.27	.445**	.655**	-.116**	.748**	.766**	-.515**	1						
C1	5.86	0.95	.382**	.541**	-.087	.557**	.597**	-.429**	.603**	1					
C2	3.06	1.02	-.090*	-.045	-.019	.050	.105*	-.002	.108*	.023	1				
C3	2.69	0.80	.026	.131**	-.001	.094*	.057	-.035	.125**	.129**	-.040	1			
C4	5.15	1.17	-.050	-.059	-.074	-.011	.028	.050	.065	.046	.495**	-.084*	1		
C5	4.84	1.23	-.137**	-.064	-.063	-.047	-.012	.143**	.023	-.002	.445**	-.074	.782**	1	
C6	3.94	0.76	.038	.025	.029	.101*	.057	.032	.091*	-.001	.023	.102**	-.002	-.038	1

Note. M: mean; SD: standard deviation; PWE: employees' evaluations of their physical work environment; HR: employees' evaluations of human resource practices; POS: perceived organizational support; JS: job satisfaction; JRA: job-related anxiety, OC: organizational commitment C1: relationship at work; C2: age; C3: education; C4: employment duration; C5: number of years worked in building; C6: number of working hours per week.

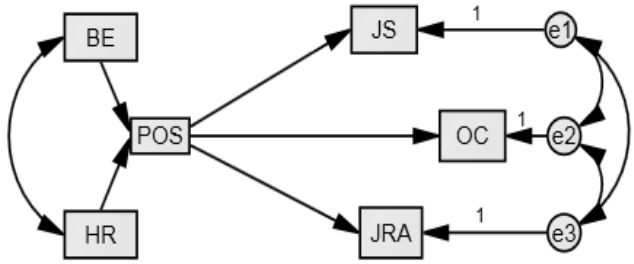
N ranged from 698 to 681 due to occasional missing data.

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

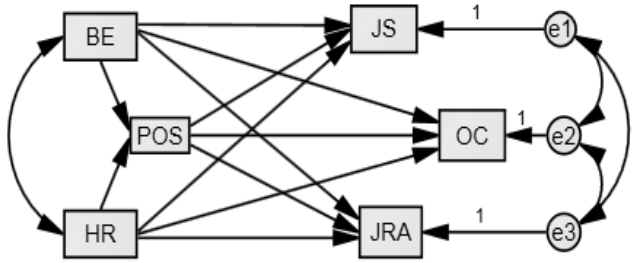
** Correlation is significant at the 0.01 level (2-tailed).



Model I



Model II



Model III

Figure 7. SEM models used for testing the mediating role POS

- Model II with POS and direct paths from initial variables to POS and from POS to outcome variables. In this model, perceived organizational support fully mediated the relationship between initial variables and outcome variables.

- Model III with POS and additional direct paths from initial variables to outcome variables. In this model, perceived organizational support partially mediated the relationship between initial variables and outcome variables.

In these three models, no path between JS, JRA, and OC was specified to only account for the mediating role of POS; however, the covariances between the disturbance terms of these latent variables were left free to vary. Besides, to increase the model degree of freedom, the authors only kept control variables with significant path coefficients. Collinearity between PWE and HR was accounted for by directly modeling the covariance between these variables in the path analysis. For all three models, the chi-square goodness of fit statistics (χ^2) was significant at $p<0.05$, which was not in support of the model fit. However, the chi-square goodness of fit test is sensitive to sample size, and when the sample size is large, like in this study, it is not uncommon to reach statistical significance. Accordingly, the authors used other common fit indexes. Cut off values for fit indexes were RMSEA values of 0.06 to 0.08 as indicators of a reasonable fit (Browne & Cudeck, 1993), CFI and TLI value of 0.90 for the minimum acceptable fit and 0.95 for a good fit (Hu & Bentler, 1999). AIC and ECVI are comparative fit indexes and the model that generates the lowest values is optimal (Bentler, 1990; Fan, Wang, & Thompson, 1999).

Table 8 summarizes the fit indices and unstandardized effect sizes for the three models. In Model II, significant paths from HR and PWE to POS satisfied Kenny et al.'s (1998) second condition for mediation that the initial variables should predict the mediator.

Table 8 Unstandardized direct effect sizes for the models developed to test the mediating role of POS

	POS	HR	PWE	C1	C2	C3	C4	C5	C6
	Model I (χ^2=20.117, *df* = 11, *RMSEA*=0.040, *CFI*=.995, *TLI*=0.980, *AIC*=152.117, *ECVI*=0.297)								
JRA	NA	-0.17	-0.135	-0.178	n.s.	n.s.	n.s.	0.058	n.s.
JS	NA	0.46	0.164	0.46	0.132	n.s.	n.s.	n.s.	n.s.
OC	NA	0.551	0.122	0.44	0.142	n.s.	n.s.	n.s.	0.097
	Model II (χ^2=45.952, *df* = 16, *RMSEA*=0.061, *CFI*=.987, *TLI*=0.956, *AIC*=167.952, *ECVI*=0.329)								
POS	NA	0.97	0.083	0.227	0.11	n.s.	n.s.	n.s.	0.143
JRA	-0.219	NA	NA	-0.157	n.s.	n.s.	n.s.	0.078	0.08
JS	0.449	NA	NA	0.432	n.s.	n.s.	n.s.	n.s.	n.s.
OC	0.552	NA	NA	0.351	n.s.	0.083	n.s.	0.053	n.s.
	Model III (χ^2=16.722, *df* = 10, *RMSEA*=0.036, *CFI*=.997, *TLI*=0.984, *AIC*=150.722, *ECVI*=0.293)								
POS	NA	0.97	0.083	0.227	0.11	n.s.	n.s.	n.s.	0.143
JRA	-0.186	n.s.	-0.121	-0.134	n.s.	n.s.	n.s.	0.069	0.081
JS	0.347	n.s.	0.125	0.391	n.s.	n.s.	n.s.	n.s.	n.s.
OC	0.491	n.s.	0.088	0.324	n.s.	0.084	n.s.	0.057	n.s.

Note. POS: perceived organizational support; HR: employees' evaluations of human resource practices; PWE: employees' evaluations of their physical work environment; JRA: Job-related anxiety; JS: Job satisfaction; OC: Organizational Commitment; C1: relationship at work; C2: age; C3: education; C4: employment duration; C5: number of years worked in building; C6: number of working hours per week

χ^2 = chi-square; *df* = degrees of freedom; *RMSEA* = root mean square error of approximation; *CFI* = comparative fit index; *TLI* = Tucker-Lewis index; *AIC* = Akaike information criterion; *ECVI* = expected cross-validation index.

n.s.: not significant

NA: not applicable, the path was not specified

N = 681

Also, POS was a significant predictor of the outcome variables, satisfying Kenny et al.'s third condition for mediation. Comparison of Model I and Model III satisfied Kenny et al.'s fourth criterion (reduction in the relationships of the initial variables with the outcome variables after adding POS as the mediator). Comparative fit indices and

change in chi-square also showed that Model III fit the data slightly better than Model I. In Model I, PWE accounted for 17.8% of the variance in job-related anxiety, 20.5% of the variability in job satisfaction, and 19.8% of the variability in organizational commitment. Adding HR explained an additional 8.1% of the variability in job-related anxiety, an additional 20.3% of the variability in job satisfaction, and an additional 24.7% of the variability in organizational commitment. In Model III, PWE accounted for 22.8% of the variability in POS, and HR accounted for an additional 42.8% of the variability in POS.

Estimated effect sizes (Table 8) for Model I and Model III indicated that by adding POS as a mediating variable, the direct relationship between PWE and the outcome variables was reduced, while direct paths from HR to the outcome variables dropped out of significance. This suggests that POS only partially mediated the relationship between employees' evaluations of their physical work environment and the outcome variables, while it fully mediated the relationship between evaluations of human resource practices and the outcome variables (Kenny, et al., 1998).

To verify whether the indirect effects of HR and PWE on the outcome variables through POS were statistically significant, the authors used Sobel's (1982) test and found that all indirect paths were statistically significant at $p < 0.05$. Finally, the high percentage of explained variance in the outcome variables showed the relative importance of both PWE and HR in predicting them. However, in comparison with PWE, HR had a more predictive capability. In summary, the results shown in Table 7 and Table 8 supported hypotheses 1 and 2 regarding the mediating role of POS in the relationship of HR and PWE with caregivers' job attitudes.

Moderating Effects of Employees' Evaluations of the Physical Work Environment

To assess the moderating effect of employees' evaluations of the physical work environment (PWE) on the relationship between HR and outcome variables, the authors added the product term of these (HR multiplied by PWE) into the model. Both PWE and HR were mean-centered before creating the product term to reduce the multicollinearity problem and simplify the interpretation of the coefficients. PWE and HR were also kept in the model to partial out the main effects of PWE and HR on the outcome variables. Table 9 shows standardized effect sizes and total effects for the final model. Fit indices showed an acceptable fir tor the model ($\chi 2 = 16.33$, df = 8, RMSEA = .045, TLI = .972, CFI = .997, AIC = 208.33) and all the parameters were significant and in the hypothesized directions shown in Figure 5. As expected, both PWE ($\beta = 0.062$, $p < .05$) and HR ($\beta = 0.702$, $p < .05$) were significant unique predictors of POS in the final model. The interaction term (PWE x HR) had a small positive effect ($\beta = 0.051$, $p < .05$) on POS, supporting hypothesis 3 regarding the synergy between HR and PWE in improving POS.

Predictors and control variables accounted for 69.2% of the variability in POS, 34.8% of the variability in job-related anxiety, 58.7% of the variability in job satisfaction, and 70.3% of the variability in organizational commitment. Standardized effect sizes showed that the strength of the relationship between HR and POS was more than 11 times stronger than the relationship between PWE and POS. Moreover, HR had larger indirect effects on all outcome variables except for job-related anxiety, on which HR and PWE had a comparable effect size.

Table 9 Standardized effect sizes for the model with interaction effect

	HR	PWE	HRxPWE	POS	JRA	JS	C1	C2	C3	C4	C5	C6
	Standardized Direct Effects											
POS	0.702	0.062	0.051	NA	NA	NA	0.158	0.093	n.s.	n.s.	n.s.	0.079
JRA	n.s.	-0.183	n.s.	-0.335	NA	NA	-0.170	n.s.	n.s.	n.s.	0.184	0.078
JS	0.116	0.076	n.s.	0.267	-0.247	NA	0.254	n.s.	n.s.	n.s.	n.s.	n.s.
OC	n.s.	n.s.	n.s.	0.386	n.s.	0.425	0.125	n.s.	0.051	n.s.	n.s.	n.s.
	Standardized Total Effects											
POS	0.702	0.062	0.051	NA	NA	NA	0.158	0.093	-0.026	0.017	-0.044	0.079
JRA	-0.235	-0.204	-0.017	-0.335	NA	NA	-0.223	-0.075	0.030	-0.081	0.199	0.052
JS	0.362	0.143	0.018	0.35	-0.247	NA	0.352	0.140	-0.041	-0.016	-0.019	0.043
OC	0.425	0.085	0.027	0.535	-0.105	0.425	0.335	0.115	0.023	0.046	-0.006	0.071

Note. HR: employees' evaluations of human resource practices; PWE: employees' evaluations of their physical work environment; POS: perceived organizational support; JRA: Job-related anxiety; JS: Job satisfaction; OC: Organizational commitment; C1: relationship at work; C2: age; C3: education; C4: employment duration; C5: number of years worked in building; C6: number of working hours per week

NA. Not applicable, the path was not specified

n.s. not significant

N = 681

Discussion and Practical Implications

Demand in the healthcare workforce is expected to grow as a result of healthcare reform, and several previous studies have highlighted the critical role of employees' job-related attitudes and feelings, as they have important implications for the recruitment and retention of caregivers (Buerhaus, 2008). It has also been demonstrated that job-related feelings and attitudes have significant influence on the quality of care that caregivers deliver and the outcomes they produce for their patients (Aiken et al., 2011). Accordingly, healthcare executives should regularly examine the factors that influence caregivers' job-related feelings and attitudes to understand and plan for necessary changes. This study

focused on the underlying processes that affect job-related attitudes and investigated the interaction of human resource management with facility design and operation, finding a synergy between these two factors for lowering job-related anxiety, improving job satisfaction, and enhancing organizational commitment of staff members. POS was responsible for mediating these relationships.

As for the mediating role of POS in the relationship between human resource management and outcome variables, findings were similar to those reported in previous studies. Both Wayne (1997) and Rhoades et al. (2001) found that POS mediated the relationship of participation in decision-making, job security, fairness of rewards, and developmental experiences with affective commitment. Filipova (2011) also found that POS positively predicted job satisfaction of nurses.

This analysis also found that when controlling for relationship at work, age, education, employment duration, number of years worked in building, and number of working hours per week, employees' evaluations of their physical work environment (PWE) had a small but positive association with POS and accounted for about 22.8% of its variability. Regarding the small effect size for PWE, a possible explanation can be the way POS was operationalized and measured in this study. As stated by Eisenberger et al. (1986), the POS measurement instrument captures two major dimensions, namely valuation of employees' contributions and caring about their well-being. The physical work environment only addresses the second dimension of POS (caring about employees' well-being), while human resource practices address both dimensions.

The synergy between employees' evaluations of their physical work environment and their evaluations of human resource practices (HR) further supported the importance of facility design and operation. Figure 8 illustrates how the relationship between HR and POS was higher for employees satisfied with their physical work environment compared with those who were less satisfied. This means that when caregivers are satisfied with the facility design and operation, an increase in their satisfaction with HR practices is associated with a greater improvement in POS. This finding is different from findings of previous studies that investigated the impact of different facets of job satisfaction among nurses, such as those conducted by Kotzer, Koepping, and LeDuc (2006) and Santos et al. (2003). These researchers reported that nurses are generally not satisfied with their physical work environment, and the built environment is a source of job dissatisfaction. Studies of job satisfaction often do not recognize the physical work environment as factor for improving job-related attitudes of caregivers. However, it is evident from Figure 8 that, overall, employees with a higher level of satisfaction with their physical work environment report a higher level of POS. This finding suggests that when the interaction between HR and PWE is considered, facility design and operation have a significant impact on improving job-related attitudes of healthcare professionals.

This study garnered several key findings from an organizational management perspective. Foremost, this study showed that facility design and operation can be used as a managerial tool for improving employees' job-related attitudes and feelings and earning their commitment. The positive influence of PWE on POS and the mediating role of POS shows that providing a high-quality and safe work environment can be perceived by

employees as an indication that the organization values and respects them and cares about their well-being. As noted by Eisenberger et al. (1986), positive valuation and attention to employees' well-being, connoted by POS, fulfills socio-emotional needs of employees and leads them to incorporate organizational membership and exchange their commitment for the support they receive.

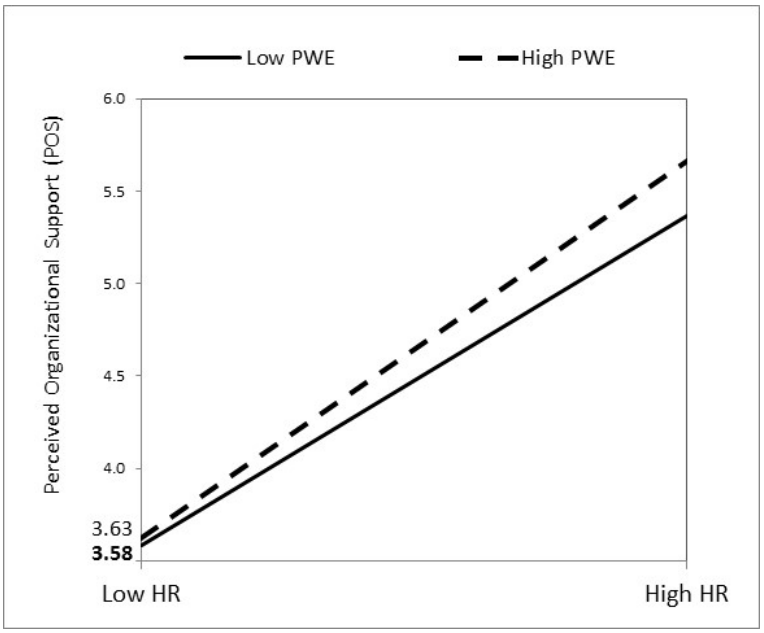


Figure 8. The relationship between human resource management (HR) and perceived organizational support (POS) as a function of employees' evaluations of their physical work environment (PWE).

Noteworthy is the fact that in this study, the authors measured affective commitment, which reflects an affective bond with the organization, developed as a result of emotional involvement or recognition of the value of being associated with it. The mediating role of POS suggests that providing a high-quality and safe work environment

can be perceived by employees as an indicator of the benevolent intent of the organization and may create an affective bond between caregivers and the organization (Meyer & Herscovitch, 2001) . An important consideration here is providing information about design and operation practices implemented to address employees' health and safety issues. For example, increasing the ventilation rate or installing high-efficiency particulate air (HEPA) filters for reducing the risk of airborne infections would be more effective when employees know that other facilities do not go beyond minimum requirements set by occupational health and safety codes. A voluntary action like this shows an organization's mindset of putting high emphasis on the needs of its members. Rhoades and Eisenberger (2002) also noted that employer–employee relationships can be characterized as "the trade of effort and loyalty for tangible benefits and social rewards" (p. 698). This study provides preliminary support for the notion that in this exchange relationship, a well-designed work environment can be accepted by employees as a benefit that they receive in return for their efforts. Caring about the well-being of employees is specifically important in healthcare settings, as employees are exposed to higher health- and safety-related risks at work.

This chapter specifically showed the role of facility design and operation in reducing job-related anxiety among caregivers. Table 9 showed that among the outcome variables in this study, PWE had the largest association with job-related anxiety. Moreover, unlike other attitudinal variables, the effect of PWE and HR on job-related anxiety was of comparable size. Previous empirical studies showed that reducing noise

level, providing natural light, allowing exterior views, and introducing green plants in work spaces can lead to less strain and anxiety (Joseph, 2006a; Ulrich et al., 2008).

As for the relationship between the outcome variables and control variables included in the analysis, Table 9 showed that age was negatively associated with job-related anxiety, indicating that younger staff members reported higher levels of anxiety. POS had a small but negative relationship with the age of employees, indicating that younger staff members care more about the support they receive from their organization. These results suggest that in comparison with older employees, improving the physical work environment can have a stronger impact on reducing the job-related anxiety of younger staff members. This finding is specifically important, as the older and retiring workforce is being replaced by younger professionals.

Study Limitations and Directions for Future Studies

As stated previously, this study is one of only a few efforts to investigate the interaction between healthcare facility design and human resource management. Though this study makes important contributions to the field, the analysis presented in this chapter does have some limitations that need to be mentioned and possibly addressed in future studies. First, this study did not include personal characteristics of employees, such as personality dimensions and the strength of socio-emotional needs. As noted by Eisenberger and Stinglhamber (2011), dispositional differences may not have an independent influence on POS, but they may alter the influence of other work-related variables on POS. Second, job title and job level may also influence POS and should be considered in future studies. In the study of POS antecedents, Eisenberger and Stinglhamber noted that in many

organizations, pay varies primarily with job type, and compared with employees with lower-level jobs, higher-level employees do not necessarily feel more supported. Third, although the results of the structural equation modeling were satisfactory and the respondent sample was large and diverse, because the primary objective of this study was to examine the role of POS in mediating the relationship of HR and PWE with attitudinal outcome, the cross-sectional design of the study is an important limitation. Relationships identified in this study should be verified using time-series data or cross-sectional studies conducted in multiple phases.

The analysis presented in this chapter did not distinguish between different medical departments and different spaces within a hospital. Chapter IV deals with the impact of different spaces (patent areas, staff work spaces, staff rest areas) on job-related attitudes and feelings of caregivers.

Conclusion

Previous studies have found that implementing human resource management practices, such as training, team-work support, and employee involvement in decision-making positively impact performance of caregivers through improved job attitudes and behaviors. Organizational psychologists suggest that human resource management practices are effective because they show that the organization values employee contributions and cares about their well-being. Attention to employee needs creates a sense of obligation in employees to care about the welfare of the organization and help it achieve its goals. Analysis presented in Chapter III found a small positive association between the perceived quality of the built environment and perceived organization

support, indicating that providing a high-quality and safe work environment can have a positive influence on caregivers by providing for their physical and socio-emotional needs. Moreover, the study found that POS is responsible for conveying part of the influence of BE on job-related anxiety, job satisfaction, and organizational commitment.

While this study supported the role of facility design and operations on reducing job-related anxiety, the overall impact of the built environment on job satisfaction and organizational commitment was small, due to strong predictive value of human resource practices as well as multiple confounding variables included in the model. The analysis also found that when healthcare professionals are satisfied with their physical work environment, the positive influence of human resource practices on perceived organizational support is stronger.

In summary, the positive influence of facility design on organizational support, the positive interaction between facility design and human resource management, and the mediating role of organizational support, controlling for multiple confounding variables, showed that providing a healthy work environment can be accepted by caregivers as a tangible benefit that they receive in return for their effort and can be reciprocated with higher levels of motivation and commitment towards the organization. Because caregivers are exposed to higher health and safety-related risks, attention to their health and well-being is particularly important.

CHAPTER IV

INFLUENCE OF PATIENT AREAS, WORK SPACES, AND STAFF AREAS ON JOB-RELATED ATTITUDES AND FEELINGS OF HEALTHCARE PROFESSIONALS

Synopsis

About 700 healthcare professionals from 10 acute-care hospitals run by three healthcare organizations participated in this cross-sectional study. Structural equation modeling found that employees' evaluations of their physical work environment were significantly associated with lower job-related anxiety, higher job satisfaction, and higher organizational commitment. Perceived organizational support was responsible for mediating part of these relationships, indicating that a healthy work environment can be perceived by employees as their organization valuing them and caring about their well-being. When distinguished between different spaces, analysis found that satisfaction with rest areas and work spaces had the largest effect size, while the influence of patient areas was small. Employees newer to the facility and to the organization were more influenced by the physical work environment. This study provides preliminary evidence that facility design can be used as a managerial tool for improving job-related attitudes and feelings of employees and earning their commitment.

Introduction

The overall purpose of this study was to understand how healthcare professionals' evaluation of their physical work environment influences their job-related attitudes and feelings. Research has shown that job-related feelings and attitudes of staff members have

significant influence on the quality of care they provide (Aiken, et al., 2011). From a managerial perspective, a report by the American Hospital Association (AHA; 2011) also suggested that caring for employees can play an important role in the financial well-being of the organization. The AHA report indicated that approximately 60 cents of every dollar of expenditures goes to caregivers and other hospital workers, making human-resource-related expenses higher than other essential expenses, including medication, devices and other supplies, treatment facility improvements, health information technology installation or upgrades, utilities, and liability coverage.

Among work environment factors that may influence healthcare professionals, this study focused on the physical work environment. The authors used findings of previous organizational psychology studies to examine the underlying processes that affect job-related attitudes and feelings of healthcare professionals. More specifically, this study focused on the socio-emotional aspects of facility design and operation as factors for improving employees' perceptions of organizational support, decreasing job-related anxiety, and enhancing job satisfaction and organizational commitment. Because employees spend their working time at different locations, the authors distinguished between three different types of spaces, defined as follows:

- *Patient areas*, including spaces that are designed to be used by patients and families, such as inpatient rooms, patient rooms in critical-access nursing units, critical care rooms, maternity rooms, and support areas for families and visitors.

- *Staff work spaces*, including individual work spaces, shared work spaces (e.g., report rooms, nurse stations), patient treatment areas, examination rooms, operation rooms, therapy rooms, and other spaces where staff spend the majority of their working time performing their tasks.
- *Staff areas*, including spaces that are used solely by employees, such as staff lounges and caregiver sleeping areas.

Accordingly, the first objective of this study was to understand how evaluations of patient areas, staff work spaces, and staff rest areas might be associated with employees' perceptions of organizational support, job-related anxiety, job satisfaction, and organizational commitment. Moreover, as Gibson (1977) and Sallis, Owen, and Fisher (2008) noted, to fully understand the multiple levels of the environment's influence, individual-level factors should be considered as well. Accordingly, the second objective of this study was to determine if there is a significant difference in the relationship between physical work environment and employees' job-related attitudes across different demographic groups.

Literature Review

This study investigated the link between employees' evaluations of their physical work environment and their job-related attitudes and feelings. As Andrade, Lima, Fornara, and Bonaiuto (2012) noted, healthcare physical environments and their implications for users have been the subject of many environmental psychology studies, and several empirical investigations have demonstrated the impact of the physical environment on healthcare employees. This section provides a brief review of previous environmental studies on

healthcare professionals and summarizes common approaches for measuring indoor environmental quality and the major environmental dimensions involved.

The Impact of Physical Work Environment on Job Attitudes and Feelings of Healthcare Employees

Job Satisfaction

Job satisfaction is the most commonly investigated variable in healthcare environmental studies of staff members. Several before-after studies have compared staff satisfaction in new versus old facilities, focusing on a bundle of environmental features. These studies have been performed in various settings, including mental health, maternity care, intensive care, and primary care facilities.

In one of the earliest examples of such studies, Folkins, O'Reilly, Roberts, and Miller (1977) performed a quasi-experimental study in a community mental health center. The researchers studied three teams of staff members, two of which moved to new facilities and one of which stayed in the old facility. The old facility had a ward-style layout, tile floors, and office windows starting at six feet, while the new facilities had H-style floor plans, carpeted floors, and floor-to-ceiling windows. The authors measured satisfaction with the physical environment and job satisfaction 12 months and 2 months before the move and 4 months after the move. The analysis found that those who moved to the new facilities had significantly higher satisfaction with the physical environment, but staff that stayed in the old facility had similar environmental satisfaction ratings at all three points in time. They also found that satisfaction with physical environment influenced overall job satisfaction.

In another before-after study of nurses who moved from traditional birth settings to a single-room maternity care unit, Janssen, Harris, Soolsma, Klein, and Seymour (2001) found that nurses described their new units (single-room maternity care) as more spacious and reported higher satisfaction with privacy, noise levels, and accessibility of equipment and supplies. In addition to satisfaction with the built environment, nurses reported that they were better able to respond to the physical, emotional, and spiritual needs of their clients in the new units.

Rice, Ingram, and Mizan (2008) also performed a before-after study in a primary care environment and used self-reported data of 19 administrative and professional staff members who moved from a converted Victorian house to a new purpose-built surgery facility in 2005. The new facility was described as being more modern and spacious and was designed with careful attention to lighting, noise, and furnishings. The researchers found that staff satisfaction with the work environment was higher in the new building, and staff reported a higher level of job satisfaction after the move. Finally, in a study of staff perceptions of the physical environment and work quality in a neonatal intensive care unit (NICU) before and after a transition from an open bay (OPBY) unit to single-family rooms (SFRs), Smith, Schoenbeck, and Clayton (2009) found that after the transition, average staff rankings of several major indicators of occupancy quality, including overall physical work environment, patient care, job, and interaction with NICU technology, was significantly higher.

In addition to before-after studies, previous research has used other design approaches to investigate the influence of facility design and operation on job satisfaction

of staff members. In a comparative analysis, Shepley, Harris, and White (2008) studied NICU medical staff providing care in two facilities, one with SFRs and the other with OPBY infant stations and SFRs. The authors measured employees' perceptions of the spaces in each facility, including respite space, work space, nourishment station, family sleeping area, and family waiting area, as well as the broader dimensions of the environment, such as décor, noise, light, natural light, window views, and overall quality. The study found that staff members in the facility with SFRs had more satisfaction with the provided spaces and reported higher job satisfaction than those in the OPBY unit. In another nursing study conducted in a general medical and surgical urban hospital in the United States, Djukic, Kovner, Budin, and Norman (2010) used a cross-sectional design and found that job satisfaction had a positive and significant correlation with physical work environment ($r = .26$, $p = .01$).

Stress, Job-Related Anxiety, and Strain

In addition to job satisfaction, previous studies have also demonstrated the influence of the physical work environment on job-related anxiety and strain. As Ulrich, Zimring, Quan, Joseph, and Choudhary (2004) noted, studies have shown that staff stress (and error) could be reduced by ergonomic interventions and environmental considerations (e.g., air quality, lighting, acoustics, exterior views, etc.). As for lighting, in a study of nurses' burnout, Alimoglu and Donmez (2005) reported that nurses who were exposed to more than 3 hours of daylight in a work shift reported higher job satisfaction and lower work-related stress. Regarding acoustics, Morrison, Haas, Shaffner, Garrett, and Fackler (2003) performed a cohort observational study in a pediatric intensive-care unit and found that

higher average sound levels significantly predicted higher heart rates, greater subjective stress, and greater annoyance among registered nurses. In another study of acoustics, Blomkvist, Eriksen, Theorell, Ulrich, and Rasmanis (2005) examined the influence of different acoustic conditions on the staff in a coronary critical care unit and found that lower noise levels were linked with a number of positive effects on staff, including reduced perceived work demands, pressure, and strain. As for exterior views, Pati, Harvey, and Barach (2008) found that visual relief through exterior and nature views strongly affected nurses' self-reported levels of alertness and acute stress, after controlling for environmental stressors (lighting, noise, thermal comfort, and ergonomics), organizational stressors, workload, and personal characteristics (age, experience, and income).

Besides the impact of the specific environmental features summarized above, several studies have focused on the collective impact of bundles of environmental factors on job-related anxiety and strain in various settings, including acute-care, intensive-care, and emergency departments. In a cross-sectional analysis, Applebaum, Fowler, Fiedler, Osinubi, and Robson (2010) studied odor, noise, light, and color in a sample of medical-surgical nurses working in acute-care settings and found that odor and light had an inverse relationship with stress, while noise had a positive correlation with perceived stress. In a before-after analysis, Berry and Parish (2008) studied differences in nurses' evaluations of their job, hospital, and building features 6 months before and 6 months after moving to a new hospital wing featuring SFRs, larger spaces, more natural light, more handwashing stations, and more staff break rooms. The analysis found significant improvements in employees' evaluations of their work environment as well as job stress and job

satisfaction. In another before-after study of hospital staff in a pediatric emergency department, Judkins (2003) found that after the opening of a dedicated pediatric emergency area in an established tertiary hospital emergency department, staff members in the new ward reported a lower level of stress when managing pediatric patients. Finally, Stevens et al. (2012) compared an old OPBY NICU, built in the late 1970s, to a new SFR NICU, built in 2006, and found that nurses reported higher satisfaction with the quality of the SFR physical work environment and lower levels of anxiety in the new unit. Similarly, a comparative study of an OPBY versus an SFR NICU revealed that SFR nurses expressed lower levels of stress than OPBY nurses (Shepley, et al., 2008).

Organizational Commitment, Turnover Intention, and Discretionary Absenteeism

A few studies have focused on organizational commitment, turnover intention, and discretionary absenteeism. For example, Applebaum et al.'s (2010) study on noise and stress found that noise was positively correlated with stress, stress was negatively related to job satisfaction, and job satisfaction was negatively correlated with turnover intent. Shepley, Gerbi, Watson, Imgrund, and Sagha-Zadeh (2012) performed a before-after study of the impact of daylight and views on intensive-care unit (ICU) patients and staff. An old ICU, built in 1956, was compared to a new ICU, built in 2007, designed to increase window views and daylight. In the new ICU, the clinical work areas and decentralized stations had views of the outdoors through windows, while the corridors, staff lounge, and offices looked out on a rooftop garden. Comparison of the two ICU units revealed that discretionary absenteeism (calling in sick, taking an unscheduled day off, leaving early, etc.) in the new unit was 25% lower than that of the old unit.

Important Environmental Features of Different Spaces within a Facility.

Previous studies have found that different spaces within the hospital influence employees' perceptions of their workplace differently. For example, Halford and Leonard (2003) studied two National Health Service Hospitals in England and found that spatial confinement of nurses to their wards led nurses to have a strong spatial identification with their ward and have negative feelings toward other spaces within the hospital. Additionally, types of activities performed in diverse spaces within a hospital differ, and studies of the work environment of healthcare professionals should consider these differences. For example, in staff work spaces, nurses may spend a considerable amount of their time performing administrative duties, while in patient areas, they spend much more time providing direct patient care. Likewise, a study by Zborowsky, Bunker-Hellmich, Morelli, and O'Neill (2010) found that contact between nurses and family members rarely occurred within nursing stations; rather, it occurred in patient rooms or corridors.

Recognizing these differences, a few studies have focused on the architectural and physical features of specific spaces within hospitals. Concerning patient areas, Reiling, Knutzen, and Stoecklein (2003) found that standardization of the location of supplies, equipment, and furniture in patient rooms reduced the potential for error by making the environment less stressful. They noted that important features of the patient rooms include in-room sinks, charting alcoves with a window, supplies and computers in the alcoves, carpeted floors, bedside computers, oversized windows, sitting areas, and a close proximity between the bed and bathroom. A study of single-occupancy versus multi-

occupancy rooms by Chaudhury, Mahmood, and Valente (2006) also looked at the physical and environmental patient room features important to caregivers and found that staff members favored single-occupancy rooms because of their flexibility, increased appropriateness for patient examination, and improved quality of patient monitoring. Staff members also reported that extra space in the room made furniture arrangement easier and provided storage for clean and dirty supplies. Better privacy for patients, more space for family members, lower noise levels, and better lighting and temperature control were also reported as helpful characteristics of single-occupancy rooms. In a pre- and post-occupancy study of a children's hospital, Kotzer, Zacharakis, Raynolds, and Buenning (2011) found that layout of the patient room, amount of natural light, adequacy of storage and writing surfaces, and overall comfort and appeal were the most important characteristics of patient rooms according to staff members.

Regarding staff work areas, Simmons (2003) reported that availability of space is one of the most important considerations. Adequate space in work areas, such as medication rooms, reduces distractions and helps staff members better focus on their tasks. In addition to availability of space, adequate countertop size, well-organized supplies, adequate task lighting, and reduced noise level are important considerations. Moreover, in a comprehensive investigation of 16 different physical features in two Chinese hospitals, Monjur and Yisong (2012) found that nurses preferred that nursing stations be designed with a degree of acoustic separation between the working areas and adjoining corridors and patient areas, while visual and auditory links between nursing stations and patient areas be maintained.

Using Surveys for Measuring Employee Evaluations of the Indoor Environment

In addition to employees' attitudes, behaviors, health, productivity, and well-being, features of the indoor environment affect lifecycle costs and energy consumption. Accordingly, several research projects have focused on developing standards and guidelines for evaluating and measuring indoor environmental quality (IEQ) in commercial buildings. In essence, evaluations may be performed using objective physical measurements, subjective occupant surveys, or a combination of both. As noted by Peretti and Schiavon (2011), there is an active discussion in the building science field regarding when and how occupant surveys should be used in lieu of or in addition to physical measurements. According to Fornara, Bonaiuto, and Bonnes (2006), when objective measures are used, results reflect analytic processes of knowledge, coded in technical and scientific sources, and when subjective measures are used, the evaluation pattern can be viewed as a result of daily psycho-social processes of knowledge, interpretation, and experience of the environment by the users.

Understanding occupants' experience of the physical environment is explicitly important in studies that focus on the link between the indoor environment and job attitudes, meaning employees' psychological responses to their experience at work. The definition of IEQ provided by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) emphasizes the role of occupants' perceptions and experiences; specifically, ASHRAE defines IEQ as a *perceived* indoor experience about the building indoor environment by occupants (ASHRAE Technical Committee 1.6, 2013). As for the suitability of using objective data versus subjective data for capturing

occupants' experiences, previous studies suggest that subjective measures are more effective. For example, Humphreys (2005) noted that environmental experience is flexible and is not completely constrained by human physiology. Peretti and Schiavon (2011) also noted that a range of complex factors such as psychological expectations and physical conditions might influence occupant responses to the physical environment in buildings, which cannot be accounted for solely by physical measurements. Heinzerling, Stefano, Tom, and Ed (2013), based on a comprehensive review of subjective and objective IEQ assessment models, noted that surveys have incomplete diagnostic capability in capturing IEQ issues that might have energy implications (e.g., over-lighting or economizer operations), but pointed out that surveying has the advantage of being fast, simple, and less expensive and, most importantly, captures occupant satisfaction, which is ultimately the primary interest of building owners and operators regardless of physical IEQ conditions.

In response to the above-mentioned discussions and to provide a consistent method for measuring and expressing energy use, water use, and indoor environment of buildings, ASHRAE (2010), in collaboration with the United States Green Building Council (USGBC) and Chartered Institution of Building Services Engineers (CIBSE), developed performance measurement protocols for commercial buildings that facilitate assessing building performance in the fields of energy and water use and IEQ (thermal comfort, indoor air quality, lighting, acoustics). Protocols are identified for three levels of measurement, with increasing level of measurement detail, frequency, accuracy, and cost, as summarized below:

- Basic evaluation using observation of building characteristics, perceptions of occupants, and data from utility bills to characterize performance.
- Diagnostic measurement using physical measurement to diagnose problems indicated at the basic level and to identify improvement areas.
- Advanced analysis using the results of the first two levels plus the findings of a professional investigation process to identify specific actions for improvement.

According to ASHRAE, annual occupant surveys are adequate for the basic level of IEQ assessment, but objective spot measurement and instrumentation is recommended as an option for diagnosis and identification of sources of dissatisfaction encountered in survey results.

Both occupant surveys and objective assessments have been used in previous healthcare studies. Studies that focused on specific features of the physical work environment, such as noise and illumination, used objective data (Blomkvist, et al., 2005; Morrison, et al., 2003; Shepley, et al., 2012; Stevens, et al., 2012), while studies that covered a wider range of features used subjective data collected through survey questionnaires (Applebaum, et al., 2010; Berry & Parish, 2008; Djukic, et al., 2010; Janssen, et al., 2001; Kotzer, et al., 2011; Monjur & Yisong, 2012; Rice, et al., 2008; Shepley, et al., 2008; Smith, et al., 2009). Exceptions for this finding include the study of daylight by Alimoglu and Donmez (2005) and the study of exterior views by Pati et al. (2008), in which the authors used subjective data rather than objective measurements.

Major Dimensions Involved in Evaluating Indoor Environment

As stated previously, healthcare physical environments and related implications for users have been a major focus of environmental psychology (Andrade, et al., 2012), and several measurement tools have been designed and used exclusively in healthcare environmental studies. Existing measurement methods used in healthcare settings are summarized in Table 10. As shown in Table 10, a wide variety of physical and design features have been investigated in previous studies. Several authors have proposed a structure to categorize these features. For example, Berry and Parish (2008) noted four facets of the physical environment that may influence employees' perceptions, specifically quality of patient care areas, quality of patient work spaces, safety (degree of hazard for staff and patients related to facility design), and pleasantness of the facility (ambience of the facility design due to specific design features). According to Moos (2008), creator of the work environment scale (WES) used in several healthcare environmental studies (e.g., Djukic, et al., 2010; Harris, et al., 2002), environmental features can be grouped into three categories:

- Architectural features, including relatively permanent characteristics such as the spatial layout of a hospital and availability of space.
- Interior design features, including less permanent elements such as furnishings, colors, and artwork.
- Ambient features, such as lighting, noise level, odor, and temperature.

Table 10 Summary of architectural and physical features covered in previous studies of healthcare professionals

Author(s)	Survey or Study Title	Architectural/Physical Features Included
The Center for the Built Environment (2013)	Occupant Indoor Environmental Quality	The survey is comprised of a core survey and optional survey modules. Optional modules are added depending on the building owner's interest and particular building's features. The core survey measures occupant satisfaction in the following categories: Space layout (availability of space and visual privacy), furnishings (quality, color, and texture of flooring, furniture and surface finishes), thermal comfort (temperature and the ability to control it), air quality (i.e. stuffy/stale air, cleanliness, odors), lighting (amount, visual comfort, and the ability to control natural daylight and electric lighting), acoustic quality (noise level and sound privacy), Speech privacy (ability to hear and understand others, level of distraction), cleanliness and maintenance, as well as overall satisfaction with workspace and building.
Huckabay and Jagla (1979)	The Questionnaire of Stressful Factors in the Intensive Care Unit	Environmental problem subscale including noise level, physical setup of the unit (such as supplies not readily available or not stored in an organized fashion), equipment failure, and physical injury to the nurse
Shepley et al. (2008), based on Fournier (1999)	The Satisfaction and Perception of Physical Environment (SPPE)	Overall physical environment, window views, natural light, light level, noise level, atmosphere and decor, waiting and resting space, corridors and signage for wayfinding, and place for food and nourishment
Kotzer et al. (2011)	Staff Evaluation of the Built Environment (SEBE)	Charting area, layout of the patient room, natural light, artificial light, placement of sinks, placement of soap dispensers, storage, writing surfaces, comfort/appeal, privacy, security/safety, parking, break room, wayfinding, and proximities.
Berry and Parish (2008)	The impact of facility improvements on hospital nurses	Quality of patient areas (including being comfortable for family and friends, encouraging staff to spend sufficient time with each patient, allowing the patients a sense of privacy, ease of private conversations with staff), quality of nurse workspaces (availability of features needed to do the job at workstations, sufficiency of meeting spaces, convenience of the location of supplies in the department, availability if enough storage areas for the work group, availability of convenient parking space to the work area, not having trouble in finding equipment when needed), safety (encouraging patient safety and staff safety, feeling that the facility is safe), and pleasantness of the facility (availability of a place to relax when the stress is high, pleasantness of features to look at in the work area, pleasing look of the hospital)

Table 10 Continued

Author(s)	Survey or Study Title	Architectural/Physical Features Included
Djukic et al. (2010) based on Moos (2008)	Physical Comfort subscale of Work Environment Scales (WES)	One architectural feature (workspace size), Four interior design features (stylish and modern in appearance, interior decorations and colors, arrangement of furniture), four ambient features (temperature, lighting, ventilation and air flow)
Janssen et al. (2001)	Before-after study of OPBY versus SFRs in a maternity care unit	Room spaciousness, setup similarity, light adequateness, supply accessibility, availability of resuscitation equipment, privacy, noise, accommodation of water therapy choices
Monjur and Yisong (2012)	Healthcare providers' perception of design factors related to physical environments	Cleanliness and ease of maintenance, air quality, noise level, thermal comfort, proximity to wards, provision for hand hygiene, artificial and natural lighting, spaciousness, pleasant color scheme, exterior view, furniture layout, indoor plants, interior/exterior landscaping, presence of coordinated art objects
Smith et al. (2009)	Before-after study of OPBY versus SFR NICU	Staff privacy, parental privacy, noise level, ease of speech communication, lighting, task visibility, thermal comfort, air quality, storage space quality
Applebaum et al. (2010)	The impact of environmental factors on nurses	Odor, noise, natural light, artificial light, color
Rice et al. (2008)	The impact of a primary care environment on staff	Availability of space, light, quietness, décor, cleanliness, noise

In the present study, the authors used the information provided in Table 10 to develop a measurement instrument to capture employees' assessments of their physical work environment.

Evaluation of Previous Studies and Discussion of Literature Gap

Empirical studies summarized in the previous sections were performed in various settings, including acute-care units, intensive-care units, emergency departments, neonatal units, pediatric units, and adult care units, thereby strengthening the evidence base for improving job-related attitudes and feelings of healthcare professionals through facility design and operation. However, these studies are subject to methodological limitations that should be highlighted.

The majority of studies reviewed used the before-after design, in which a single group of employees was measured on the dependent variable (e.g., evaluation of the physical work environment, job satisfaction, job-related anxiety, attrition) both before and after the change in the independent variable (i.e., physical work environment). The major limitation of this study design in the aforementioned studies is that the physical work environment was not appropriately measured or researchers did not completely isolate the effect of other events that might have occurred contemporaneously with the change in the physical environment. For example, new hospitals are normally designed to facilitate utilization of new technologies and electronic resources that might have a positive impact on job satisfaction or job-related anxiety of caregivers. The NICU studies by Stevens et al. (2012) and Smith et al. (2009) both noted that survey participants reported significantly higher levels of satisfaction with the quality of interaction with NICU technology.

However, the authors did not make it clear how much of the improvement in job attitudes (reduction in staff anxiety and improvement in job satisfactions) could be accounted for by the improvement in technology versus the improvement in the physical work environment. Similarly, the ICU study by Shepley et al. (2012) compared a 1956 facility to a 2007 study, but no information regarding the possible impact of advanced medical technologies that might have been used in the new unit was provided.

Moreover, before moving to new facilities, organizations normally implement nursing education programs to prepare staff for working in the new environment. For example, Janssen et al. (2001) reported that the introduction of single-room maternity care necessitated a 6-month preparation period of cross-training before moving to the new facility. Although the authors acknowledged the possible contribution of the education program to improved perceptions of competency and staff satisfaction, their analysis did not account for the effect of training.

Finally, in Judkins' (2003) study of a pediatric emergency department, the questionnaire sent to staff members did not cover employees' evaluations of their work environment, and the author just assumed that the lower level of stress reported by caregivers after moving to a new facility was associated with changes in the work environment. It is very important to note that the main focus of the studies conducted by Judkins (2003), Stevens et al. (2012), and Shepley et al. (2012) were on patient outcomes; therefore, the shortcomings described above do not apply to the analyses regarding the impact of the new units on patients and their families.

One possible way to account for the impact of relevant confounding factors is by including them as control variables in the analysis. For example, in their before-after study of noise and stress, Morrison et al. (2003) included years of nursing experience, caffeine intake, patients' Pediatric Risk of Mortality Score, shift assignment, and room assignment as control variables in their regression model. In such cases, when control variables are included in the analysis, in addition to percentage of variance explained by the whole model, predictive capability of each variable should be discussed. For example, although Morrison et al. reported estimated effect sizes for each variable and stated that the model explained 90% of the variance in the outcome variable, the percentage of variance explained by the main predictor (noise) was not clear. Stepwise regression analysis, in which the control variables and main predictor are entered in the model in different steps, could be used to address this issue.

Cross-sectional design is another common approach used in previous studies (e.g., Alimoglu & Donmez, 2005; Applebaum, et al., 2010; Morrison, et al., 2003; Pati, et al., 2008; Shepley, et al., 2008). Compared to before-after studies, cross-sectional design is more suitable for performing an individual-level analysis because study variables are measured at a single point in time. In before-after studies, matching individual-level responses collected at different points in time is difficult, and often impossible. Accordingly, before-after studies normally compare descriptive statistics (mean, median, percentile, and variance) across groups of participants before and after the intervention. Moreover, because cross-sectional studies are performed over a short period of time and the study is not limited to the facility in which intervention is implemented, multiple sites

can participate, which increases the sample size and facilitates the inclusion of multiple variables (control, dependent, and independent) in the analysis.

Conversely, an important limitation of cross-sectional studies, including those reviewed herein, is that all variables are measured simultaneously, and unlike before-after studies, the temporal sequence between exposure and outcomes cannot be established. Accordingly, even when the relationship between study variables is strong and statistically significant, it is not possible to draw conclusions regarding the causal relationship between them. For example, in their daylight study, Alimoglu and Donmez (2005) highlighted that stress and burnout might show a sequential progression over time, and if that is true, a longitudinal, repeated measure study would give more reliable results regarding the causal relationship between daylight and work-related stress. Similarly, Applebaum et al. (2010) acknowledged that although they found a significant relationship between higher sound levels and more stress, they were not able to prove that it was a causal relationship. More noise, for instance, might be associated with a greater number of alarms requiring nursing intervention and dealing with ICU patents, thus leading to higher stress and annoyance.

Another major limitation of studies reviewed herein is that only a few performed an integrated analysis of different spaces within a hospital and differences across demographic groups. As for the influence of different spaces within a facility, the majority of studies focused on patient and family spaces (e.g., P. Janssen, et al., 2001; Smith, et al., 2009), a few studies measured staff and patient spaces separately but did not report the differences (e.g., Applebaum, et al., 2010; Djukic, et al., 2010; Rice, et al., 2008; Stevens, et al., 2012), and the few studies that reported the differences only looked at descriptive

statistics (e.g., Alimoglu & Donmez, 2005; Berry & Parish, 2008; Blomkvist, et al., 2005; Kotzer, et al., 2011; Shepley, et al., 2012), despite the fact that different spaces within the hospital influence employees' perceptions of their workplace differently (Simmons, 2003; Zborowsky, et al., 2010).

Concerning demographic characteristics, the few studies that performed additional analyses all found significant differences across different groups, highlighting the need to distinguish among employees with different demographics. For example, the NICU study by Smith et al. (2009) grouped NICU nursing staff, house staff, and supervisory personnel in one category and NICU neonatologists and neonatal nurse practitioners in another. The analysis found that compared to neonatologists and neonatal nurse practitioners, members of the first group were less sensitive to occupancy quality differences between the OPBY and SFR environments. Likewise, Kotzer et al. (2011) found that compared to NICU nurses, therapists were less sensitive to some features, including placement of soap dispensers, safety/security, wayfinding, and proximities. Regarding work shifts, Blomkvist et al. (2005) collected data from employees working in three different shifts (morning, afternoon, and night) and found that afternoon shift staff experienced significantly lower work demands and reported less pressure and strain. Finally, previous studies normally treated age and experience level as control variables in the model and did not thoroughly discuss the impact of these factors on findings.

The current study expands the findings of previous studies through an integrated analysis of the relationship between employees' job attitudes and their satisfaction with architectural and physical features of important environments within healthcare facilities

(patient rooms, work spaces, and staff areas). In this case, integrated analysis means that variables representing employees' evaluations of patient rooms, work spaces, and staff areas, as well as variables representing job attitudes of caregivers, were included in the same statistical model, and the relationships between all of these variables were tested simultaneously. Performing integrated analysis is important to examine the pattern of relationships between different hospital spaces and various job attitudes and to determine differences across these spaces. The second contribution of this study is in its examination of differences across different demographic groups (age, number of years worked in the facility, work shift, and job title). Understanding differences across demographic groups is specifically important, as the demographic composition of healthcare professionals might vary considerably from one organization to the next, and studying all demographic groups together reduces the generalizability of findings.

Conceptual Framework

As stated previously, the main objective of this study was to test whether employees' evaluations of important environments within hospitals were significantly associated with their job-related attitudes and feelings, and whether this relationship varied across different demographic groups. Similar to Chapter III, the outcome variables in this study were job satisfaction (JS), job-related anxiety (JRA), and organizational commitment (OC). As explained in Chapter II and Chapter III, literature review suggested that employees' satisfaction with their physical work environment is expected to increase their overall job satisfaction and reduce their job-related anxiety. However, previous studies in healthcare settings indicated that the effect of physical work environment on job

satisfaction is mediated through factors such as stress, health, and safety (Djukic, et al., 2010; R. Ulrich, et al., 2008). In line with findings of Chapter II and Chapter III, in this chapter the authors investigated the mediating role of perceived organization support (POS), a construct used in previous organizational psychology studies, in the relationship between satisfaction with the physical work environment and job attitudes of healthcare professionals.

Eisenberger, Huntington, Hutchison, and Sowa (1986) defined POS as "an experience-based attribution concerning the benevolent or malevolent intent of the organization's policies, norms, procedures, and actions as they affect employees" (p. 42). These authors also noted that employees have a tendency to assign humanlike characteristics to their organization and view favorable or unfavorable treatment as an indication that the organization favors or disfavors them. As stated in Chapter II and Chapter III, the authors assumed that providing a healthy environment with a high indoor environmental quality sends the message that senior management values and respects employees and cares about their health and well-being. Accordingly, the researchers expected to find a positive relationship between POS and employees' satisfaction with the architectural and physical features of patient areas, work spaces, and staff rest areas. Moreover, Rhoades and Eisenberger (2002) suggested that when employees feel that their organization gives special attention to their needs, a sense of obligation and motivation develops and leads them to care about the welfare of the organization and help it achieve its goals. Accordingly, POS was expected to have a positive relationship with the outcome variables of the study (JS, JRA, OC).

The positive impact of POS on job attitudes and feelings of employees has been well documented in previous organizational psychology studies in healthcare settings. In a cross-sectional study of 650 nurses in Ontario, Canada, Mallette (2011) found a strong, positive relationship (r = .53) between POS and job satisfaction. Kwak, Chung, Xu, and Eun-Jung's (2010) cross-sectional study of 496 registered nurses working at 23 acute-care hospitals in South Korea also found that job satisfaction was positively correlated with POS (r = .36). Previous meta-analyses indicated a strong, positive relationship (r = .59–.61) between POS and job satisfaction (Rhoades & Eisenberger, 2002; Riggle, et al., 2009).

As shown in Chapter III, POS may also reduce job-related anxiety, as it conveys to employees that the organization will provide resources such as physical assistance and emotional support when needed (Hochwarter, et al., 2006; Witt & Carlson, 2006). Previous studies of job stratification among caregivers also found that job satisfaction decreases as job-related anxiety increases (Newbury-Birch & Kamali, 2001; Spector, 1997). Organizational commitment was another outcome variable of this study. As noted by Eisenberger et al. (1986), positive valuation and attention to employees' well-being, connoted by POS, fulfills socio-emotional needs of employees and leads them to incorporate organizational membership and exchange their commitment for the support they receive. A significant and positive relationship between POS and desire to remain (r = .59) and overall organizational commitment (r = .71) has been reported in previous meta-analyses (Rhoades & Eisenberger, 2002; Riggle, et al., 2009). Finally, in a study of withdrawal behavior, Tett and Meyer (1993) found that commitment develops from job

satisfaction. Figure 9 provides an overview of the proposed relationships between the variables of this study. Note that satisfaction levels with patient areas, work spaces, and staff areas are entered in the model as three separate predictors.

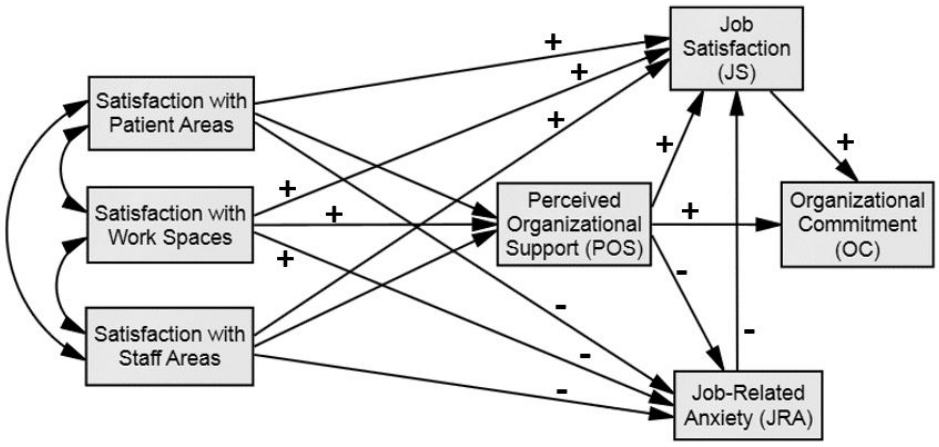


Figure 9. Overview of proposed study relationships.

Methods

As stated in Chapter III, this study used a cross-sectional research design. Ten short-term acute-care hospitals run by three nongovernment and nonprofit healthcare organizations in one Midwestern state and one Southern state in the United States participated in the study. Regarding the size (between 33 and 772 beds, average size = 294) and age (built between 1954 and 2008, average age = 43 years) of facilities, hospitals selected for this study represented a wide range of spatial and physical conditions. The authors used self-reported data of employees' evaluations of their physical work environments and their

job-related attitudes and feelings. The authors decided to use self-reported data for the following important reasons:

- The focus of this study was on the cognitive processes that impact employees' job-related attitudes and feelings. The outcome variables of the study were subjective responses of employees regarding their experiences at their job. As noted by Peretti and Schiavon (2011) and Fornara et al. (2006), only judgmental measures, where respondents use survey questionnaires to rate various physical features, capture the experiences of the environment by the users. As stated in Chapter II, using judgmental measures is specifically helpful in measuring attributes of the physical environment, such as feelings of cleanliness and the amount of privacy afforded by a building, which vary from person to person.
- According to Michael, Beard, Choi, Farquhar, and Carlson (2006), using self-reported data is advantageous for an individual-level analysis, as some direct physical measures do not translate into employees' perceptions of their environment. For example, the room temperature might not be directly linked to the temperature that the occupant actually prefers, or physical measure of the size and number of windows might not be sufficient for evaluating window view given that an individual's evaluation may depend on factors such as the spatial arrangement of the windows.
- Compared to objective measurements, surveying was less expensive. Though the literature review revealed that the major shortcoming of

surveys is their incomplete diagnostic capability for analyzing the energy implications of IEQ issues, such analysis was beyond the purpose of this study.

Study Participants

Permission to conduct the study was granted by the academic institution of the authors in February 2012 (Appendix A) and the Institutional Review Boards of the participating organizations in summer 2012. Healthcare professionals that were employed full-time and involved in delivering care services requiring direct interactions with patients were the subject population of this study. As explained in Chapter III, approximately 2,800 individuals who met eligibility criteria were invited to participate in the study (1,800 registered nurses and 1,000 other healthcare professionals). A total of 698 surveys were received, resulting in a response rate of 24.93% (25.50% for registered nurses and 24.20% for other healthcare professionals, such as technologists and therapists). The demographic profile of the study sample is presented in Table 3. Respondents were mostly female (93%), white (85%), and working dayshifts (70%).

Measurement

The authors first developed a draft questionnaire by incorporating the findings from the review of literature and industry guidelines. As explained in Chapter III, two nurse researchers, two chief nursing officers from participating organizations, three staff registered nurses, and two healthcare environmental researchers reviewed the draft for accuracy and content validity. Participants were asked to state any deficiencies in the content of the questionnaire and other potential sources of perceptions not covered.

Based on the comments provided by the review panel, the authors decided to provide definitions of important terms along with more information about selected environmental features to ensure the consistency of respondents' interpretations. Moreover, to ensure the usability of the online survey instrument, two staff registered nurses, one nurse researcher, one graduate nursing student, and four graduate civil engineering students pilot-tested the online survey. Based on the comments provided by these individuals, minor adjustments were made to the wording of some questions. The final version of the survey questionnaire is provided in Appendix B and is also accessible at https://www.surveymonkey.com/s/QRV7C29.

Explanatory Variables

As advised by Harris et al. (2002), the authors studied three relevant dimensions of the physical environment, including architectural features, interior design features, and ambient features. The first section of the questionnaire addressed background and demographic information, and the second measured individuals' evaluations of architectural and physical features. The second section distinguished between three different types of spaces (patient areas, staff work space, and staff areas) and asked respondents to rate architectural and physical features of each space separately, using a 7-point scale (1 = *very dissatisfied*, 2 = *mostly dissatisfied*, 3 = *somewhat dissatisfied*, 4 = *neither satisfied nor dissatisfied*, 5 = *somewhat satisfied*, 6 = *mostly satisfied*, 7 = *very satisfied*).

The authors used the Center for the Built Environment (CBE; 2013) standardized occupant IEQ survey for healthcare facilities as the basis for developing and formatting the questions in section two of the survey, based on the following reasons:

- Developing a new measurement instrument was beyond the scope of this study. Robust and iterative investigations are required to fully develop a measurement instrument, establish its reliability and validity, and provide evidence to support its psychometric integrity. The CBE core IEQ has an established reliability and validity and has been extensively tested and refined by researchers and industry partners of CBE. The cognitive interviewing testing method has been used to assess the ability of respondents to accurately comprehend and answer the CBE IEQ's questions (Zagreus, Charlie, Edward, & David, 2004).
- The CBE IEQ survey is one of the two subjective instruments recognized and recommended in the ASHRAE (2010) performance measurement protocols for subjective IEQ measurement with respect to thermal comfort, indoor air quality, lighting, and acoustics.
- Among the IEQ surveys listed in Table 1, the CBE IEQ survey is the most comprehensive instrument for measuring employees' perceptions of various environmental features. It has been used in more than 600 facilities, with over 65,000 individual occupant responses (CBE, 2013).

Figure 10 shows the breakdown of architectural and physical features investigated. In total, 26 different architectural and physical features were included in the analysis

performed in this chapter. In summary, as Harris et al. (2002) recommended, architectural features, interior design features, and ambient features were studied. The authors decided to exclude feature such as exterior lighting, proximities to basic services, alternative transportation, and green spaces because they do not explain interior spaces studied in this chapter. As stated previously, to ensure the consistency of respondents' interpretations, in the second section of the survey, the following information was provided via web links and shown in separate pop-up windows:

- Definition of speech privacy (the ability to have conversations without distracting colleagues or having colleagues overhear, and vice versa).
- Definition of visual comfort of artificial and natural light (absence of issues such as glare, reflections, contrast).
- List of possible interior sources of noise (building mechanical-electrical-plumbing systems, air distribution systems, and other facility noise sources).
- List of possible exterior sources of noise (road traffic, aircraft flyovers, railroads, on-site heliports, emergency power generators during maintenance testing, outdoor mechanical and building services equipment).
- List of devices normally used for controlling artificial and natural light (light switch, light dimmer, task light, bedside light, window blinds or shades).

- List of devices normally used for controlling temperature (window blinds or shades, operable window, thermostat, portable heater/fan, adjustable air vent in wall or ceiling, adjustable floor air vent/diffuser).

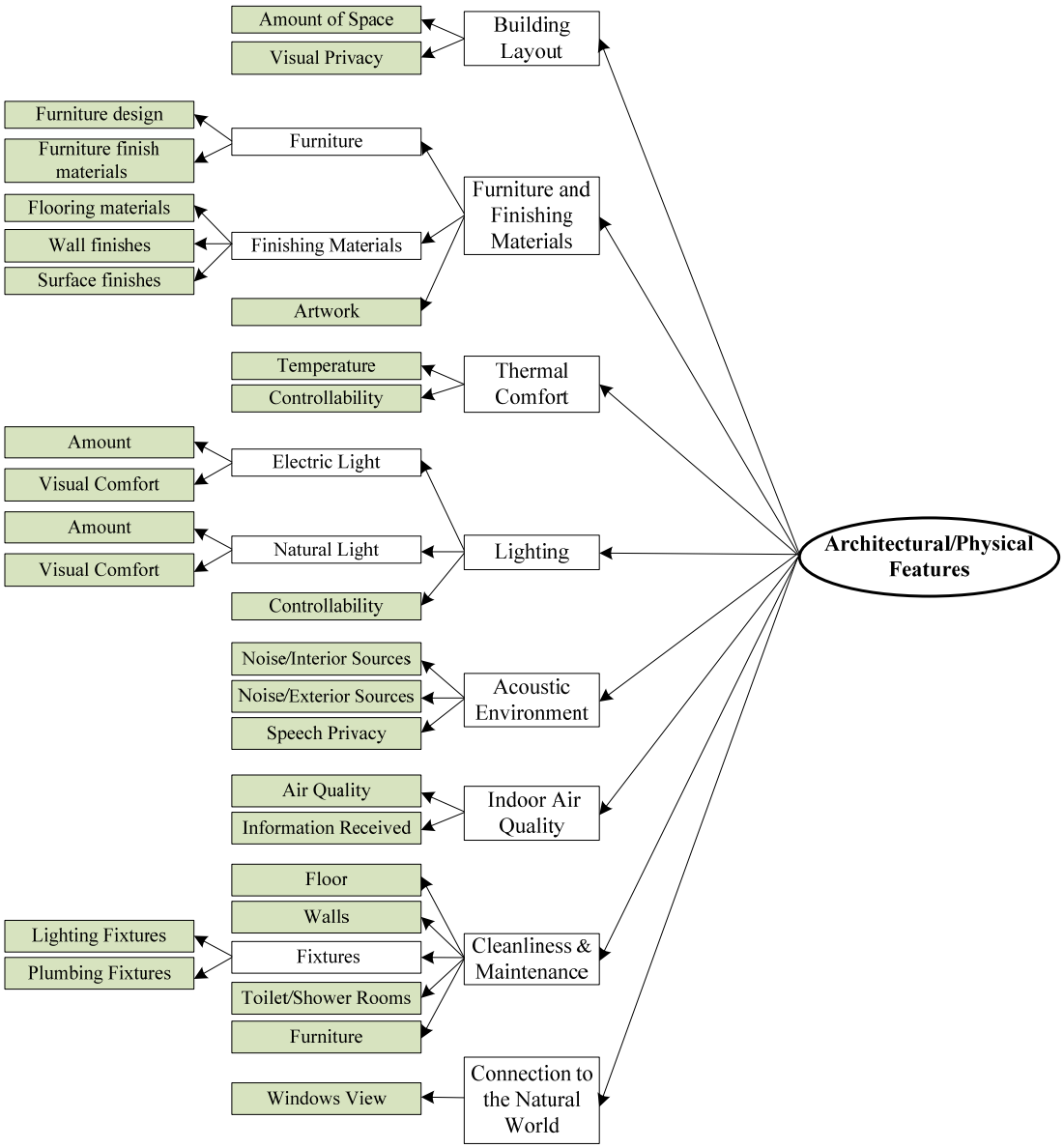


Figure 10. Breakdown of architectural and physical features analyzed in Chapter IV.

Outcome Variables

As explained in Chapter III, perceived organizational support, job-related anxiety, job satisfaction, and organizational commitment were measured using standardized instruments commonly used in measuring employees' job-related attitudes and feelings. Table 4 in Chapter III summarizes background information about each survey instrument.

Control Variables

Similar to Chapter III, the authors controlled for age, education level, employment duration, number of years worked in building, number of working hours per week, and employees' satisfaction with their relationships at work. Age, educational level, and tenure (employment duration) might be positively related to autonomy and negatively related to job stress, both of which are an important predictor of job satisfaction (Djukic & Kovner, 2009). Previous meta-analyses also reported that communication of nurses with their supervisors and physicians is an important antecedent of job satisfaction (Rhoades & Eisenberger, 2002; Riggle, et al., 2009). Accordingly, employees were asked to indicate their satisfaction with their working relationships with the physician(s) with whom they worked, their immediate supervisor, and other members of their work group. A composite score representing employees' overall satisfaction with their relationships at work was calculated and included in the analysis.

Analysis Approach

Similar to Chapter IIII, the authors performed a multivariable path analysis to simultaneously test and estimate the relationships between explanatory variables (predictors) and outcome variables (Figure 9). Control variables were included in the

model as explanatory variables predicting all the outcome variables. The unit of analysis for the study was the individual caregivers. The authors employed SEM techniques and used the strictly confirmatory approach proposed by Jöreskog (1993). Unit-weighted composite scores were calculated and used for all the variables in the model. The authors used SPSS AMOS with maximum-likelihood estimation and employed the covariance matrix with pairwise deletion of cases to deal with missing data. After testing and estimating the relationships shown in Figure 9, the authors performed multiple-group analysis to examine how demographic characteristics of employees may influence the relationships. To perform multigroup comparisons, the authors used critical ratios for differences between parameters, a statistic reported by AMOS, and performed pairwise parameter comparisons for testing the hypothesis that estimated effect sizes associated with each path in Figure 9 would be equal across groups.

Results

Preliminary Analysis

Table 11 shows the relationships among the study variables and indicates that predictor variables were related to the outcome variables and all correlations were significant at the $p < .01$ level. Preliminary analysis also indicated that data collected for this study were suitable for performing factor analysis, as all variables had acceptable skewedness (lower than 2.0) and kurtosis (lower than 7.0) values for factor analysis with maximum-likelihood estimation (Curran, et al., 1996). Kaiser–Meyer–Olkin (KMO) measures of sampling adequacy were higher than the minimum acceptable value (0.08) recommended by Kaiser

(1960). A Bartlett Test of Sphericity (BTS) was also statistically significant in all three datasets at $p < .000$, indicating that the variables were not completely uncorrelated.

To assess the possible impact of clustering structure (respondents clustered within facilities) on study results, the authors calculated the intraclass correlation coefficient (ICC) for all study variables. The results did not indicate strong similarities among employees working in the same facility, and ICC values were less than .11. The reliability coefficients (coefficient alphas) for all four scales were higher than the .70 recommended by Nunnally and Bernstein (1995), and all items loaded significantly on their respective construct at .50 or above, providing support for convergent validity (Hair, et al., 1998). The authors performed a separate analysis to verify the reliability of the measurement instrument developed for quantifying caregivers' evaluations of patient areas, work spaces, and staff areas. The analysis found that all three measurement models had acceptable reliability coefficients, and the measurement models also had an acceptable fit. Table 12 summarizes model fit and reliability information for this instrument. Detailed results of this analysis in provided in Chapter V.

Table 11 Means, standard deviations, and correlations among study variables

Variables	*M*	*SD*	*Coefficient Alpha*	Patient Areas	Work Spaces	Staff Areas	POS	JRA	JS	OC	C1	C2	C3	C4	C5	C6
Patient Areas	4.49	1.27	.84	1												
Work Spaces	4.40	1.25	.83	.789**	1											
Staff Areas	4.30	1.38	.76	.655**	.745**	1										
POS	4.59	1.38	.92	.402**	.447**	.445**	1									
JRA	2.08	0.74	.90	-.377**	-.409**	-.365**	-.517**	1								
JS	5.55	1.26	.89	.391**	.444**	.393**	.671**	-.574**	1							
OC	4.87	1.27	.89	.375**	.426**	.400**	.748**	-.515**	.766**	1						
C1	5.86	0.95	-	.320**	.372**	.339**	.557**	-.429**	.597**	.603**	1					
C2	3.06	1.02	-	-.071	-.113**	-.105**	.050	-.002	.105*	.108*	.023	1				
C3	2.69	0.80	-	.058	.024	-.019	.094*	-.035	.057	.125**	.129**	-.040	1			
C4	5.15	1.17	-	-.080*	-.065	-.026	-.011	.050	.028	.065	.046	.495**	-.084*	1		
C5	4.84	1.23	-	-.152**	-.136**	-.104*	-.047	.143**	-.012	.023	-.002	.445**	-.074	.782**	1	
C6	3.94	0.76	-	.020	.035	.025	.101*	.032	.057	.091*	-.001	.023	.102**	-.002	-.038	1

Notes: M: mean; SD: standard deviation; POS: perceived organizational support; JRA: job-related anxiety; JS: job satisfaction; OC: organizational commitment; C1: relationship at work; C2: age; C3: education; C4: employment duration; C5: number of years worked in building; C6: number of working hours per week.

N ranged from 698 to 681 due to occasional missing data.

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

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

Table 12 Summary of fit indices for measurement models capturing employees' evaluations with architectural/physical features of patient area, work spaces, and staff areas

	χ^2	χ^2/df	*RMSEA—Low 90 CI*	*RMSEA—High 90 CI*	*Standardized RMR*	*CFI*
Patient area	612.241	1.97	.050	.063	.058	.944
Work spaces	670.331	2.15	.053	.067	.091	.942
Staff area	631.802	2.06	.054	.068	.063	.955

Notes: χ^2 = chi-square; *df* = degrees of freedom; *RMSEA—Low 90 CI* = lower 90% confidence interval for root mean square error of approximation; *SRMR—High 90 CI* = higher 90% confidence interval for standardized root mean square residual; *CFI* = comparative fit index.

For all three models, the chi-square goodness of fit statistics (χ^2) were significant at $p < 0.05$, which was not in support of the model fit. However, the chi-square goodness of fit test is sensitive to sample size, and when the sample size is large, like in this study, it is not uncommon to reach statistical significance. Accordingly, the authors used other common fit indexes. Cut-off values for fit indexes were a minimum value of 3 for χ^2/df (Marsh, Balla, & McDonald, 1988); χ^2/df values as high as 5 (Schumacker & Lomax, 2004); *RMSEA* values of 0.06 to 0.08 as indicators of a reasonable fit (Browne & Cudeck, 1993); *SRMR* values less than 0.10 for the upper limit of acceptable fit (Hu & Bentler, 1999); and a *CFI* value of 0.90 for the minimum acceptable fit and 0.95 for a good fit (Hu & Bentler, 1999).

The Structural Equation Model

When estimated for the total sample using SPSS AMOS, the SEM showed an excellent fit. The results of the SEM analysis are presented in Table 13 and Figure 11. Of the nine examined parameters associated with patient areas, work spaces, and staff areas, only three were significant in the hypothesized directions. None of the paths linking the evaluation of patient areas to outcome variables reached the 5% significance level. Work spaces had two significant paths, and staff areas had one significant path. The relationships among outcome variables (POS, JRA, JS, and OC) were significant and in the predicted directions.

Table 13 Standardized direct and total effect sizes

	Work Spaces	Staff Areas	POS	JRA	JS	C1	C2	C3	C4	C5	C6
	Standardized Direct Effects										
POS	.136	.173	NA	NA	NA	.435*	.109*	.009	-.095	.032	.078*
JRA	n.s.	n.s.	-.388	NA	NA	-.171*	-.054	.036	-.054	.160*	.075*
JS	.144	n.s.	.348	-.241	NA	.263*	.095*	-.029	.095	.044	.025
OC	n.s.	n.s.	.387	NA	.429	.124*	.014	.053*	.014	.029	.020
	Standardized Total Effects										
POS	.136	.173	NA	NA	NA	.435	.109	.009	-.095	.032	.078
JRA	-.046	-.058	-.388	NA	NA	-.319	-.091	-.091	-.022	.149	.049
JS	.202	.074	.430	-.241	NA	.491	.155	.155	-.074	.020	.041
OC	.139	.099	.571	-.103	.429	.503	.123	.123	-.046	.050	.068

Notes: POS: perceived organizational support; JRA: job-related anxiety; JS: job satisfaction; OC: organizational commitment; C1: relationship at work; C2: age; C3: education; C4: employment duration; C5: number of years worked in building; C6: number of working hours per week.

Chi-square (χ^2) = 2.31, χ^2/degree of freedom =.578, comparative fit index = 1.00, 90% confidence interval for root mean square error of approximation (*RMSEA*) = .00 and .043.

NA = not applicable, the path was not specified.

n.s. = not significant.

* Significant at $p < 0.05$.

The relative size of the estimated structural coefficients (standardized total effects), shown in Table 6, indicated that evaluations of staff areas and work spaces had comparable influences on POS ($\beta = .173$ and .136, respectively, $p \leq .01$) and JRA ($\beta = -.058$ and $-.046$, respectively, $p \leq .01$). However, evaluation of work spaces had stronger effects on JS and OC compared with the evaluation of staff areas. Control variables explained 33% of the variability in POS and 37% of the variability in JS. Staff areas and work spaces accounted for an additional 9% of the variability in POS and 8% of the variability in JS.

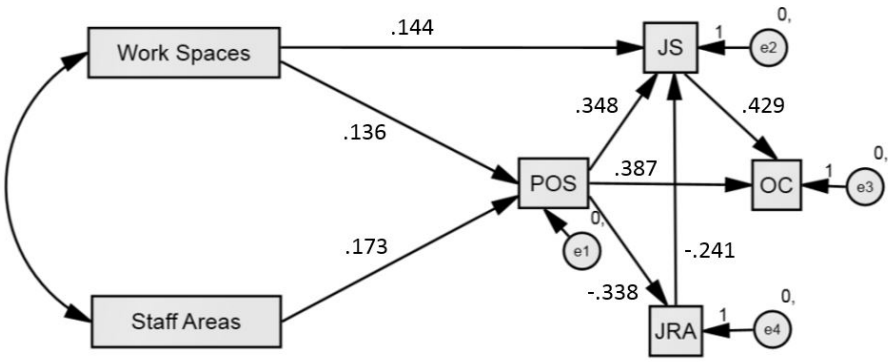


Figure 11. Standardized effect sizes found in the SEM analysis.

Among outcome variables, the most prominent effects were associated with POS as it related to JRA ($\beta = -.39$, $p \leq .01$), JS ($\beta = .35$, $p \leq .01$), and OC ($\beta = .39$, $p \leq .01$). Other important results included the effect of JS on OC ($\beta = .43$, $p \leq .01$) and JRA on JS ($\beta = -.24$, $p \leq .01$). In the final model, 42% of the variance in POS, 60% of the variance in JS, 36% of the variance in JRA, and 71% of the variance in OC were explained.

Multiple-Group Analysis

Age, number of working hours per week, number of years worked in building, employment duration, work shift, and job title were included in the multigroup analysis. Table 14 shows standardized direct effects associated with paths linking patient areas, work spaces, and staff areas to outcome variables across each group. For example, Table 14 shows that for employees over 50 years old, only the path from work space to job satisfaction was significant at $p < .05$, and the standardized effect size for this path was .22.

Table 14 Estimated effect sizes associated with paths linking space to job-related attitudes for each demographic group

Type of Space	Patient Areas			Work Spaces			Staff Areas		
Outcome Variable	POS	JS	JRA	POS	JS	JRA	POS	JS	JRA
	Age (χ^2 = 11.050, *df* = 12, *RMSEA* = 0.00, *CFI* = 1, *TLI* = 1)								
Under 39 years	n.s.	n.s.	n.s.	n.s.	.26	-.41	n.s.	n.s.	n.s.
40-49 years	n.s.	n.s.	n.s.	0.21	n.s.	n.s.	n.s.	n.s.	n.s.
Over 50 years	n.s.	n.s.	n.s.	n.s.	.22	n.s.	n.s.	n.s.	n.s.
	Number of Working Hours Per Week (χ^2 = 17.433, *df* = 12, *RMSEA* = 0.25, C*FI* = .998, *TLI* = 0.971)								
<34 hours	n.s.	n.s.	n.s.	n.s.	n.s.	-.46	n.s.	n.s.	-.31
35-40 hours	n.s.	n.s.	n.s.	n.s.	.24	n.s.	.29	n.s.	-.18
>41 hours	n.s.	n.s.	n.s.	.30	n.s.	n.s.	n.s.	n.s.	n.s.
	Number of Years Worked in Building (χ^2 = 10.585, *df* = 16, *RMSEA* = 0.00, *CFI* = 1, *TLI* = 1)								
<2 years	n.s.	n.s.	n.s.	.38	n.s.	n.s.	.37*	.38*	n.s.
3-5 years	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
5-10 years	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	.18*	n.s.
>10 years	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	.15*	n.s.	n.s.
	Employment Duration (χ^2 = 24.594, *df* = 16, *RMSEA* = 0.027, *CFI* = .997, *TLI* = 0.940)								
<2 years	n.s.	n.s.	n.s.	.47*	n.s.	n.s.	.37	n.s.	n.s.
3-5 years	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
5-10 years	.30	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
>10 years	n.s.	n.s.	n.s.	.19*	n.s.	n.s.	n.s.	n.s.	n.s.
	Work Shift (χ^2 = 7.879, df = 12, *RMSEA* = 0.00, *CFI* = 1, *TLI* = 1)								
Dayshift	n.s.	n.s.	n.s.	.15*	n.s.	n.s.	.27	n.s.	n.s.
Nightshift	.32	n.s.	n.s.	.41*	n.s.	-.11	.37	n.s.	n.s.
Rotating	n.s.	n.s.	n.s.	n.s.	.28	n.s.	n.s.	n.s.	n.s.
	Job Title (χ^2 = 7.954, *df* = 12, *RMSEA* = 0.00, *CFI* = 1, *TLI* = 1)								
Nurses	n.s.	n.s.	-.16	.39	n.s.	n.s.	.45	n.s.	n.s.
Technologists/Therapists	.27	n.s.	n.s.	n.s.	.22	n.s.	n.s.	n.s.	-.34
Assistants	n.s.	n.s.	n.s.	n.s.	.36	n.s.	n.s.	.22	n.s.

Notes: χ^2 = chi-square; *df* = degrees of freedom; *RMSEA* = root mean square error of approximation; *CFI* = comparative fit index; *TLI* = Tucker-Lewis index.

n.s.: not significant at $p < .05$. Estimated effect sizes shown in Table 6 apply.

POS: perceived organizational support; JS: job satisfaction; JRA: job-related anxiety.

* The null hypothesis for the equality of effect sizes in the pairwise comparisons across groups is rejected. The authors performed a Bonferroni correction by dividing the critical P-value ($\alpha = .05$) by the number of comparisons being made.

Table 14 also summarizes the results of pairwise parameter comparisons and indicates significant differences across demographic groups. For example, the influence of staff areas on POS was significantly larger for employees who had been working in the facility for more than 10 years compared with those who had been working in the facility for less than 2 years.

Discussion

This study is one of few efforts to investigate how different spaces within a hospital influence job-related feelings and attitudes of healthcare professionals. In addition to variables commonly studied in healthcare environmental studies, such as job satisfaction and job-related anxiety, the current study included perceived organizational support and organizational commitment.

Influence of the Physical Environment on Job-Related Attitudes and Feelings

The analysis found a positive relationship between employees' satisfaction with the architectural/physical features of their environment and POS, possibly because of the positive message that providing a well-designed work environment sends to employees. As Rhoades and Eisenberger (2002) suggested, employees welcome resources voluntarily provided by the organization as indications that the organization values and respects its employees and cares about their well-being.

As for organizational commitment, the analysis did not find a direct association between employees' evaluations of their physical environment and affective organizational commitment. However, a positive relationship between the physical environment and POS and between POS and OC showed the role of facility design in

improving the affective bond between employees and their organization. This finding suggests that providing a well-designed work environment can be perceived by employees as an indicator of the benevolent intent of the organization. As Eisenberger et al. (1986) noted, this fulfills employees' socio-emotional needs and leads them to incorporate organizational membership and exchange their commitment for the support they receive. Caring about the well-being of employees is specifically important in healthcare settings, as healthcare service delivery is emotionally demanding for caregivers (Aiken, Clarke, Sloane, Sochalski, & Silber, 2002).

The analysis found a very small association between the physical work environment and job-related anxiety of healthcare professionals (Table 13), which can be explained by the substantial role of other factors that impact the anxiety of caregivers at work. Previous studies have shown that autonomy, workload, uncertainty about treatments, and experience with patient death and dying are among the most important work-related factors that cause anxiety and stress among healthcare workers (Aiken, et al., 2002).

In general, although the estimated effect sizes for the influence of architectural and physical features on outcome variables are small, they are still significant despite providing control of multiple confounders, including employees' relationships at work (with immediate supervisor, with members of work group, and with physicians). Previous studies, such as a meta-analysis by Rhoades and Eisenberger (2002), reported that supervisor support was the second strongest predictor ($\beta = .32$, $p < .01$) among different antecedents of POS. Additionally, Zangaro and Soeken's (2007) meta-analysis found that

among different antecedents of job satisfaction, nurse–physician collaborations had the strongest positive correlation (r =.37, p < .01) with job satisfaction.

As for different environments in the facility, SEM analysis found that work spaces and staff areas had a considerable influence on job-related feelings and attitudes of employees, while the impact of patient areas was negligible. Multigroup comparisons across demographic variables confirmed this general finding. Table 12 shows that each of the variables representing satisfaction with patient areas, work spaces, and staff areas was involved in a total of 60 different relationships with outcome variables. For patient areas, only four paths were found to be statistically significant, while for work spaces and staff areas, 16 and 13 paths were significant, respectively. As previous studies suggested, this finding confirms that spaces within the hospital influence employees' perceptions differently.

As noted by Halford and Leonard (2003), higher effect sizes associated with work spaces can be explained by the fact that staff members have a strong spatial identification with their work spaces because of their confinement to their work areas. Moreover, work spaces and staff areas are solely used by staff members, and employees may value the quality of the physical environment in these spaces as indications that the organization cares about their well-being. Similarly, small effect sizes for paths linking patient areas to outcome variables can be explained by the fact that these spaces are dominantly used by patients and their families, leading staff members to perceive that the organization pays more attention to the safety and comfort of patients and families in these areas.

Differences Across Demographic Groups

Regarding demographic characteristics of employees, estimated effect sizes, displayed in Table 6, showed that employees newer to the building were more sensitive to the physical work environment than those who had been working in the facility for a longer period of time. The theory of work adjustment proposed by Dawis and Lofquist (1984) for describing the relationship of employees with their work environment can be used to explain this finding. According to Dawis and Lofquist, the work environment requires that certain tasks be performed by employees. To perform these tasks, employees require compensation for their performance, as well as the presence of certain conditions. To continue this interaction, the work environment and the employee need to continue to meet each other's requirements, and the success of work relations depends on the degree to which requirements of each side are met (correspondence between individual and environment characteristics). Work adjustment refers to the process of achieving and maintaining the state of correspondence. Based on this theory, employees newer to a facility are affected by their physical work environment to a greater extent since they might be in the process of achieving the state of correspondence, while those who have been working in the facility might have achieved that state and are accustomed to their environment.

Theory of work adjustment can also be used to explain the larger effect size of the physical work environment on employees with shorter employment durations. Table 8 shows that level of association between employees' evaluations of work spaces and the perceived organizational support was estimated to be .47 for those employed for less than

2 years, while it was only .19 for those who had been employed for more than 10 years. Analysis found similar results for employment duration, which was expected given the high correlation between the number of years worked in the building and employment duration ($r = 782$, $p < .01$). Besides, newer employees normally have lower levels of work experience and confidence in their skills, which might lead them to be more influenced by their work environment, including its architectural and physical features.

Multigroup analysis also found that compared with dayshift staff, nightshift employees were more sensitive to the physical work environment. Physical work environment might have high importance for nightshift employees because they normally have less interaction with administrative staff and family members of patients in comparison with dayshift staff members. Less personal interaction escalates the influence of other environmental factors, such as architectural and physical features of the workplace. Previous studies also showed that shift work might create negative physical and psychological effects (Applebaum, et al., 2010; Berger & Hobbs, 2006; Coffey, Skipper, & Jung, 1988; Fitzpatrick, While, & Roberts, 1999), and these negative consequences may make nightshift staff members more susceptible to environmental stimuli such as noise, temperature, and lighting.

Practical Implications

Previous studies have indicated a serious shortage in the healthcare workforce and highlighted the critical role of employees' job-related attitudes and feelings, as they have important implications for the recruitment and retention of caregivers (Buerhaus, 2008). It has also been demonstrated that job-related feelings and attitudes have significant

influence on the quality of care that caregivers deliver and the outcomes they produce for their patients (Aiken, et al., 2011). This study showed that facility design and operation can be used as a managerial tool for improving job-related attitudes and feelings of employees and earning their commitment.

This study also found that new employees are more sensitive to the way a facility is designed and operated compared to older employees. This is important because previous studies showed that as the population of healthcare professionals is aging, a wave of recruitment of new employees is approaching in the coming years (Buerhaus, Auerbach, & Staiger, 2009). While factors such as age, education, and work experience of the new generation of healthcare professionals are less controlled by hospital executives, a well-designed work environment could assist organizations in improving job-related attitudes and feelings of employees. To improve the role of the physical work environment, important considerations and recommendations for application of the research findings are provided next.

Several studies, including those summarized in the literature review, have focused on the physical work environment of patient areas and staff work spaces. In patient areas, in-room sinks, charting alcoves with a window, availability of supplies and computers in the alcoves, carpeted floors, bedside computers, oversized windows, sitting areas, and close proximity between the bed and bathroom were found to be important considerations (Reiling, et al., 2003). In staff work areas, adequately available space, adequate countertop size, well-organized supplies, adequate task lighting, and reduced noise level were found to be important considerations (Simmons, 2003). However, the number of studies that

have performed a comprehensive study of physical and architectural factors is very small; thus, the relative importance of these features is not clear. One example of such a comprehensive investigation is the study by Monjur and Yisong (2012), in which they gathered perspectives of nurses, doctors, and administrative staff regarding 16 different physical features. Their analysis found that to improve staff members' evaluation of their physical work environment, attention to cleanliness and ease of maintenance, air quality, noise level, and thermal comfort are critical. It is important to note that although Monjur and Yisong found that the presence of art objects was the least important aspect of the physical work environment, previous studies indicate that employees may value features that improve the aesthetic attributes of the physical environment in other spaces. For example, in an exploratory analysis of hospital design and staff perceptions focusing on patient and family areas, Mroczek, Mikitarian, Vieira, and Rotarius (2005) reported that staff members provided neutral ratings for pieces of artwork because they were not able to appreciate artwork throughout the day due to their work schedules. However, in staff lounges and caregiver sleeping areas, where caregivers spend their rest time, presence of artwork might be valued by employees. Similarly, in staff areas, providing daylight, access to nature, and improved interior design features, such as furnishings and colors, might be valued by employees.

Limitations and Directions for Future Studies

Although this study makes important contributions to the field, it does have some limitations that need to be acknowledged and possibly addressed in future studies. First, because of the sampling approach used in this study, the findings can only be generalized

to healthcare professionals in acute-care settings in the United States. Second, because of the cross-sectional design of the study, relationships identified in this chapter should be verified using time-series data or cross-sectional studies conducted in multiple phases. Third, findings are limited by the self-reporting nature of the survey. Although relevant information was provided as web links in the online questionnaire, some of the questions for quantifying employees' evaluations of their physical work environment may have been inadequately defined. Fourth, to better understand differences found in different spaces, future studies should also focus on activities and tasks performed in each space. Mapping staff activities and collecting time data should be performed to identify medical staff activity patterns and link them with employees' evaluations of each space. Moreover, the influence of work requirements in different medical departments should be taken into account before generalizing the findings of this study. For example, caregivers may feel a greater need for cleanliness in surgical or intensive-care units, where the risk of infection transferred from patients to caregivers is higher. Finally, as stated in Chapter III, this study did not include personal characteristics of employees, such as personality dimensions and the strength of socio-emotional needs.

Conclusion

In this study, the authors used perceived organizational support, a construct proposed by organization psychologists, and investigated the influence of the physical work environment on job-related anxiety, job satisfaction, and organizational commitment of healthcare professionals. Analysis found that positive evaluations of the physical work environment were significantly associated with higher levels of perceived organizational

support, indicating that providing a healthy work environment can be perceived by employees as their organization valuing them and caring about their well-being. Analysis also found that perceived organizational support was significantly associated with lower job-related anxiety, higher job satisfaction, and higher organizational commitment. This finding indicates that attention to employees' well-being can be reciprocated with higher levels of motivation and commitment toward the organization and can lead employees to care about the welfare of the organization, thereby helping it achieve its goals.

In summary, in line with finings of Chapter III, this chapter provided preliminary evidence that facility design and operation can be used as a managerial tool for improving job-related attitudes and feelings of employees and earning their commitment. As for different environments in the facility, results of this study indicated that work spaces and staff areas were highly valued by employees, while the association between evaluations of patient areas and job-related attitudes and feelings of employees was negligible. As for demographic characteristics of employees, multigroup analysis found that the employees newer to the facility and the organization, along with nightshift staff members, were more sensitive to the physical work environment compared to other groups of staff members.

CHAPTER V

FACTORS INFLUENCING EVALUATION OF PATIENT AREAS, WORK SPACES, AND STAFF AREAS BY HEALTHCARE PROFESSIONALS*

Synopsis

Previous research reported that healthcare professionals rate the physical work environment more negatively than other characteristics of the environment. This study investigated salient dimensions of employees' perceptions of healthcare facilities and differences across demographic groups. A total of 496 healthcare professionals from eight acute care hospitals participated in this cross-sectional study. Employees' perceptions of 27 different architectural and physical features in patient areas, work spaces, and staff areas were measured. Common factors were extracted through principal component analysis, levels of association between employees' perceptions and each architectural and physical feature were determined through confirmatory factor analysis, and differences across demographic groups were defined though invariance analysis. Findings of this study highlight the importance of attention to caregiver needs for a safe and comfortable work environment via finishing materials, indoor air quality, and furniture design. In comparison, features that address the visual quality of the work environment, such as window views and artwork, were found to have smaller associations with positive

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evaluations by employees. However, in nonclinical staff areas, employees appreciate features improving the visual quality of their rest area. The study also found that younger employees and those newer to the facility would appreciate improvements in the architectural/physical features to a greater extent.

Introduction

A satisfied and motivated staff is a necessary element of good healthcare delivery, and healthcare executives should regularly examine the factors that influence clinicians' perceptions of quality and satisfaction to understand and plan for necessary changes (Andrade, et al., 2012). One of the most extensive bodies of evidence and knowledge on the relationship between physical design of buildings and key patient and staff outcomes (injury, stress, work effectiveness, and satisfaction) exists in the healthcare design domain, which is commonly known as Evidence-Based Design (EBD). Hamilton and Watkins used principles of Evidence-Based Medicine (EBM) and defined EBD as a process in which current best evidence from research and practice are used in informing critical design decisions (Hamilton & Watkins, 2009) . They noted that as medicine has increasingly moved toward EBM, healthcare design is increasingly moving toward approaches that link hospitals' physical environments to healthcare outcome. As for staff outcomes, evaluation of the scientific research on evidence-based healthcare design conducted by Ulrich et al. reported that well-designed physical settings play an important role in making hospitals a better workplace (Ulrich, et al., 2008) . Accordingly, as Mroczek, Mikitarian, Vieira, and Rotarius (2005) suggested, it is important to understand how healthcare employees perceive different aspects of the hospital physical environment. The authors used previous

studies to identify important dimensions involved in evaluating the facility physical environment by staff members, and conducted a cross section study to answer the following research questions:

- *Research Question 1:* What is the relative importance of major environmental dimensions involved in evaluating facility physical environment by healthcare professionals?
- *Research Question 2:* Is there any significant difference in employees' perceptions of the physical work environment across different demographic groups?

As Gibson (1977) noted, in addition to the object shapes and spatial relationships between them, perceiving meaning from the environment may depend on the individual's intentions, experiences, social setting, and culture as well as the individual's ability to perceive the information. Sallis, Owen, and Fisher (2008) also noted that individual factors should be considered as well to fully understand multiple levels of the environment's influence on individuals. Because employees spend their working time at different locations, the authors decided to distinguish between three different types of spaces.

Literature Review

According to McAlexander, Mama, Medina, O'Connor, & Lee (2011), self-report data on individuals' perceptions of their environments is commonly used to understand the link between behaviors and environments. Table 15 summarizes post-occupancy evaluation surveys commonly used in previous studies conducted in healthcare and non-healthcare settings. Among generic evaluation methods used in different types of buildings, the

physical comfort subscale of Work Environment Scales (WES) developed by Moss (1994) has been used in numerous healthcare studies (e.g., Dickens, Sugarman, & Rogers, 2005; Djukic, et al., 2010; Kotzer & Arellana, 2008; Kotzer, et al., 2006).

Several measurement tools are also designed and used exclusively in healthcare environmental studies. Becker (2007) posits that a healthcare workplace is an interdependent system comprised of the environment, work processes, organizational culture, workforce demographics, and information technology. Berry and Parish (2008) defined perception of hospital physical environment as quality of the physical environment as perceived by healthcare staff members. They maintained that four facets of the physical environment may influence employees' perceptions, including the quality of patient care area, the quality of patient work spaces, safety (the degree of hazard for staff and patients related to facility design), and pleasantness (the ambience of the facility design due to specific design features). As stated in Chapter IV, according to Moos (2008), studies of environmental sources of satisfaction in healthcare facilities should distinguish between three relevant dimensions of the physical environment:

- Architectural features, including relatively permanent characteristics such as the spatial layout of a hospital and room size
- Interior design features, including less permanent elements such as furnishings, colors, and artwork
- Ambient features, such as lighting, noise levels, odors and temperature.

Table 15 Summary of selected post-occupancy evaluation studies

Survey/Study Title	Developer	Setting	Note
Occupant Indoor Environmental Quality	The Center for the Built Environment (CBE, 2013)	Generic	Has been implemented in more than 600 facilities as of October 2012
Post-occupancy Review Of Buildings and their Engineering (PROBE)*	Building Use Studies Ltd. (Cohen, Standeven, Bordass, & Leaman, 2001)	Generic	Has been used in over 23 educational and commercial facilities
National Environmental Assessment Toolkit (NEAT)**	The Center for Building Performance and Diagnostics (Kim, Srivastava, & Aziz, 2005)	Generic	Has been used in over 29 federal facilities in the United States.
B3-Sustainable Post-Occupancy Evaluation Survey (B3-SPOES)***	The Center for Sustainable Building Research (Brigham, Guerin, Kim, Choi, & Scott, 2010)	Generic	Cronbach's alpha for subscales ranged between .81 and .86.
Physical Comfort subscale of Work Environment Scales (WES)	Moos (1994)	Generic	Cronbach's alpha : .76 - .81
The questionnaire of stressful factors in the intensive care unit	Huckabay and Jagla (1979)	Healthcare - ICU	Cronbach's alpha : .90
The Satisfaction and Perception of Physical Environment (SPPE)	Shepley et al. (2008), based on survey developed by Fournier (1999)	Healthcare - NICU	Reliability and validity information not reported
Staff Evaluation of the Built Environment (SEBE)	Kotzer, et al. (2011)	Healthcare - acute care, intensive care	Test/retest reliability ≥ .90

Table 15 Continued

Survey/Study Title	Developer	Setting	Note
The impact of facility improvements on hospital nurses	Berry and Parish (2008)	Healthcare - perioperative surgical services, postanesthesia care, intensive care units, and cardiac catheterization laboratory.	Cronbach's alpha : .91
Before-after study of OPBY versus SFRs in a maternity care unit	Janssen et al.(2001)	Healthcare - maternity care units	Cronbach's alpha : .88
Healthcare providers' perception of design factors related to physical environments	Monjur and Yisong (2012)	Healthcare - acute care, intensive care, critical care	Cronbach's alpha : .74 - .86
Before-after study of OPBY versus SFR NICU	Smith et al. (2009)	Healthcare - ICU	Cronbach's alpha > .70
The impact of environmental factors on nurses	Applebaum et al. (2010)	Healthcare - inpatient units (acute care)	Odor: .77, noise: .70, light: .87 (Cronbach's alpha)
Enhancing the impact of a primary care environment on staff	Rice et al. (2008)	Healthcare – surgery units	Not reported

Notes: ICU: Intensive care unit; NICU: neonatal intensive care unit; OPBY: open bay; SFR: single family room

* Architectural/physical features include overall design of the building and how well it meets perceived needs, personal control on heating, cooling, lighting, etc., effectiveness of management after complaints have been made, temperature, air movement, air quality, lighting, noise, overall occupant comfort, occupant health, and occupant productivity at work

** Architectural/physical features include physical environment of the personal workstations with regard to thermal comfort, air quality, lighting and views, acoustic quality, and maintenance as well as functionality, community, and well-being of occupants

*** Architectural/physical features include thermal conditions, IAQ, lighting conditions, view conditions, acoustic conditions, privacy conditions, furnishings, personal controls, functionality and features, aesthetics, technology, and cleaning and maintenance

As Andrade, et al. (2012) noted, healthcare physical environments and their implications for users have been the major focus of environmental psychology. In a quasi-experimental study in a community mental health center, Folkins, et al. (1977) found that the staff members who moved to new facilities reported a significantly higher satisfaction with the physical environment and higher overall job satisfaction. Similarly, in a before-after study of nurses in single-room maternity care versus traditional birth settings, Janssen, et al. (2001) found that nurses working in new units reported higher overall satisfaction with the work environment and higher job satisfaction.

In addition to job satisfaction, job-related stress and burnout have been the subject of many empirical studies. For example, Applebaum, et al. (2010) studied 116 full-time registered nurses in adult medical-surgical units and found significant relationships between perceived noise and stress and between stress and job satisfaction. In another study of nurses' burnout, Alimoglu and Donmez (2005) reported that nurses who were exposed to more than three hours of daylight in a work shift reported higher job satisfaction and lower work-related stress. Dendaas (2011) also studied work related stress among 471 nurses in 39 medical/surgical units from 12 hospitals and found a moderate negative correlations ($r = -0.55$, $p < 0.001$) between physical environment attributes (e.g., room size, space around patient beds, individual storage space, furnishings, etc.) and work-related stress.

Although several studies investigated the influence of facility design on healthcare professionals, the number of studies that performed an integrated analysis of comprehensive physical and architectural factors is very small. One example for such

comprehensive investigations is the Monjur and Yisong (2012) study of healthcare providers' perceptions of design factors related to physical environments in two Chinese hospitals. They gathered perspectives of nurses, doctors, and administrative staff regarding 16 different physical features, including spatial characteristics (indoor plants, interior/exterior landscaping, furniture layout, exterior view from the space, presence of coordinated art objects, pleasant color scheme, architectural design of the space, location and orientation of the space, spaciousness of working areas, proximity to wards), environmental (adequate illumination, availability of daylight, thermal comfort, noise level, air quality and freshness), and maintenance (provision for hand hygiene, cleanliness, and ease of maintenance). They found that that cleanliness and ease of maintenance were considered very important, while the presence of coordinated art objects was considered the least important of the analyzed design aspects. The respondents also rated air quality, noise level, and thermal comfort as the second, third, and forth most important items.

The current study expands the findings of previous studies by exploring salient dimensions of caregiver perceptions of architectural and physical features of important environments within healthcare facilities (patient rooms, work spaces, and staff areas) and investigating differences in evaluation of employees across different demographic groups (age, number of years worked in the facility, work shift, and job title).

Methods

Study Participants

Healthcare professionals that were employed full-time and involved in delivering care services that require direct interactions with patients were the subject population of this

study. Participants were recruited from eight different short-term acute-care hospitals run by three nongovernment and nonprofit healthcare organizations in the United States. Regarding the size and age of facilities, facilities represent a wide range of spatial and physical conditions.

The authors did not restrict the study to any particular unit and all employees on all units were invited to participate. An invitation letter with a web-link to an anonymous, voluntary survey questionnaire was sent by the Chief Nursing Officer of each hospital to employees who met selection criteria. Approximately 2,200 individuals who met eligibility criteria were invited to participate in the study (1,550 registered nurses and 650 other healthcare professionals). Of the 511 surveys submitted, 496 were retained (318 surveys from registered nurses and 178 surveys from other healthcare professionals) after removing surveys with significant missing responses. The response rate was 20.51% for registered nurses and 27.38% for other healthcare professionals. The demographic profile of the study sample is presented in Table 16.

Measurement

The authors used self-reported data of employees' perceptions of their physical work environments in patient areas, staff work space, and staff areas. Measuring employees' perceptions provides valuable information because they constitute the most frequent facility user group and are familiar with the relationship of the physical work environment with the requirements of their work. As stated in Chapter II, using judgmental measures, where respondents use survey questionnaires to rate various physical features, is a common approach for measuring individuals' perceptions of their environment.

Table 16 Demographic characteristics of survey participants

Demographic Groups	Number of Responses Received
Age	
29 or under	54
30-39	86
40-49	138
Over 50	218
Number of years working in the building	
6-11 months	18
1-2 years	49
3-5 years	119
5-10 years	119
More than 10 years	191
Number of working hours per week	
12 hours or less	5
12-23 hours	14
24-34 hours	66
35-40 hours	313
More than 40 hours	98
Work shift	
Day shift (6 am to 7 pm)	347
Evening shift (2pm to midnight)	24
Night shift (6 pm to 8 am)	79
Rotating shifts (combination of above)	46
Job title	
Nurse	306
Therapist/Technologist / Technician	155
Nurse Assistant / Physician Assistant	29
Physician	6

This approach is advantageous for an employee-level analysis as some direct physical measures do not translate into employees' perceptions of their environment (Michael, et al., 2006). Moreover, using judgmental measures are specifically helpful in measuring attributes of the physical environment that vary from person to person, such as feelings of cleanliness and the amount of privacy afforded by the building.

As stated in Chapter III and Chapter IV, the authors first developed a draft questionnaire by incorporating the findings from review of literature and industry

guidelines. Two nurse researchers and two chief nursing officers from participating organizations, as well as three staff registered nurses and two healthcare environmental researchers reviewed the draft for accuracy and content validity. Participants were asked to state any deficiencies of the content of the questionnaire and other potential sources of perceptions not covered. For the analysis performed in this chapter, the authors used data collected from the first two sections of the survey. As Appendix B shows, the first section addressed background and demographic information and the second section measured individuals' evaluations of different architectural and physical features of the facility. For the analysis presented in this chapter, the authors focused on 27 different features and attributes of the work environment shown in Figure 10 in Chapter IV. In summary, as Harris et al. (Harris, et al., 2002) recommended, architectural features, interior design features, and ambient features were studied.

As explained in Chapter III and Chapter IV, the authors administrated the survey in a Web-based platform. The final version of the online survey questionnaire is provided in Appendix B and is accessible using the following link:

https://www.surveymonkey.com/s/96JYLBZ .

As Appendix B shows, the second section of the survey distinguished between three different types of spaces (patient areas, staff work space, and staff areas) and asked respondents to rate architectural and physical features of each space separately. Employees rated their satisfaction with each feature using a seven point scale ranging from 1 to 7. (*1=Very dissatisfied; 2=Mostly dissatisfied; 3=Somewhat dissatisfied; 4=Neither satisfied or dissatisfied; 5=Somewhat satisfied; 6=Mostly satisfied; 7=Very satisfied*).

Analysis Approach

The IBM® Statistical Package for the Social Sciences (SPSS®) and the Analysis of Moment Structures (AMOS®) version 21 were used for data analysis. The authors performed a separate analysis for patient areas, staff work space, and staff areas. To investigate the dimensionality of employees' perceptions of their physical work environment, the authors performed principal component analysis (PCA) to determine the number of factors to be extracted. Confirmatory factor analysis (CFA) was then performed to establish the factor structure demonstrated by PCA results, evaluate the adequacy of model specification, and determine the level of association between each architectural feature and a higher-order factor labeled as employees' overall perceptions of their physical work environment. The results of CFA were used to prioritize architectural and physical features based on their association with the higher-order factor. Finally, the author then performed measurement model invariance analysis to identify differences across demographic groups. The authors followed the approach recommended by Chen, Sousa, and West (2005) and used the chi-square difference test (Bentler & Bonett, 1980) for evaluating a series of hierarchically nested models to test invariance across groups.

Results

Preliminary Analysis

All variables had acceptable skewedness (lower than 2.0) and kurtosis (lower than 7.0) values for factor analysis with maximum-likelihood estimation (Curran, et al., 1996). Kaiser–Meyer–Olkin (KMO) measures of sampling adequacy were higher than the minimum acceptable value (0.08) recommended by Kaiser (1970). Bartlett Tests of

Sphericity (BTS) was also statistically significant in all three datasets at p<.000, indicating that the variables are not completely uncorrelated.

Principal Component Analysis

Consulting scree plots (Cattell, 1966) and using the criterion of retaining factors with eigenvalues of one and greater (Kaiser, 1960), PCA on the patient area data set resulted in a six-factor component, accounting for 70.23% of the variation in the data. PCA on the work space and staff area data sets extracted five components, accounting for 67.31% and 73.53% of the variance respectively. Table 17, Table 18, and Table 19 show the results of PCA for each dataset (patient areas, staff work space, staff rest areas) and reports the internal reliability information for each subscale. As recommended by Pett, Lackey, and Sullivan (2003) and Ho (2006), oblique solutions for all PCA analyses were chosen and the Oblimin rotation with Kaiser normalization was used as advocated by Hinkin (1995) and Nunnally and Bernstein (1995). To investigate subscale reliability, Cronbach's alpha was used and 0.70 was considered as the minimum acceptable value for the internal reliability of each sub-scale (Kline, 1993). Items with a loading of greater than 0.40 on a specific factor were assigned to the corresponding factor (Kim & Mueller, 1978).

All subscales exceeded the minimum level of internal reliability and after a few modifications for improving conceptual interpretations of subscales, structuring of variables in all three data sets resulted in simple and theoretically meaningful subdimensions (Gorsuch, 1983; Kline, 2002). In summary, items measuring furniture and finishing materials clustered together in all three data sets and explained more than 50% of the variability in data, followed by items measuring cleanliness and maintenance.

Table 17 Factor structure for observed variables in patient areas

	Explained Variance (Cumulative)	Observed Variable	Sub-Scale Reliability	*M*	*SD*	Components					
						1	2	3	4	5	6
F1	41.59%	Surface finishes	.90	4.80	1.68	**.74**	-.16	.08	-.02	-.15	-.11
		Wall finishes		4.69	1.77	**.74**	-.17	.16	-.05	-.15	-.19
		Furniture finish materials		4.93	1.64	**.72**	-.10	-.04	.06	-.06	.11
		Furniture design		4.34	1.68	**.72**	-.06	-.02	.06	.03	.19
		Art work		4.84	1.72	**.63**	-.03	.23	-.17	-.11	.03
		Flooring materials		4.88	1.68	**.56**	-.25	.07	.12	-.12	-.17
F2	8.95% (50.54%)	Floor cleanliness	.94	3.99	1.94	-.02	**-.90**	.00	.00	.07	-.02
		Cleanliness of plumbing		4.08	1.80	-.04	**-.88**	.02	.06	.02	.04
		Cleanliness of toilets		3.97	1.89	-.01	**-.87**	.08	.02	.02	-.02
		Cleanliness of furniture		4.06	1.83	.09	**-.82**	-.03	.02	.05	.08
		Wall cleanliness		4.19	1.85	.12	**-.82**	-.05	-.02	-.04	.00
		Cleanliness of lighting fixtures		4.13	1.72	.02	**-.82**	-.05	.00	-.04	.10
F3	6.33% (56.88%)	Amount of daylight	.87	4.91	1.83	.04	.01	**.89**	.01	-.05	.02
		Visual comfort of daylight		4.99	1.72	.04	.03	**.84**	-.01	-.13	.08
		Window view		4.67	1.89	.04	-.04	**.81**	.12	.28	.08
F4	5.11% (61.99%)	Noise from interior source	.79	4.25	1.75	-.11	-.19	.00	**.75**	-.12	-.01
		Speech privacy		4.25	1.85	.02	-.06	.25	**.68**	.01	.01
		Noise from exterior source		5.30	1.43	-.04	-.07	.11	**.62**	-.34	-.08
		Visual privacy for patient care		4.57	1.81	.44	.07	-.07	**.56**	.15	.14
		Space for patient care		4.52	1.89	.31	.09	-.04	**.51**	.30	.26
F5	4.42% (66.41%)	Amount of electric light	.84	5.38	1.43	.18	.04	-.04	.18	**-.70**	.18
		Visual comfort of electric light		5.13	1.54	.21	-.01	-.04	.14	**-.69**	.22
		Controllability of light		4.91	1.67	.17	.02	.30	.15	**-.47**	.13
F6	3.82% (70.32)	Temperature control	.76	3.67	2.03	-.11	-.05	.12	-.11	-.11	**.81**
		Temperature		3.39	1.75	-.01	-.13	.14	.03	-.13	**.63**
		Information about indoor		3.63	1.72	.13	-.29	.02	.07	.03	**.47**
		Indoor air quality		4.65	1.72	.17	-.23	.06	.19	-.12	**.36**

Note. M: mean; SD: standard deviation

Indoor air quality had no factor loadings greater than 0.4 on any factor. The contribution of this item to the reliability of F6 was examined for assigning it to this factor (Pett, et al., 2003).

Table 18 Factor structure for observed variables in work spaces

	Explained Variance (Cumulative)	Observed Variable	Sub-Scale Reliability	*M*	*SD*	Components				
						1	2	3	4	5
F1	41.12	Wall finishes	.91	4.55	1.66	**.78**	-.17	-.04	-.19	-.09
		Flooring materials		4.58	1.78	**.78**	-.10	.06	-.18	-.03
		Surface finishes		4.66	1.68	**.77**	-.11	.01	-.15	-.16
		Furniture finish materials		4.34	1.71	**.73**	-.09	.05	.10	.00
		Furniture design		4.52	1.76	**.72**	-.03	.07	.21	.06
		Art work		4.20	1.71	**.64**	.00	.03	-.06	-.12
		Space for individual work		4.22	1.90	**.61**	.02	.11	.31	.12
		Visual privacy in your work space		4.43	1.83	**.58**	.11	.07	.36	.06
F2	9.57 (50.70)	Cleanliness of toilets	.93	3.84	1.90	-.05	**-.91**	.03	-.09	-.06
		Cleanliness of fixtures		4.05	1.81	-.07	**-.90**	.01	-.02	-.07
		Cleanliness of lighting fixtures		4.14	1.78	-.04	**-.83**	-.04	.06	-.08
		Wall cleanliness		4.11	1.88	.13	**-.81**	-.06	.03	.02
		Floor cleanliness		3.81	1.99	.09	**-.80**	.08	-.02	.13
		Cleanliness of furniture		4.00	1.80	.09	**-.75**	-.02	.13	.02
F3	7.07 (57.75)	Amount of daylight	.92	3.98	2.15	.08	.04	**.87**	-.01	-.11
		Visual Comfort of daylight		4.19	2.06	.12	.03	**.86**	.00	-.10
		Window view		3.52	2.17	-.03	-.12	**.82**	.12	.05
F4	5.40 (63.17)	Temperature control	.80*	3.69	2.03	-.10	-.11	.16	**.71**	-.11
		Temperature		4.00	1.96	-.04	-.08	.12	**.69**	-.14
		Information about indoor quality		4.50	1.79	.13	-.36	.07	**.45**	.12
		Indoor air quality		3.63	1.72	.18	-.31	.05	**.37**	-.16
F5	4.15 (67.32)	Electric light	0.83**	5.41	1.46	.04	-.07	.18	-.02	**-.76**
		Visual comfort of electric light		5.04	1.64	-.03	-.05	.25	.07	**-.73**
		Noise from exterior source		5.32	1.49	.17	-.09	-.20	.36	**-.54**
		Controllability of light		4.64	1.85	.14	-.01	.41	.00	**-.52**
		Noise from interior source		4.31	1.83	.21	-.04	-.23	.38	**-.43**
		Speech privacy		4.19	1.83	.25	.01	-.05	.44	**-.26***

Note. M: mean; SD: standard deviation

* Moving speech privacy from F4 to F5 slightly decreased the reliability of this subscale from 0.809 to 0.800. Assigning speech privacy to F5 makes more sense theoretically and conceptually as items addressing noise from exterior and interior sources are parts of F5.

** Moving speech privacy from F4 to F5 increased the reliability of this subscale from 0.817 to 0.828

Table 19 Factor structure for observed variables in staff rest areas

	Explained Variance (Cumulative)	Observed Variable	Sub-Scale Reliability	*M*	*SD*	Component				
						1	2	3	4	5
F1	%50.32	Availability of space	.94	3.62	2.18	**.85**	.11	.00	-.03	.18
		Furniture design		3.43	2.04	**.81**	-.07	.05	.01	.11
		Visual privacy		4.04	2.17	**.80**	.14	-.08	-.20	.10
		Furniture finish materials		3.70	2.02	**.75**	-.12	.08	-.02	.06
		Wall finishes		4.13	1.95	**.72**	-.16	.05	-.11	-.20
		Surface finishes		4.15	1.98	**.72**	-.13	.10	-.08	-.11
		Flooring materials		4.10	2.06	**.62**	-.23	.02	-.13	-.09
		Art work		3.44	2.13	**.51**	-.16	.29	.06	-.18
F2	%8.28 (%58.604)	Cleanliness of toilets	.93	3.27	2.22	-.10	**-.87**	.06	.01	.02
		Cleanliness of plumbing fixtures		3.46	2.13	-.03	**-.85**	.03	-.04	-.01
		Cleanliness of lighting fixtures		3.82	1.94	-.01	**-.83**	-.03	-.15	.00
		Cleanliness of furniture		3.52	2.00	-.01	**-.81**	.01	-.09	.03
		Floor cleanliness		3.44	2.14	.14	**-.81**	-.09	.05	.07
		Wall cleanliness		3.75	2.04	.22	**-.74**	-.04	-.01	.05
F3	%6.00 (%64.61)	Visual comfort of daylight	.90*	4.71	1.90	-.08	.03	**.91**	-.13	.04
		Amount of daylight		3.81	2.37	-.05	.03	**.91**	-.10	.05
		Window View		3.04	2.36	.14	.02	**.83**	.14	.03
F4	%4.62 (%69.23)	Noise from exterior sources	.92**	4.97	1.83	-.01	-.05	.05	**-.84**	-.06
		Noise from interior sources		4.45	1.96	.09	-.04	-.02	**-.78**	.11
		Speech privacy		4.39	1.98	.16	.00	.03	**-.71**	.02
		Amount of electric light		5.01	1.88	.12	-.15	.10	**-.68**	-.05
		Visual comfort of electric light		4.71	1.90	.02	-.16	.26	**-.59**	.00
		Controllability of light		3.91	2.34	.11	-.07	.50	**-.34**	.04
F5	%4.31 (%73.53)	Temperature control	.76***	3.71	2.02	-.06	.01	.08	-.13	**.80**
		Information about indoor air		3.62	1.72	.14	-.26	.08	.20	**.62**
		Temperature		4.09	2.03	.19	-.10	.02	-.42	**.37**
		Indoor air quality		4.23	2.03	.25	-.20	.15	-.29	**.28**

Note. M: mean; SD: standard deviation

* By moving controllability of light to F4, the reliability of F3 increased from 0.897 to 0.905. Moving controllability of light to F4 makes more sense theoretically and conceptually as F4 covers electric lights.

** By moving temperature and indoor air quality from F4 to F5, the reliability of this subscale slightly decreased from 0.919 to 0.912. However, moving controllability of light from F3 to F4 improved the reliability of F4 from 0.912 to 0.919 and improved the conceptual interpretability of F4.

*** Moving temperature and indoor air quality from F4 to this subscale improved its reliability from 0.533 to 0.759 and increased the conceptual interpretability of F5.

Daylight and window view items load on a common factor, and items related to the acoustic environment and space layout are part of the same factor as well. Moreover, in all three datasets, items measuring temperature and indoor air quality clustered together. Because all subscales were interpretable and none of the items appear to be redundant the authors decided to keep all 27 items (all observed variables) in the analysis.

Confirmatory Factor Analysis

The authors performed a higher-order factor analysis to test whether the covariance among the latent variables (first-order factors extracted using PCA) could be explained by a general factor (overall evaluation of the physical work environment). The authors used Maximum-likelihood estimation for performing CFA, and used covariance matrixes with pairwise deletion for dealing with missing values. For all three CFA models, the chi-square goodness of fit statistics (χ^2) was significant at $p<0.05$, which was not in support of the model fit. However, the chi-square goodness of fit test is sensitive to sample size, and when the sample size is large, like in this study, it is not uncommon to reach statistical significance (Marsh, et al., 1988). Accordingly, the authors used other common fit indexes, such as the ratio of chi-square to degrees of freedom ratio (χ^2/df), root mean square error of approximation (RMSEA), standardized root mean square residual (SRMR), and Comparative Fit Index (CFI). Table 20 shows fit indices for the three CFA analyses representing the measurement models for patient areas, work spaces, and staff areas.

Table 20 Summary of fit indices for CFA models

	χ^2	*df*	χ^2/df	*RMSEA - Low 90 CI*	*RMSEA - High 90 CI*	*Standardized RMR*	*CFI*
Patient areas*	612.24	313	1.97	.050	.063	.058	.944
Staff work spaces**	670.33	311	2.15	.053	.067	.091	.942
Staff areas***	631.80	306	2.06	.054	.068	.063	.955

Note. *df* = degrees of freedom; *RMSEA-Low 90 CI* = lower 90% confidence interval for root mean square error of approximation; *SRMR-High 90 CI*= higher 90% confidence interval for standardized root mean square residual

All chi-square tests are significant at $p<.05$

Cut off values for fit indexes were minimum value of 3 for χ^2/df (Marsh, et al., 1988), χ^2/df values as high as five (Schumacker & Lomax, 2004), *RMSEA* values of 0.06 to 0.08 as indicators of a reasonable fit (Browne & Cudeck, 1993), *SRMR* values less than 0.10 for the upper limit of acceptable fit (Hu & Bentler, 1999), and *CFI* value of 0.90 for the minimum acceptable fit and 0.95 for a good fit (Hu & Bentler, 1999).

Standardized residuals with values greater than 2.58 (Brown, 2006; Byrne, 2010; Kline, 1993) and modification indices higher than 15 (Thompson, 2004) were used for determining error terms to be correlated to improve model specifications.

* Error terms of the following observed variables are correlated to improve model fit: cleanliness of toilets and cleanliness of plumbing fixtures, wall cleanliness and floor cleanliness, furniture design and furniture finish materials, availability of space and visual privacy, temperature and temperature control.

** Error terms of the following observed variables are correlated to improve model fit: cleanliness of toilets and cleanliness of plumbing fixtures, wall cleanliness and floor cleanliness, furniture design and furniture finish materials, availability of space and visual privacy, temperature and temperature control, noise from exterior sources and noise from interior sources, noise from exterior sources and speech privacy, noise from interior sources and speech privacy.

*** Error terms of the following observed variables are correlated to improve model fit: cleanliness of toilets and cleanliness of plumbing fixtures, cleanliness of lighting fixtures and cleanliness of plumbing fixtures, wall cleanliness and floor cleanliness, furniture design and furniture finish materials, availability of space and visual privacy, surface finishes and wall finishes, furniture design and availability of space, visual privacy and furniture design, noise from exterior sources and noise from interior sources, noise from exterior sources and speech privacy, noise from interior sources and speech privacy, amount of electric light and visual comfort of electric light, temperature and temperature control, indoor air quality and information about indoor air quality.

As indicated in Table 20, all models met minimum levels of fit indices. Moreover, all estimated effect sizes were significant at $p<0.05$ level and all the first-order factors were highly loaded onto the second-order factor, with factor loadings ranging from 0.64 to 0.89 for the patient area data set, 0.66 to 0.88 for the work space data set, and 0.67 to 0.95 for the staff area data set. Overall, CFA results indicate that the higher-order solutions provide a good account for the covariance among the first-order factors.

Invariance Analysis and Hypotheses Testing

After confirming the factor structure, multiple-group CFA was applied to the best-fitting models to investigate the invariance of the measurement model across demographic variables. The authors assumed that factor structures are identical across groups. To test the other forms of invariance, 12 different models were analyzed to examine the invariance of the measurement models in patient areas, work spaces, and staff areas. The hypotheses of these analyses are as follows:

Study hypothesis: Given the factor structure shown in Table 17, Table 18, and Table 19, the level of association between each architectural feature and employees' overall perceptions of the physical work environment is similar across demographic groups.

Age, number of years in building, work shift, and job title were selected for invariance analysis. Because only one group had an adequate sample size, performing invariance analysis was not possible to compare employees with different numbers of working hours per week. P-values for the invariance of first-order factor loadings and second-order factor loadings are specified in Table 21. P-values lower than 0.05 would indicate that study hypothesis is rejected. Overall, invariance analysis showed that employees' perceptions of their physical work environment are different across demographic groups.

Pairwise Parameter Comparison across Groups

Descriptive statistics for variables measured in this study and standardized effect sizes are shown in Table 22. Colors represent different levels of priority for employees. Note that the effect sizes show the level of associations and do not necessarily imply causality.

Table 21 Summary of chi-square difference test statistics for invariant analysis

	Demographic Variables			
	Age	Years in Building	Work Shift	Job Title
	Patient Areas			
χ^2 – Baseline model (unrestricted)	1972.21	1509.81	1510.39	1502.63
Df - Baseline model	954	636	636	636
χ^2/df - Baseline model	2.07	2.37	2.37	2.36
RMSEA - High 90 CI - Baseline model	0.050	0.058	0.056	0.058
χ^2 – Model with first-order factors restricted	2030.74	1536.45	1538.68	1540.39
Df - Model with first-order factors restricted	1008	663	663	663
p-value for invariance of first-order factor loadings *	.312	.483	.396	.082
χ^2 – Model with first- and second-order factors restricted	2113.11	1603.248	1619.05	1604.42
Df - Model with first- and second-order factors restricted	1026	675	675	675
p-value for invariance of second-order factor loadings **	**.000**	**.000**	**.000**	**.000**
	Work Spaces			
χ^2 – Baseline model (unrestricted)	2343.383	1765.14	1737.86	1716.20
Df - Baseline model	957	638	638	638
χ^2/df - Baseline model	2.45	2.77	2.72	2.69
RMSEA - High 90 CI - Baseline model	0.059	0.067	0.062	0.064
χ^2 – Model with first-order factors restricted	2413.98	1814.63	1756.71	1737.19
Df - Model with first-order factors restricted	1011	665	665	665
p-value for invariance of first-order factor loadings *	0.0641	**0.005**	0.875	.787
χ^2 – Model with first- and second-order factors restricted	2513.809	1910.98	1851.07	1814.57
Df - Model with first- and second-order factors restricted	1026	675	675	675
p-value for invariance of second-order factor loadings **	**.000**	**.000**	**.000**	**.000**
	Staff Rest Areas			
χ^2 – Baseline model (unrestricted)	2659.547	2127.84	2141.46	2201.97
Df - Baseline model	960	638	638	638
χ^2/df - Baseline model	2.77	3.34	3.36	3.45
RMSEA - High 90 CI - Baseline model	0.059	0.076	0.066	0.072
χ^2 – Model with first-order factors restricted	2722.84	2145.13	2165.52	2252.28
Df - Model with first-order factors restricted	1001	665	665	665
p-value for invariance of first-order factor loadings *	**.014**	.924	.626	**.004**
χ^2 – Model with first- and second-order factors restricted	2839.52	2242.27	2258.33	2346.07
Df - Model with first- and second-order factors restricted	1026	675	675	675
p-value for invariance of second-order factor loadings **	**.000**	**.000**	**.000**	**.000**

Note. Sample size for testing invariance across age groups is as follows:
- Group one: employees under 39 years of age N=137
- Group two: employees between 40 and 49 years of age N=140
- Group three: Employees over 50 years of age: N= 222

Sample size for testing invariance across groups with different numbers of years in the building is as follows:
- Group one - employees worked in the facility for less than 10 years: N=285
- Group two - employees worked in the facility for more than 10 years: N=194

Sample size for testing invariance across work-shift groups is as follows:
- Group one - Dayshift employees: N=347
- Group two - Employees working in other shifts: N=149

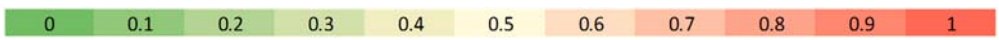
Sample size for testing invariance across job title groups is as follows:
- Group one - Nurses: N=311
- Group two - Other employees: N=152

* Hypothesis 1: Loadings of observed variables on the corresponding latent variables (first-order factors) are similar across groups.

** Hypothesis 2: Loadings of first-order factors on the second-order latent variable are similar across groups

Table 22 Descriptive statistics and standardized effect sizes for the association between architectural feature and overall evaluation of the physical work environment

		Mean	Standard Deviation	Loading on Factor from Patter Matrix in PCA	Age			Years in Building		Workshift		Job Title	
					under 39	Between 40 and 49	Over 49	<10 years	>10 years	Dayshift	Other	Nurses	Other
Presence of artwork	Patientareas	4.84	1.68	0.63	0.64	0.43	0.50	0.59	0.50	0.52	0.60	0.54	0.47
	Work spaces	4.20	1.71	0.64	0.71	0.37	0.42	0.61	0.35	0.50	0.52	0.52	0.46
	Staff areas	3.44	2.13	0.51	0.69	0.47	0.54	0.59	0.52	0.56	0.60	0.53	0.65
Window view	Patientareas	4.67	1.89	0.81	0.47	0.39	0.38	0.48	0.37	0.42	0.40	0.44	0.43
	Work spaces	3.52	2.17	0.82	0.36	0.36	0.41	0.44	0.28	0.39	0.38	0.40	0.40
	Staff areas	3.04	2.36	0.83	0.57	0.44	0.43	0.51	0.38	0.48	0.45	0.41	0.61
Amount of daylight	Patientareas	4.91	1.83	0.89	0.67	0.50	0.47	0.60	0.47	0.54	0.56	0.52	0.60
	Work spaces	3.98	2.15	0.87	0.42	0.59	0.47	0.54	0.36	0.48	0.51	0.49	0.51
	Staff areas	3.81	2.37	0.91	0.66	0.69	0.54	0.68	0.48	0.61	0.64	0.54	0.75
Visual Comfort of daylight	Patientareas	4.99	1.72	0.84	0.63	0.50	0.47	0.56	0.49	0.53	0.55	0.48	0.64
	Work spaces	4.19	2.06	0.86	0.41	0.56	0.46	0.54	0.35	0.47	0.50	0.47	0.50
	Staff areas	4.71	1.90	0.91	0.66	0.70	0.55	0.69	0.47	0.62	0.62	0.56	0.73
Amount of electric light	Patientareas	5.38	1.43	-0.70	0.75	0.61	0.60	0.72	0.51	0.63	0.70	0.66	0.65
	Work spaces	5.41	1.46	-0.76	0.70	0.67	0.68	0.71	0.62	0.71	0.61	0.69	0.71
	Staff areas	5.01	1.88	-0.68	0.79	0.87	0.78	0.84	0.72	0.82	0.75	0.74	0.85
Visual comfort of electric light	Patientareas	5.13	1.54	-0.69	0.72	0.74	0.62	0.74	0.60	0.68	0.67	0.70	0.63
	Work spaces	5.04	1.64	-0.73	0.66	0.64	0.63	0.68	0.58	0.68	0.57	0.64	0.68
	Staff areas	4,71	1.90	-0.59	0.75	0.84	0.77	0.81	0.69	0.79	0.72	0.71	0.86
Controllability of lights	Patientareas	4.91	1.67	-0.47	0.68	0.58	0.53	0.61	0.53	0.57	0.64	0.57	0.67
	Work spaces	4.64	1.85	-0.52	0.40	0.45	0.46	0.49	0.38	0.47	0.38	0.45	0.43
	Staff areas	3.91	2.34	-0.34	0.69	0.74	0.66	0.73	0.56	0.71	0.59	0.65	0.73
Availability of space	Patientareas	4.52	1.89	0.51	0.69	0.52	0.45	0.58	0.48	0.59	0.41	0.54	0.53
	Work spaces	4.22	1.90	0.61	0.62	0.47	0.54	0.53	0.59	0.56	0.48	0.56	0.54
	Staff areas	3.62	2.18	0.85	0.69	0.44	0.59	0.65	0.45	0.59	0.57	0.58	0.62
Visual privacy	Patientareas	4.57	1.81	0.56	0.71	0.66	0.54	0.66	0.54	0.65	0.52	0.63	0.59
	Work spaces	4.43	1.83	0.58	0.50	0.40	0.54	0.47	0.54	0.51	0.44	0.54	0.43
	Staff areas	4.04	2.17	0.80	0.66	0.48	0.53	0.63	0.42	0.58	0.52	0.52	0.63
Speech privacy	Patientareas	4.25	1.85	0.68	0.70	0.52	0.58	0.63	0.53	0.64	0.52	0.57	0.68
	Work spaces	4.19	1.83	-0.26	0.62	0.55	0.56	0.57	0.61	0.63	0.52	0.59	0.60
	Staff areas	4.39	1.98	0.71	0.69	0.75	0.57	0.71	0.54	0.66	0.58	0.62	0.66
Noise from interior source	Patientareas	4.25	1.75	0.75	0.64	0.46	0.57	0.58	0.49	0.57	0.55	0.53	0.62
	Work spaces	4.31	1.83	-0.43	0.56	0.52	0.61	0.51	0.69	0.62	0.51	0.57	0.61
	Staff areas	4.45	1.96	-0.78	0.68	0.78	0.66	0.74	0.61	0.73	0.56	0.66	0.75
Noise from exterior source	Patientareas	5.30	1.43	0.62	0.56	0.39	0.57	0.54	0.48	0.54	0.48	0.53	0.53
	Work spaces	5.32	1.49	-0.54	0.54	0.52	0.59	0.54	0.61	0.61	0.47	0.59	0.54
	Staff areas	4.97	1.83	-0.84	0.66	0.84	0.59	0.73	0.60	0.73	0.51	0.62	0.72
Indoor air quality	Patientareas	4.65	1.72	0.36	0.65	0.67	0.78	0.73	0.70	0.72	0.70	0.71	0.71
	Work spaces	3.63	1.72	0.37	0.69	0.50	0.77	0.70	0.71	0.70	0.71	0.73	0.72
	Staff areas	4.23	2.03	0.28	0.77	0.57	0.66	0.71	0.60	0.69	0.69	0.78	0.80
Information about indoor quality	Patientareas	3.63	1.72	0.47	0.60	0.57	0.63	0.63	0.57	0.61	0.60	0.62	0.60
	Work spaces	4.50	1.79	0.45	0.58	0.37	0.64	0.58	0.57	0.58	0.53	0.58	0.58
	Staff areas	3.62	1.72	0.62	0.60	0.36	0.47	0.49	0.45	0.43	0.55	0.55	0.35
Temperature	Patientareas	3.39	1.75	0.63	0.68	0.47	0.50	0.58	0.50	0.57	0.53	0.52	0.64
	Work spaces	4.00	1.96	0.69	0.62	0.57	0.60	0.64	0.58	0.65	0.51	0.62	0.60
	Staff areas	4.09	2.03	0.37	0.84	0.80	0.77	0.83	0.77	0.81	0.73	0.61	0.81
Temperature control	Patientareas	3.67	2.03	0.81	0.58	0.37	0.47	0.51	0.39	0.46	0.52	0.50	0.49
	Work spaces	3.69	2.03	0.71	0.61	0.57	0.58	0.61	0.59	0.61	0.57	0.62	0.57
	Staff areas	3.71	2.02	0.80	0.56	0.28	0.40	0.43	0.38	0.37	0.55	0.47	0.33

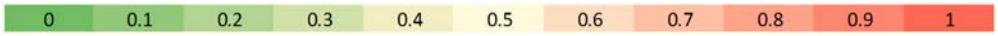


Lower level of association with overall evaluation of the physical work environment

Higher level of association with overall evaluation of the physical work environment

Table 22 Continued

		Mean	Standard Deviation	Loading on Factor from PCA Patter Matrix	Age			Years in Building		Workshift		Job Title	
					under 39	Between 40 and 49	Over 49	<10 years	>10 years	Dayshift	Other	Nurses	Other
Surface finishes	Patientareas	4.80	1.68	0.74	0.80	0.59	0.70	0.73	0.64	0.71	0.69	0.72	0.67
	Work spaces	4.66	1.68	0.77	0.80	0.57	0.63	0.71	0.58	0.66	0.66	0.65	0.66
	Staff areas	4.15	1.98	0.72	0.83	0.73	0.72	0.81	0.67	0.77	0.75	0.73	0.81
Wall finishes	Patientareas	4.69	1.77	0.74	0.77	0.64	0.68	0.72	0.65	0.71	0.68	0.71	0.67
	Work spaces	4.55	1.66	0.78	0.77	0.58	0.57	0.69	0.50	0.63	0.64	0.62	0.64
	Staff areas	4.13	1.95	0.72	0.83	0.71	0.73	0.80	0.68	0.78	0.73	0.75	0.79
Flooring materials	Patientareas	4.88	1.68	0.56	0.68	0.60	0.62	0.66	0.56	0.63	0.63	0.61	0.64
	Work spaces	4.58	1.78	0.78	0.72	0.54	0.57	0.63	0.54	0.62	0.58	0.60	0.61
	Staff areas	4.10	2.06	0.62	0.88	0.77	0.78	0.86	0.73	0.83	0.78	0.79	0.85
Furniture finish materials	Patientareas	4.93	1.64	0.72	0.77	0.62	0.62	0.71	0.67	0.71	0.58	0.67	0.64
	Work spaces	4.34	1.71	0.73	0.80	0.67	0.66	0.70	0.70	0.72	0.62	0.68	0.73
	Staff areas	3.70	2.02	0.75	0.77	0.59	0.72	0.76	0.59	0.71	0.69	0.65	0.77
Furniture design	Patientareas	4.34	1.68	0.72	0.75	0.62	0.58	0.70	0.63	0.69	0.53	0.62	0.67
	Work spaces	4.52	1.76	0.72	0.74	0.63	0.67	0.69	0.66	0.69	0.63	0.65	0.71
	Staff areas	3.43	2.04	0.81	0.78	0.57	0.70	0.75	0.58	0.69	0.70	0.63	0.78
Wall cleanliness	Patientareas	4.19	1.85	-0.82	0.67	0.48	0.60	0.62	0.52	0.60	0.55	0.59	0.55
	Work spaces	4.11	1.88	-0.81	0.62	0.40	0.60	0.55	0.55	0.56	0.55	0.56	0.55
	Staff areas	3.75	2.04	-0.74	0.69	0.61	0.66	0.69	0.62	0.70	0.61	0.60	0.76
Floor cleanliness	Patientareas	3.99	1.94	-0.90	0.68	0.50	0.58	0.63	0.51	0.60	0.53	0.57	0.59
	Work spaces	3.81	1.99	-0.80	0.57	0.40	0.54	0.54	0.48	0.53	0.50	0.50	0.54
	Staff areas	3.44	2.14	-0.81	0.68	0.61	0.60	0.68	0.56	0.68	0.54	0.56	0.74
Cleanliness of plumbing fixtures	Patientareas	4.08	1.80	-0.88	0.71	0.60	0.60	0.67	0.56	0.63	0.60	0.61	0.63
	Work spaces	4.01	1.81	-0.90	0.60	0.53	0.61	0.60	0.57	0.58	0.60	0.59	0.62
	Staff areas	3.46	2.13	-0.85	0.63	0.66	0.55	0.64	0.54	0.63	0.56	0.57	0.68
Cleanliness of toilets	Patientareas	3.97	1.89	-0.87	0.69	0.54	0.61	0.65	0.55	0.63	0.57	0.61	0.57
	Work spaces	3.84	1.90	-0.91	0.60	0.51	0.60	0.59	0.58	0.58	0.59	0.59	0.61
	Staff areas	3.27	2.22	-0.87	0.56	0.63	0.54	0.61	0.53	0.62	0.49	0.55	0.64
Cleanliness of furniture	Patientareas	4.06	1.83	-0.82	0.68	0.56	0.60	0.64	0.56	0.61	0.59	0.61	0.57
	Work spaces	4.00	1.80	-0.75	0.59	0.45	0.56	0.53	0.58	0.55	0.55	0.57	0.51
	Staff areas	3.52	2.00	-0.81	0.69	0.67	0.57	0.70	0.53	0.65	0.60	0.58	0.75
Cleanliness of lighting fixtures	Patientareas	4.13	1.72	-0.82	0.65	0.59	0.58	0.62	0.54	0.57	0.62	0.59	0.60
	Work spaces	4.14	1.78	-0.83	0.53	0.50	0.60	0.55	0.56	0.54	0.62	0.58	0.57
	Staff areas	3.82	1.94	-0.83	0.63	0.68	0.63	0.69	0.58	0.66	0.64	0.61	0.76



Lower level of association with overall evaluation of the physical work environment

Higher level of association with overall evaluation of the physical work environment

After confirming that employees' perceptions of their physical work environment are different across different demographic groups, the authors used the critical ratios to examine differences between parameters (factor loadings of observed variables on the corresponding latent variables) reported by AMOS to identify architectural/physical features that contribute to this difference. Table 23 lists features that are perceived differently at $p<0.1$. For example, in all three spaces, the association between employees' perceptions regarding cleanliness of furniture and their overall evaluation of the physical environment was significantly different across different age groups.

Table 23 Architectural/physical features contributing to differences in caregiver's evaluation of the built environment in different spaces

Architectural/Physical Features	Type of Space		
	Patient Areas	Work Spaces	Staff Areas
Floor cleanliness	-	-	-
Wall cleanliness	-	Age	Age
Cleanliness of furniture	Job title	Job title	-
Cleanliness of lighting fixtures	Age/Work shift	Age/Work shift	Age
Cleanliness of plumbing fixtures	Age	-	-
Cleanliness of toilets	-	-	-
Furniture design	Years in building	-	-
Furniture finish materials	Years in building	Years in building	-
Surface finishes	-	-	Age
Wall finishes	-	-	-
Flooring materials	Job title	-	-
Art work	-	Age/Years in building	-
Window view	Job title	Age	Age
Amount of daylight	-	-	-
Visual comfort of daylight	-	-	-
Amount of electric light	Job title	-	Age
Visual comfort of electric light	-	Work shift	-
Controllability of light	Job title	-	-
Noise from interior source	-	-	-
Noise from exterior source	Age	-	Age
Speech privacy	-	-	-
Availability of space	Work shift	Years in building	
Visual privacy for patient care	-	Years in building/Job title	-
Temperature control	-	-	Job title
Temperature	Age	-	Work shift/Job title
Indoor air quality	Age	Age	Age/Work shift
Information about indoor quality	-	-	-

Discussion Regarding Differences across Spaces

A comparison of effect sizes associated with different features across spaces indicates that the function of an environment affects the dimensions along which employees evaluate it. For example, electric lighting (amount and visual quality of electric light) is a more salient feature of employees' work spaces where they need task light for performing activities such as reading patents' medical records or charting. Buchanan, Barker, Gibson, Jiang, and Pearson. (1991) found that the rate of prescription-dispensing errors was associated with lower levels of illumination. Additionally, temperature (thermal comfort) is perceived as one of the most highly-valued attributes of the environment in staff areas, while this is not the case in patient areas and work spaces. Lower level of association between thermal comfort and overall evaluation of the physical work environment in patient areas can be explained by the fact that caregivers are aware that the purpose of measuring and controlling temperature in patient rooms is providing a safe and comfortable environment for patients and families. Accordingly, staff members do not show their appreciation of it in patient areas. However, staff areas are solely used by caregivers and because of that thermal comfort is highly valued by employees.

Also, specifically in patient and staff areas, estimated effect sizes for temperature level are generally higher than effect sizes for temperature control. Visual comfort of electric light also has a greater effect size than controllability of lightings. As far as choice and control are considered, Shepley (2004) notes that access to options and providing the ability to manipulate the physical environment regarding lighting, temperature, and

acoustic environments are critical to stress reduction for employees. This study suggests that when environmental factors such as the amount of lighting and temperature are in the appropriate range, employees feel like the factors are under control and do not care much about personal control.

Discussion Regarding Similarities in Different Spaces

Despite variances in the importance of architectural/physical features in different types of spaces, certain patterns exist. The analysis found that items addressing indoor air quality and finishing materials (furniture, surfaces, and walls) emerged as highly associated with the evaluation of the physical work environment, regardless of the function of the environment and demographic characteristics of employees. Previous studies showed that furniture and finish materials contribute considerably to the design quality of the environment and to fostering a more home-like, less institutional feeling (Dalke, et al., 2006; Ulrich, et al., 2008). Additionally, carpeting and rubber flooring that have softer properties can be used to mitigate some of the effects of long work hours and excessive workload, including fatigue (John Reiling, Hughes, & Murphy, 2008). Previous studies also provided evidence that the ergonomic design of work areas, including furniture, reduces staff back pain and work-related injuries (Chambers & Bowman, 2011). The importance of indoor air quality as a concern for employees is also reported in previous studies. In an exploratory analysis of hospital design and staff perceptions, that air quality was mentioned by employees as one of the top three factors having a positive impact on the quality of their work life (Mroczek, et al., 2005). Moreover, in a study of healthcare providers' perception of physical environment factors in two Chinese hospitals,

Monjur and Yisong (2012) found that in terms of mean response scores, air quality and freshness was ranked the second most important environmental factor.

The fact that indoor air quality and finishing materials have the highest relative importance among 27 features included in the analysis indicates that healthcare professionals are highly cognizant of health and safety-related risks at work, where they often use many highly toxic chemicals such as cleaners and disinfectants. According to the U.S. Bureau of Labor Statistics, the rate of occupational injuries and illnesses in hospitals is about 80% higher than the rate for all of the private industry (U.S. Bureau of Labor Statistics, 2007). Previous studies also reported that sick building syndrome (SBS) is generally high in hospitals buildings, and health-related complaints are higher in hospitals with SBS (Ulrich, et al., 2008). Note that the analysis also found that employees also highly value information they receive about the organizational efforts in reducing the quantity of indoor air contaminants, as evidenced by standardized effect sizes reported in Table 22.

As for noise levels, the current study found that in all three types of spaces, night and evening shift staffs are more sensitive to high noise levels. The night and evening shift staff may have higher sensitivity to noise, as previous studies reported that hospitals are generally less noisy at night (Joseph & Ulrich, 2007). Additionally, shift work may cause negative physical and psychological effects (Berger & Hobbs, 2006; Coffey, et al., 1988; Fitzpatrick, et al., 1999) making night and evening shift staffs more susceptible to environmental stressors such as noise. The analysis also found that among the three types of spaces, the highest association between noise control and employees' overall

evaluations of the environment exists in staff areas. This indicates that quietness of staff areas is highly valued by employees. As pointed out in previous studies, this might indicate that employees recognize that noise in patient rooms and work areas (generated by alarms, paging systems, visitors, and staff conversations) is unavoidable and should not have a negative impact on their work (Beyea, 2007; Parsons & Hartig, 2000). In comparison, in staff areas, employees expect lower levels of noise and value quietness to a greater extent. Another important finding with respect to perception of noise is that employees care more about control of interior noise than exterior noises. Joseph and Ulrich's (2007) literature review found that sounds contributing to the loud noise levels in hospitals come from interior sources such as mechanical equipment, staff, and visitors.

One of the important unexpected finding of this study is the low association of daylight-and-view items with employee's perception of their work environment. The current study found that electric light has a higher association with employees' perceptions across all demographic variables and in all three types of spaces. Although previous studies have found that daylight is not inherently better than artificial lighting for performance of most visual tasks. Previous studies also found that healthcare employees appear to feel better where natural daylight and views to nature are provided (Hunter & Howlett, 2003; Joseph, 2006a). The small effect sizes found for daylight and view probably should not be interpreted as if employees do not care about daylight and view in hospitals. Rather, it shows the higher "relative" importance of other environmental features included in this study. In other words, the analysis suggests that employees give a higher priority to the design of furniture, indoor air quality, finishing materials, thermal

comfort, and noise control, all of which are essential for safe and efficient delivery of care. Lower relative ranking of window view and daylight than other environmental and maintenance items is also reported by Monjur and Yisong (2012). They suggested that window view and daylight appear to be important in studies that look at individual aspects rather than the integrated whole.

Finally, the analysis found that the compared with other spaces, artwork placed in staff areas is valued to a greater extent. According to Mroczek et al. (2005), employees are not able to appreciate artwork in patient and family areas because of their work schedules. Interestingly enough, estimated effect size also indicated that compared with patient areas and work spaces, daylight and window view in staff areas are valued to a greater extent.

Practical Implications

Attention to health and well-being of healthcare professionals become more important when we consider the fact that employees are the greatest cost in an organization (Kats, Braman, & James, 2010). Previous research on job satisfaction of healthcare professionals have reported that nurses and other employees rate the physical work environment more negatively than other characteristics of the environment (Djukic & Kovner, 2009; Kotzer & Arellana, 2008; Kotzer, et al., 2006). Findings of this study provide healthcare architects and facility owners with empirical evidence to inform design decisions by showing the most important factors that may improve employees' satisfaction with architectural and physical features of their workplace. Informed decision making in the design phase is

important because environment features are determined during early design stages, and subsequent modifications during facility operation are difficult to implement.

The most important finding of this study is that finishing materials play a critical role in improving staff satisfaction with the physical environment across all spaces. In addition to visual and physical properties of finishing materials, such as their pattern, color, and texture, the correct selection of finishing materials has an influence on indoor air quality and caregiver safety. Analysis indicates the importance of providing comfortable furniture with ergonomic design in patient areas and staff work spaces. Ergonomic design includes features related to the adjustability of furniture, inclusion of armrests for support, locking casters, and contoured edges (Malone & Dellinger, 2011). In addition to design features, this study also shows the importance of facility operation such as maintaining indoor air quality and thermal comfort. Findings also suggest that proper facility operation can compensate for functions facility design does not offer. For example, employees care less about personal control over room temperature or lighting devices when they are in the appropriate range. Finally, the analysis found that as far as employees are considered, improving visual quality by incorporating pieces of artwork and providing outside view and daylight is more effective in staff areas than in patient rooms and work spaces.

Table 22 shows the level of association between different architectural and physical features and employees' evaluation of their physical work environment within each space. Red cells indicate that the corresponding architectural/physical feature has the highest "relative" level of importance for the corresponding demographic group. In comparison, a

green cell represents the lowest level of importance. Hospital designers and owners may use the information provided in Table 22 to determine the most effective improvements in the facility based on the demographic characteristics of their employees.

Study Limitations and Directions for Future Studies

Approaches such as analysis of variance commonly used for analyzing the differences between group means do not account for underlying factor structures and the relationship between observed variables. Using second-order factor models added to the robustness of the analysis approach. However, certain limitations of this study need to be discussed. First of all, although CFA results indicated acceptable fit and satisfactory model specification in all three data sets, full psychometric evaluation of the measurement instrument was beyond the scope and purpose of this study. Instrument development is an iterative process requiring robust investigations to establish the reliability and validity of the instrument and provide evidence to support its psychometric integrity.

Additionally, because the number of variables incorporated in the measurement model is high, the sample size required for each categorical group was high. Although multiple sites participated in this study, the number of responses collected from certain demographic groups was not adequate to include them in the multigroup analysis, and several groups had to be combined to obtain adequate sample sizes. Furthermore, although the analysis did not find significant differences among nurses and employees, or in perceptions of employees working the day shift versus other shifts, there may be differences between subcategories. More specifically, the influence of work requirements in different medical departments should be taken into account before generalizing the

findings of this study. For example, a greater need for cleanliness exists in departments such as surgery, emergency, and intensive care units where the risk of infection transfer from patients to employees might be higher (Monjur & Yisong, 2012).

With respect to differences found in different spaces, future studies should focus on understanding differences in activities and tasks performed in each space. Data could be collected mapping staff activities, recording location, activity, and time data to identify medical staff activity patterns and linking them with employees' evaluations of architectural and physical features of each space. Future studies should also investigate those outcomes that are different than what was expected (such as window view and daylight) by follow-up detailed analysis of these specific factors via surveys or interviews.

Conclusion

This study highlights the importance of attention to caregiver needs for a safe and comfortable work environment. Among the 27 different environmental features investigated in this study, the analysis found that finishing materials and indoor air quality have the highest levels of association with employees' overall satisfactions with their physical work environment, regardless of their individual characteristics. Additionally, employees highly valued furniture design and thermal comfort. In comparison, features that address the visual quality of the work environment, such as window view and pieces of artwork were found to have smaller associations with employees' evaluations. However, in nonclinical areas, where safety concerns are not as high as such concerns in patient areas and work spaces, staff appreciate features improving the visual quality of their rest area, such as daylight, window view, and the presence of artwork.

In general, this chapter found that the function of an environment affects the dimensions along which employees evaluate it. The chapter also found that demographic variables also influence employees' evaluations of architectural and physical features. In general, employees younger than 40 years and those who had worked in the facility for less than 10 years will most appreciate the improvements in the architectural/physical features of patient rooms.

CHAPTER VI

SUMMARY

Overall Conclusion

The overall purpose of this study was to understand how healthcare organizations can use facility design and operation as human resource management tools for sustainable improvement of their performance. Previous research has documented that implementing human resource practices, such as providing training, allowing employees to participate in decision making, and communicating the organizational vision and mission to employees, can enhance performance outcomes at the individual and organizational levels. As documented in Chapter II, social exchange theory explains that one reason that human resource practices are effective in improving employee motivation and performance is that they convey the message that an organization values employees' contributions and cares about their well-being, that can be reciprocated with higher levels of motivation and commitment toward the organization. Chapter II also revealed that findings of healthcare environmental studies suggest that a safe and high-quality work environment sends a similar message to employees and can improve their job attitudes and behaviors.

Chapter III presented findings on the empirical investigation of the impact of human resource management and the physical work environment on job-related attitudes and feelings of caregivers. As revealed in Chapter III, employees' evaluations of their physical work environment and human resource practices influenced their job-related feelings and attitudes, and perceived organizational support mediated this relationship.

The influence of physical work environment was small, mainly because of the high predictive value of human resource practices and strong confounding variables included in the analysis. The analysis presented in Chapter III specifically showed the role of facility design and operation in reducing job-related anxiety among caregivers. The study found a small but positive interaction effect between the physical work environment and human resource practices. In other words, the relationship between human resource management and perceived organizational support was higher for employees satisfied with their physical work environment than for those who were less satisfied. This finding suggests that when the interaction between the physical work environment and human resource practices is considered, facility design and operation can have a significant impact on improving job-related attitudes of healthcare professionals.

Chapter IV focused on discussing the study's attempt to understand how employees' evaluations of important spaces within a facility (patient areas, staff work spaces, staff rest areas) impact their job-related attitudes and feelings. The analysis presented in Chapter IV found that work spaces and staff areas had a considerable influence on job-related feelings and attitudes of employees, while the impact of patient areas was negligible. As for demographic characteristics of employees, multigroup analysis found that the influence of the physical work environment on employees newer to the facility and the organization, as well as on nightshift staff members, was stronger.

Finally, Chapter V presented the findings of the examination of the relative importance of different dimensions of the physical work environment in different spaces. Common factors were extracted through principal component analysis, levels of

association between employees' perceptions and each architectural and physical feature were determined through confirmatory factor analysis, and differences across demographic groups were defined through invariance analysis. Among the 27 different environmental features investigated, finishing materials and indoor air quality had the highest levels of association with employees' overall evaluation of their environment, regardless of their individual characteristics. Additionally, employees highly valued furniture design and thermal comfort. In comparison, features that addressed the visual quality of the work environment, such as window views and pieces of artwork, were found to have smaller associations with employees' evaluations. However, in nonclinical areas, where safety concerns are not as high as in patient areas and work spaces, staff appreciated features that improved the visual quality, such as daylight, window views, and the presence of artwork. In general, the results presented in Chapter V highlight the importance of paying attention to caregiver needs for a safe and comfortable work environment. Analysis also found that demographic variables influenced employees' evaluations of architectural and physical features. For example, employees younger than 40 and those who had worked in the facility for less than 10 years appreciated improvements in their work environment to a greater extent than others.

Contributions to Literature

In summary, this research provides healthcare organizations with new perspectives for enhancing their performance. As explained in Chapter II, the resource-based view of firms suggests that differences in performance of organizations originate from differences in their resources. The resource-based view of firms also suggests that the value generated

by a rare, unique, and complex resource pool is difficult for competitors to imitate or reproduce. Accordingly, organizations need to obtain and combine a variety of resources, including economic, social, and ecological capital, to create a value-adding resource bundle and achieve an enduring competitive advantage. By finding a synergy between employees' evaluations of their physical work environment and human resource management systems, this study indicates that healthcare organizations can add facility design and operation practices to the array of human resource management tools for enhancing employees' job-related attitudes and ultimately their overall performance. Furthermore, this research expands the body of knowledge in the following areas:

- Investigated the interaction between facility design and operation and human resource management as factors for improving job-related attitudes and feelings of employees and earning their commitment.
- Performed an integrated analysis of the relationship between employees' job attitudes and their satisfaction with architectural and physical features of important environments within healthcare facilities (patient rooms, work spaces, and staff areas).
- Studied the relative importance of various architectural and physical features of different spaces within a hospital.
- Examined differences across different demographic groups (age, number of years worked in the facility, work shift, and job title).

Limitations of the Study and Overall Direction for Future Research

Though this research makes important contributions to the field, as discussed in each chapter, it does have limitations that need to be mentioned and possibly addressed in future studies:

- The respondent sample was large and diverse. However, because of the sampling approach, the findings can only be generalized to healthcare professionals in acute-care settings in the United States. More importantly, more than 90% of participants were female, limiting the generalizability of findings to female employees.
- All models included in Chapter III, Chapter IV, and Chapter V had a satisfactory model fit. However, because of the cross-sectional design of the study, relationships identified in these chapters do not necessarily imply causation and should be verified using time-series data or cross-sectional studies conducted in multiple phases.
- All measurement models presented in Chapter III, Chapter IV, and Chapter V had satisfactory reliability measures. However, findings revealed in these chapters are limited by the self-reporting nature of the survey. Although relevant information was provided as web links in the online questionnaire, some of the questions for quantifying employees' evaluations of their physical work environment and human resource practices may have been inadequately defined. As stated in Chapter V, full

psychometric evaluation of the measurement instruments was beyond the scope and purpose of this study.

- As discussed in Chapter IV and Chapter V, this study performed an integrated analysis of different spaces within a hospital. To better understand differences found in different spaces, future studies should also focus on activities and tasks performed in each space. For instance, mapping staff activities and collecting time data could be used to identify medical staff activity patterns and link them with employees' evaluations of various features in each space. Furthermore, the analysis presented in Chapter IV and Chapter V did not distinguish between different medical departments within a hospital. Future studies should look at the influence of work requirements in different medical departments. For example, caregivers may feel a greater need for cleanliness in surgical or intensive care units, where the risk of infection transferred from patients to caregivers is higher.
- This study investigated differences across important demographic groups, including age, number of working hours per week, education level, tenure, number of years worked in the facility, work shift, and job title. However, the related analyses did not account for personal characteristics of employees, such as personality dimensions and the strength of socio-emotional needs. Dispositional differences may not have an independent influence on job-related attitudes and feelings, but they may alter the

influence of other work-related variables on attitudinal outcomes. Future studies could include personal characteristics of employees as control variables in the analysis. Job level may also impact job-related attitudes and feelings and could be considered in future studies as a control variable. Employees' level of authority and payment might vary primarily with job type, and compared with employees with lower-level jobs, higher-level employees might not necessarily feel more supported.

Finally, by accepting the role of the built environment as a human resource management tool, an extensive body of the knowledge in human resource management literature becomes available to healthcare environmental researchers and can be used for strengthening the case for investing in facility design and operation. As stated in Chapter I, because studying all attitudinal and behavioral variables was not achievable in a single investigation, this research focused on the impact of human resource management and the physical work environment on job-related attitudes and feelings of caregivers. Findings presented in Chapter II suggest that long-term behaviors, such as the decision to leave an organization, stem from stable features and the structure of the job environment, while short-term behaviors, such as tardiness or helping others, stem from spontaneous job events (Weiss & Cropanzano, 1996). As a stable feature and structure of the job environment, the built environment may have a stronger impact on the long-term behaviors of employees than on their short-term behaviors.

Previous meta-analysis studies have reported that job satisfaction is positively correlated (r = .30) with focal performance (work behaviors prescribed by formal job

roles; Harrison et al, 2006), and organizational commitment is positively correlated (r = .32) with organizational citizenship behavior (Meyer et al., 2002) and negatively with turnover (r = -.22). High turnover results in significant costs to healthcare organizations in terms of recruiting and training new employees and might also adversely impact the quality of care provided (Li & Jones, 2013). Using the findings of this research, future studies could look at the influence of the physical work environment and human resource practices on behavioral outcomes (e.g., turnover, absenteeism, and organizational citizenship behavior) transferred through the attitudinal variables included in this study. More specifically, future studies could compare cost savings resulting from reduced turnover and absenteeism with additional costs associated with improving facility design and operation as well as implementing human resource practices. Results of such analyses can be used to support long-term investments in facility design and operation.

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APPENDIX A

INSTITUTIONAL REVIEW BOARD APPROVAL LETTER

TEXAS A&M UNIVERSITY
DIVISION OF RESEARCH - OFFICE OF RESEARCH COMPLIANCE AND BIOSAFETY

1186 TAMU, General Services Complex
College Station, TX 77843-1186
750 Agronomy Road, #3501

979.458.1467
FAX 979.862.3176
http://researchcompliance.tamu.edu

Human Subjects Protection Program — Institutional Review Board

APPROVAL DATE: 29-Feb-2012

MEMORANDUM

TO: SADATSAFAVI, HESSMALDIN
77843-3578

FROM: Office of Research Compliance
Institutional Review Board

SUBJECT: Initial Review

Protocol Number: 2011-0917

Title: Influence of the Human Resource Management System and Quality of the Built Environment on Healthcare Professionals

Review Category: Expedited

Approval Period: 29-Feb-2012 **To** 28-Feb-2013

Approval determination was based on the following Code of Federal Regulations:

Eligible for Expedite Approval (45 CFR 46.110): Identification of the subjects or their responses (or the remaining procedures involving identification of subjects or their responses) will NOT reasonably place them at risk of criminal or civil liability or be damaging to the their financial standing, employability, insurability, reputation, or be stigmatizing, unless reasonable and appropriate protections will be implemented so that risks related to invasion of privacy and breach of confidentiality are no greater than minimal.

Criteria for Approval has been met (45 CFR 46.111) - The criteria for approval listed in 45 CFR 46.111 have been met (or if previously met, have not changed).

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(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation or quality assurance methodologies.

(Note: Some research in this category may be exempt from the HHS regulations for the protection of human subjects. 45 CFR 46.101(b)(2) and (b) (3). This listing refers only to research that is not exempt.)

Provisions:

Comments: Waiver of Documentation of Consent (45 CFR 46.117

This research project has been approved. As principal investigator, you assume the following responsibilities

1. **Continuing Review:** The protocol must be renewed each year in order to continue with the research project. A Continuing Review along with required documents must be submitted 45 days before the end of the approval period. Failure to do so may result in processing delays and/or non-renewal.
2. **Completion Report:** Upon completion of the research project (including data analysis and final written papers), a Completion Report must be submitted to the IRB Office.
3. **Adverse Events:** Adverse events must be reported to the IRB Office immediately.
4. **Amendments:** Changes to the protocol must be requested by submitting an Amendment to the IRB Office for review. The Amendment must be approved by the IRB before being implemented.
5. **Informed Consent:** Information must be presented to enable persons to voluntarily decide whether or not to participate in the research project unless otherwise waived as noted above.

This electronic document provides notification of the review results by the Institutional Review Board.

APPENDIX B

SURVEY QUESTIONNAIRE

Subject: Invitation to Participate in Survey of Healthcare Professionals

Dear Healthcare Professional,

I am a doctoral student in civil engineering at Texas A&M University, and I am writing to invite you to participate in a study entitled **"Influence of the Human Resource Management System and Quality of the Built Environment on Healthcare Professionals".** Your input is very important and can make a difference in documenting factors that promote job attitudes of healthcare workers. If you are willing to participate, please follow the link below to the survey information page:

https://www.surveymonkey.com/s.aspx?sm=Hni3g_2bSYmOvG34keMUk8OZ4L1gcbi0wiW6s0pPltoss_3d

The survey will ask about your perception of architectural and physical features of your workplace, and attitudes towards your job and your organization.

- The survey is anonymous and your answers are completely confidential
- Completing the survey will take between 15-20 minutes of your time. You may stop and return to finish the survey later.

More information about the study and the survey is provided in the introduction part of the survey. This research study has been reviewed by the Institutional Review Board at Texas A&M University. As a token of appreciation, you have the opportunity to enter a drawing to win one of five gift certificates. **On the last page of the survey ,you will see a question asking if you want to enter the drawing.** If you complete and submit the survey before **(date)**, you will have two chances to win!

Regards,

Hessam Sadatsafavi, MS, LEED GA
Construction Engineering and Management Program
Zachry Department of Civil Engineering
Texas A&M University
3136 TAMU, 710 CE/TTI Building
College Station, TX 77843-3136
Email: hessam@neo.tamu.edu
Voice: (979) 209 9350

Please note: If you do not wish to receive further emails from us, please click the link below, and you will be automatically removed from our mailing list.
https://www.surveymonkey.com/optout.aspx

INFORMATION SHEET

Project Title: **Influence of the Human Resource Management System and Quality of the Built Environment on Helathcare Professionals.**

You are being invited to take part in a research study being conducted by Texas A&M University and asked to read this form so that you know about this research study. The information in this form is provided to help you decide whether or not to take part. If you decide you do not want to participate, there will be no penalty to you, and you will not lose any benefit you normally would have.

WHY IS THIS STUDY BEING DONE?

The purpose of this study is to investigate the effects of factors mentioned above on job satisfaction, work-related wellbeing, and organizational commitment among healthcare workers.

WHY AM I BEING ASKED TO BE IN THIS STUDY?

You are being asked to be in this study because you are (1) a full-time employee (i.e., you work 35 hours per week or more on all shifts) (2) involved in direct care of patients, and hired by a facility which is Medicare and/or Medicare/Medicare certified.

HOW MANY PEOPLE WILL BE ASKED TO BE IN THIS STUDY?

About 400 people are expected to participate in this study. Overall, a total of 1000 people at five facilities have received the invitation to participate in this study.

WHAT ARE THE ALTERNATIVES TO BEING IN THIS STUDY?

The alternative is not to participate.

WHAT WILL YOU BE ASKED TO DO IN THIS STUDY?

If you agree to participate in this study, you will be asked to answer a variety of questions about your perception of the quality of architectural and physical features of your workplace, and your attitudes towards your job and organization. This study will take about 20 minutes of your time. You may stop and return to finish the survey later.

ARE THERE ANY RISKS TO ME?

The things that you will be doing have no more risk than you would come across in everyday life. You may find some questions in the first section of the survey to be sensitive (e.g., ethnicity, marital

status, and number of dependents). These questions are helpful in interpreting your other responses compared to other respondents. You may pass over any questions you chose not to answer; however, not answering questions may reduce the accuracy study. No effort will be made to match your responses to your identity.

ARE THERE ANY BENEFITS TO ME?

There is no direct benefit to you by being in this study. From a professional perspective, this study may provide healthcare organizations with managerial and architectural design recommendations to improve employees' job attitudes and enrich organizational capabilities.

WILL THERE BE ANY COSTS TO ME?

Aside from your time, there are no costs for taking part in the study.

WILL I BE PAID TO BE IN THIS STUDY?

As a token of appreciation, upon completion and submission of the survey, you will be offered an option to enter a drawing to win one of three $20 gift certificates within your hospital.

WILL INFORMATION FROM THIS STUDY BE KEPT PRIVATE?

This survey is anonymous and the records of this study will be kept private. No identifiers linking you to this study will be included in any sort of report that might be published. Research records will be stored securely and only the student investigator, Hessam Sadatsafavi, and his advisor, Dr. John Walewski will have access to the records.

Representatives of regulatory agencies such as the Office of Human Research Protections (OHRP) and entities such as the Texas A&M University Human Subjects Protection Program may access your records to make sure the study is being run correctly and that information is collected properly.

WHOM CAN I CONTACT FOR MORE INFORMATION?

You can call the Principal Investigator to tell him about a concern or complaint about this research study. The Principal Investigator, Hessam Sadatsafavi, can be called at 979-209-9350 or emailed at hessam@neo.tamu.edu. You may also contact the student committee chair Dr. John Walewski, at 979-862-5673 or jwalewski@civil.tamu.edu.

For questions about your rights as a research participant; or if you have questions, complaints, or concerns about the research and cannot reach the Principal Investigator or want to talk to someone other than the Investigator, you may call the Texas A&M Human Subjects Protection Program office at (979)458-4067 or irb@tamu.edu.

MAY I CHANGE MY MIND ABOUT PARTICIPATING?

You have the choice whether or not to be in this research study. You may decide to not begin or to stop the study at any time. If you choose not to be in this study, there will be no effect on your employment. You can stop being in this study at any time with no effect on your employment, evaluation.

By participating in the survey, you are giving permission for the investigator to use the information you provide for research purposes.

If you would like to be in the study, please go to the next page to start the survey.

SECTION I - BACKGROUND & DEMOGRAPHICS

Note: If you need to save your answers and stop select **"Exit this survey"** on the right. Your answers will be saved automatically. To return, use the same link in the invitation e-mail you received. You will be directed to the same page you left.

DIRECTION

Please answer the following questions about yourself. You may find some questions in this part to be sensitive (e.g., ethnicity, marital status, and number of dependents). These questions are helpful in interpreting your other responses compared to other respondents. You may pass over any questions you chose not to answer; however, not answering questions may reduce the accuracy study.No effort will be made to match your responses to your identity.

1. What is your age?

- ◯ 29 or under
- ◯ 30-39
- ◯ 40-49
- ◯ Over 50

2. What is your gender?

- ◯ Male
- ◯ Female

3. What is your race?

- ◯ Caucasian
- ◯ African-American
- ◯ Hispanic
- ◯ Asian
- ◯ Other (please specify)

4. What is the highest education you have received

- ◯ Diploma
- ◯ Bachelor's degree
- ◯ Master's degree
- ◯ PhD
- ◯ Other (please specify)

5. How long have you been employed by the current employer?

- ◯ Less than 6 months
- ◯ 6-to 12 months
- ◯ 1-2 years
- ◯ 3-5 years
- ◯ 5-10 years
- ◯ More than 10 years

6. How many years have you worked in this building?

- ◯ Less than 6 months
- ◯ 6-to 12 months
- ◯ 1-2 years
- ◯ 3-5 years
- ◯ 5-10 years
- ◯ More than 10 years

7. Please select the medical department in which you work. If you work in more than one department, select the one in which you work the most hours?

- ◯ Patient Units (e.g., Med/Surg, Cardiac, Peds)
- ◯ Specialty care (e.g., Women's, Oncology, Maternity, Mental health, Rehabilitation)
- ◯ Surgery Suite (OR, Post-Anesthesia Care Unit, Prep/Recovery)
- ◯ Emergency Department
- ◯ Diagnostic (Imaging and radiology)
- ◯ Critical Care Nursing (CCU, CSU, ICU, NICU, intermediate and step-down units)

Would you be willing to share the name of your department/unit below?

8. What shift do you work?

- ◯ Day shift (beginning not earlier than 6am and ending not later than 7pm)
- ◯ Evening shift (beginning not earlier than 2pm and ending not later than midnight)
- ◯ Night shift (beginning not earlier than 6 pm and ending not later than 8 am)
- ◯ Rotating shifts (any combination of the above categories)

9. How many hours do you work in a typical week at this facility?

- ◯ 12 or less
- ◯ 13-23
- ◯ 24-34
- ◯ 35-40
- ◯ 41 or more

10. Which of the following best describes your job title? if your job title is not listed, please specify it in the comment box below:

SECTION II - PERCEIVED QUALITY OF THE BUILT ENVIRONMENT

DIRECTION

The first section of the survey evaluates *your satisfaction with the facility in which you work*. Click here* to see the list of features this section covers.

Because you might spend your time in different locations, in a number of questions three different types of spaces are listed and you are asked to rate each separately. These three spaces are as follow:

1. Patient and family spaces; including spaces that are designed to be used by patients and families, such as inpatient rooms, patient rooms in critical access nursing units, critical care rooms, LDR/LDRP room as well as support areas for families and visitors

2. Caregivers work spaces; including your individual work space, shared work space (e.g., report rooms, nurse stations), patient treatment area, examination room, operation room, therapy room, and other spaces where you spend the majority of your working time performing your tasks

3. Caregivers dedicated spaces; including spaces that are used solely by employees, such as staff lounge and caregivers sleeping area

To help you answer questions the definition of important terms along with more information about environmental features are provided. **Using this information is completely optional.**

* In this section of the survey, you will be asked about the following features:

- Part 1 - Building Layout
- Part 2 - Furniture and Finishing Materials
- Part 3 - Thermal Comfort
- Part 4 - Lighting
- Part 5 - Acoustic Environment
- Part 6 - Indoor Air Quality
- Part 7 - Cleanliness and Maintenance
- Part 8 - Community Connectivity
- Part 9 - Alternative Transportation
- Part 10 - Connection to the Natural World

SECTION II - PART 1 - BUILDING LAYOUT

Note: If you need to save your answers and stop select **"Exit this survey"** on the right. Your answers will be saved automatically. To return, use the same link in the invitation e-mail you received. You will be directed to the same page you left.

1. Please indicate how satisfied you are with the issues listed below:

	For patient care in patient rooms	For individual work at your workspace	Staff lounge or caregivers sleeping area
The amount of space			
Visual privacy			

SECTION II - PART 2 - FURNITURE AND FINISHING MATERIALS

Note: If you need to save your answers and stop select **"Exit this survey"** on the right. Your answers will be saved automatically. To return, use the same link in the invitation e-mail you received. You will be directed to the same page you left.

1. Please indicate how satisfied you are with the issues listed below:

	Patient and family spaces	Your workspace	Staff lounge or caregivers sleeping area
Furniture design			
Furniture finish materials			
Flooring materials			
Wall finishes			
Surface finishes (counters, work surfaces)			
Artwork			

SECTION II - PART 3 - THERMAL COMFORT

Note: If you need to save your answers and stop select **"Exit this survey"** on the right. Your answers will be saved automatically. To return, use the same link in the invitation e-mail you received. You will be directed to the same page you left.

1. Please indicate how satisfied you are with the issues listed below

	Patient and family spaces	Your workspace	Staff lounge or caregivers sleeping area
Temperature	☐	☐	☐

2. Please indicate how satisfied you are with the extent to which you are able to personally adjust or control temperature (Note*).

- ◯ 1- Very dissatisfied
- ◯ 2- Mostly dissatisfied
- ◯ 3- Somewhat dissatisfied
- ◯ 4- Neither satisfied or dissatisfied
- ◯ 5- Somewhat satisfied
- ◯ 6- Mostly satisfied
- ◯ 7- Very satisfied
- ◯ Not important to me

* The following options can be used to adjust or control temperature:
  - Window blinds or shades
  - Operable window
  - Thermostat
  - Portable heater / fan
  - Adjustable air vent in wall or ceiling
  - Adjustable floor air vent (diffuser)

SECTION II - PART 4 - LIGHTING

Note: If you need to save your answers and stop select **"Exit this survey"** on the right. Your answers will be saved automatically. To return, use the same link in the invitation e-mail you received. You will be directed to the same page you left.

1. Please indicate how satisfied you are with the issues listed below

	Patient and family spaces	Your workspace	Staff lounge or caregivers sleeping area
The amount of electric light	☐	☐	☐
The visual comfort* of the electric lighting	☐	☐	☐
The amount of natural daylight	☐	☐	☐
The visual comfort of the natural daylight	☐	☐	☐
Controllability** of lighting to suit individual task needs and personal preferences	☐	☐	☐

2. Please indicate how satisfied you are with the issues listed below

	Facility driveways	Facility entrance	Staff parking area	Walking paths
Exterior lighting at night	☐	☐	☐	☐

* Visual comfort refers to issues such as glare, reflections, contrast.
** The following options can be used to adjust or control lighting:
- Light switch
- Light dimmer
- Desk (task) light
- Bedside light
- Window blinds or shades

SECTION II - PART 5 - ACOUSTIC ENVIRONMENT

Note: If you need to save your answers and stop select **"Exit this survey"** on the right. Your answers will be saved automatically. To return, use the same link in the invitation e-mail you received. You will be directed to the same page you left.

1. Please indicate how satisfied you are with the issues listed below

	Patient and family spaces	Your workspace	Staff lounge or caregivers sleeping area
The level of distracting noise in building from interior sources*	☐	☐	☐
The level of distracting noise in building from exterior sources**	☐	☐	☐
The speech privacy*** in the building	☐	☐	☐

* Interior sources of noise include background sound levels generated by all building mechanical-electrical-plumbing systems, air distribution systems and other facility noise sources.
** Exterior sources of noise include road traffic, aircraft flyovers, railroads, on-site heliports, emergency power generators during maintenance testing, outdoor mechanical and building services equipment.
*** Speech privacy in this question is defined as the ability to have conversations without distracting your colleagues or your colleagues overhearing and vice versa.

SECTION II - PART 6 - INDOOR AIR QUALITY

Note: If you need to save your answers and stop select **"Exit this survey"** on the right. Your answers will be saved automatically. To return, use the same link in the invitation e-mail you received. You will be directed to the same page you left.

1. Please indicate how satisfied you are with the issues listed below

	Patient and family spaces	Your workspace	Staff lounge or caregivers sleeping area
Indoor air quality			

2. How well informed do you feel about the organizational efforts in reducing the quantity of indoor air contaminants?

- ◯ 1- Very dissatisfied
- ◯ 2- Mostly dissatisfied
- ◯ 3- Somewhat dissatisfied
- ◯ 4- Neither satisfied or dissatisfied
- ◯ 5- Somewhat satisfied
- ◯ 6- Mostly satisfied
- ◯ 7- Very satisfied
- ◯ Not important to me

SECTION II - PART 7 - CLEANLINESS AND MAINTENANCE

Note: If you need to save your answers and stop select **"Exit this survey"** on the right. Your answers will be saved automatically. To return, use the same link in the invitation e-mail you received. You will be directed to the same page you left.

1. Please indicate how satisfied you are with the issues listed below

	Patient and family spaces	Your workspace	Staff lounge or caregivers sleeping area
Floor cleanliness	☐	☐	☐
Wall cleanliness	☐	☐	☐
Cleanliness of toilets and shower rooms	☐	☐	☐
Cleanliness of plumbing fixtures	☐	☐	☐
Cleanliness of lighting fixtures	☐	☐	☐
Furniture cleanliness	☐	☐	☐

2. Please indicate how satisfied you are with the issues listed below:

	1 Very dissatisfied	2 Mostly dissatisfied	3 Somewhat dissatisfied	4 Neither satisfied or dissatisfied	5 Somewhat satisfied	6 Mostly satisfied	7 Very satisfied	Not important to me, I am not a regular user
Accessibility and convenient use of hand-washing stations before and after each patient contact	○	○	○	○	○	○	○	○
Accessibility and convenient use of alcohol-based hand-rub dispensers before and after each patient contact	○	○	○	○	○	○	○	○

SECTION II - PART 8 - COMMUNITY CONNECTIVITY

Note: If you need to save your answers and stop select **"Exit this survey"** on the right. Your answers will be saved automatically. To return, use the same link in the invitation e-mail you received. You will be directed to the same page you left.

1. Please indicate how satisfied you are with the issues listed below:

	1 Very dissatisfied	2 Mostly dissatisfied	3 Somewhat dissatisfied	4 Neither satisfied or dissatisfied	5 Somewhat satisfied	6 Mostly satisfied	7 Very satisfied	Not important to me, I am not a regular user
The proximity* of the facility to residential area or neighborhood (not necessarily your residential area or neighborhood).	○	○	○	○	○	○	○	○
The proximity** of the facility to basic services***.	○	○	○	○	○	○	○	○

* Proximity in this question is defined as being within walking distance with pedestrian access available.
** Proximity in this question is defined as being within walking distance with pedestrian access or on-demand shuttle service available.
*** Examples of basic services for this question include the followings:

- Parks
- Convenience grocery
- Beauty salon
- Laundry
- Library
- Post office
- Super market
- Fitness center

SECTION II - PART 9 - ALTERNATIVE TRANSPORTATION

Note: If you need to save your answers and stop select **"Exit this survey"** on the right. Your answers will be saved automatically. To return, use the same link in the invitation e-mail you received. You will be directed to the same page you left.

1. Please indicate how satisfied you are with the issues listed below:

	1 Very dissatisfied	2 Mostly dissatisfied	3 Somewhat dissatisfied	4 Neither satisfied or dissatisfied	5 Somewhat satisfied	6 Mostly satisfied	7 Very satisfied	Not important to me, I am not a regular user
The proximity* of the facility to public modes of transportation	○	○	○	○	○	○	○	○
Availability of bicycle storage, showers and changing rooms	○	○	○	○	○	○	○	○

* Proximity in this question is defined as being within walking distance with pedestrian access available.

SECTION II - PART 10 - CONNECTION TO THE NATURAL WORLD

Note: If you need to save your answers and stop select **"Exit this survey"** on the right. Your answers will be saved automatically. To return, use the same link in the invitation e-mail you received. You will be directed to the same page you left.

1. Please indicate how satisfied you are with the issues listed below.

	Patient and family spaces	Your workspace	Staff lounge or caregivers sleeping area
Windows view	☐	☐	☐

2. Please indicate how satisfied you are with the issues listed below:

	1 Very dissatisfied	2 Mostly dissatisfied	3 Somewhat dissatisfied	4 Neither satisfied or dissatisfied	5 Somewhat satisfied	6 Mostly satisfied	7 Very satisfied	Not important to me, I am not a regular user
The amount and visual quality of vegetated open space	○	○	○	○	○	○	○	○
Availability and suitability of outdoor spaces as places of respite (Note*).	○	○	○	○	○	○	○	○
Availability and suitability of interior atrium, greenhouses, solaria as places of respite (Note**).	○	○	○	○	○	○	○	○

* To be a suitable place of respite, outdoor spaces should meet the following criteria:
  1. Accessible from within the building
  2. Located where no medical intervention or direct medical care is delivered
  3. Open to fresh air, the sky and the natural elements, including seasonal weather
  4. Provide options for shade or indirect sun at a minimum of one seating space per 200 square feet

** To be a suitable place of respite, indoor spaces should meet the following criteria:
  1. Located where no medical intervention or direct medical care is delivered
  2. Receive direct line of sight to unobstructed views of nature in 90% of square footage

SECTION III - PERCEPTION OF HUMAN RESOURCE MANAGEMENT PRACTICES

Note: If you need to save your answers and stop select **"Exit this survey"** on the right. Your answers will be saved automatically. To return, use the same link in the invitation e-mail you received. You will be directed to the same page you left.

DIRECTION

This section of the survey focuses on organizational policies and practices. A number of statements that represent possible opinions that YOU may have about organizational polices are listed. To help you answer questions the example of relevant human resource practices are provided. **Using these examples is optional.**

1. Please indicate the degree of your agreement or disagreement with each statement:

	1 Strongly disagree	2 Disagree	3 Undecided	4 Agree	5 Strongly agree
1. Communicating Mission and Vision: Managers communicate the organization's scope and mission to employees, and let employees know how their work contributes to the organization's mission and goals. Examples	○	○	○	○	○
2. Information Sharing: Employees are kept informed on issues affecting their jobs. Examples	○	○	○	○	○
3. Employee Involvement in Decision-Making: Sufficient effort is made to get the opinions and thinking of employees on decisions that matter. Examples	○	○	○	○	○
4. Performance-Driven Reward/Recognition: Employees are rewarded for success in achieving organization-supportive goals and/or providing high-quality services to customers. Examples	○	○	○	○	○
5. Selective Hiring: My organization makes sufficient effort to fill open positions with	○	○	○	○	○

Examples include but not limited to the followings:
- Annual "sign off " on mission as part of performance review
- Employee-focused messages regarding mission/vision reinforced throughout human resource functions such as new employee orientation

Examples include but not limited to the followings:
- Large formal gatherings to share information with all employees
- Use of report cards showing quality of care or patient safety metrics through newsletters and bulletin boards that are accessible to all employees
- Posting of report cards in a high-visibility public area
- Using intranet to inform employees on regular basis

Examples include but not limited to the followings:
- Use of employee committees to collect and use employee opinions
- Involving employees in leading and/or participating in process improvement projects such as lean projects and peer safety coaches

Examples include but not limited to the followings:
- Individual and team recognition programs tied to organizational values and goals or results of organizational balanced scorecard
- Performance management systems linking individual accountabilities to organizational objectives
- Use of accountabilities as a basis for performance review and/or compensation
- Holding ceremonies to recognize employees by senior executives
- Recognizing and rewarding long term employment, e.g., 10 and 25 years

Examples include but not limited to the followings:
- Ensuring that new employees have the right "fit" with the organizational culture and its values
- Creating an integrated process for selection and on-boarding
- Use of behavioral standards in selection process
- Use of team interviewing and greater employee involvement in hiring process

high quality candidates. Examples

○ ○ ○ ○ ○

6. Extensive Training: My organization provide more-than-mandated / more-than-typical investment in developing staff to achieve greater effectiveness. Examples

Examples include but not limited to the followings:
- Ensuring that training starts from new-employee orientation and continues into the employee development process
- Use of large leader and staff employee forums as part of the training component of employee development
- Establishing a robust "corporate university" or formal relationship with local universities to support the training process
- Tuition reimbursement programs
- Tying pay increase and reimbursement to certifications in addition degrees

○ ○ ○ ○ ○

7. Career Development: Sufficient effort is made by the organization to give employees a real opportunity to improve their skills and to make advancement in their career. Examples

Examples include but not limited to the followings:
- Providing subsides for conference attendance
- Offering leadership development programs and classes for high-potential managers
- Providing formal mentoring programs
- Use of some career ladders (e.g., for nurses)
- Leadership coaching as part of the on-boarding process

○ ○ ○ ○ ○

8. Employment Security: My organization makes sufficient effort to provide stable employment and greater-than-mandated employment security. Examples

Examples include but not limited to the followings:
- Emphasis on employment continuity
- Strategic redeployments instead of layoffs
- Minimizing layoffs

○ ○ ○ ○ ○

9. Employment Safety: My organization protects employees from repercussion for speaking up about safety and quality concerns. Examples

Examples of human resource actions for this question include but not limited to the followings:
- Support for employees to "speak up"
- Use of team communication training

○ ○ ○ ○ ○

10. Reduced Status Distinction: The organization makes sufficient effort to treat employees equally across different roles. Examples

Examples include but not limited to the followings:
- Shared governance
- Use of employee/management multilevel teams to set and track goals and resolve key issues

○ ○ ○ ○ ○

11. Teams/Decentralized

Decision-Making: My organization supports teamwork and provides teams an opportunity to decide how to organize and complete their work.

Examples

Examples include but not limited to the followings:
- Managers and direct supervisors are empowered to work with doctors and housekeepers
- Use of report cards to move accountability to the division or unit level
- Deploying employee innovation teams to generate ideas for strategic growth

SECTION IV - PERCEIVED ORGANIZATIONAL SUPPORT

Note: If you need to save your answers and stop select **"Exit this survey"** on the right. Your answers will be saved automatically. To return, use the same link in the invitation e-mail you received. You will be directed to the same page you left.

DIRECTION

This section of the survey focuses on the relationship you have with your organization . A number of statements that represent possible opinions that YOU may have about your relationship with your organization are listed.

1. Please indicate the degree to which you believe that the characteristics stated in each statement exhibited in the organizational policies and practices.

	1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Neither agree or disagree	5 Somewhat agree	6 Agree	7 Strongly agree
The organization values my contribution to its well-being	○	○	○	○	○	○	○
The organization fails to appreciate any extra effort from me	○	○	○	○	○	○	○
The organization would ignore any complaint from me	○	○	○	○	○	○	○
The organization really cares about my well-being	○	○	○	○	○	○	○
Even if I did the best job possible, the organization would fail to notice	○	○	○	○	○	○	○
The organization cares about my general satisfaction at work	○	○	○	○	○	○	○
The organization shows very little concern for me	○	○	○	○	○	○	○
The organization takes pride in my accomplishments at work	○	○	○	○	○	○	○

SECTION V - JOB SATISFACTION

Note: If you need to save your answers and stop select **"Exit this survey"** on the right. Your answers will be saved automatically. To return, use the same link in the invitation e-mail you received. You will be directed to the same page you left.

DIRECTION

The followings are statements about you and your job. When answering, keep in mind the kind of work you do and the experiences you have had working for your current organization.

1. Please indicate how much do you agree or disagree with each statement:

	1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Neither agree or disagree	5 Somewhat agree	6 Agree	7 Strongly agree
All in all, I am satisfied with my job	○	○	○	○	○	○	○
In general, I don't like my job	○	○	○	○	○	○	○
In general, I like working here	○	○	○	○	○	○	○

SECTION VI - JOB-RELATED ANXIETY AND DEPRESSION

Note: If you need to save your answers and stop select **"Exit this survey"** on the right. Your answers will be saved automatically. To return, use the same link in the invitation e-mail you received. You will be directed to the same page you left.

DIRECTION

A number of statements that could be used to describe YOUR feelings at work are listed below. Think of a typical workday at your organization and indicate the frequency for the given emotion.

1. Please indicate the frequency of the time your job has made you feel each of the following

	Never	Occasionally	Some of the time	Most of the time	All of the time
Tense	○	○	○	○	○
Worried	○	○	○	○	○
Uneasy	○	○	○	○	○
Miserable	○	○	○	○	○
Depressed	○	○	○	○	○
Gloomy	○	○	○	○	○

SECTION VII - ORGANIZATIONAL COMMITMENT

Note: If you need to save your answers and stop select **"Exit this survey"** on the right. Your answers will be saved automatically. To return, use the same link in the invitation e-mail you received. You will be directed to the same page you left.

DIRECTION

Listed below are statements that represent possible opinions that YOU may have about your organization.

1. Please indicate the degree of your agreement or disagreement with each statement:

	1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Neither agree or disagree	5 Somewhat agree	6 Agree	7 Strongly agree
I would be very happy to spend the rest of my career with this organization	○	○	○	○	○	○	○
I really feel as if this organization's problems are my own	○	○	○	○	○	○	○
I do not feel a strong sense of "belonging" to my organization	○	○	○	○	○	○	○
I do not feel "emotionally attached" to this organization	○	○	○	○	○	○	○
I do not feel like "part of the family" at my organization	○	○	○	○	○	○	○
This organization has a great deal of	○	○	○	○	○	○	○

SECTION VIII - RELATIONSHIPS AT WORK

Note: If you need to save your answers and stop select **"Exit this survey"** on the right. Your answers will be saved automatically. To return, use the same link in the invitation e-mail you received. You will be directed to the same page you left.

DIRECTION

Listed below are statements that represent possible opinions that YOU may have about your relationships at work.

1. Please indicate the degree of your agreement or disagreement with each statement:

	1 Strongly disagree	2 Disagree	3 Somewhat disagree	4 Neither agree or disagree	5 Somewhat agree	6 Agree	7 Strongly agree
Overall, I have a good working relationship with my **immediate supervisor**	○	○	○	○	○	○	○
Overall, I have a good working relationship with the **physician(s) who I work with**	○	○	○	○	○	○	○
Overall, I have a good working relationship with **other members of my work group**	○	○	○	○	○	○	○

Thank You

Thank you for taking your time to participate in this study. As a token of appreciation, you have the opportunity to enter a drawing to win one of five gift certificates.

To see the drawing page click here

Enter Prize Drawing

Please provide your e-mail address if you would like to enter the prize drawing to win one of five gift certificates.

Please note that the information you are providing here is being recorded at a separate database and **your e-mail address will not be attached in any way to the anonymous survey you just completed.**

1. please enter your e-mail address below and select "Done" to enter the drawing: