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SUSTAINABILITY INITIATIVES IN THE WORKPLACE AND EMPLOYEE PRODUCTIVITY

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Sustainability in the workplace has the potential to affect many aspects of an organization, including employee productivity. Sustainable designers, such as LEED (Leadership in Energy and Environmental Design) professionals, claim that sustainability has numerous positive impacts in the workplace. These impacts include fewer employee sick days, increased building occupant satisfaction, and increased employee productivity. Researchers that have studied this claim have found that in many cases, sustainable initiatives and buildings have had a slight to profound positive effects on occupant satisfaction, attendance, and productivity. Lower levels of satisfaction for lighting and acoustics are common, though, because many sustainable workplaces use an open floor plan design. Most of the research has focused on the structural aspect of sustainability and indoor environmental quality and its impact on employees. There is little research on how sustainable behavior initiatives in the workplace have affected employee productivity; there is a need for this gap in research to be filled. The existing research, synthesized for this paper, gives evidence that sustainable initiatives often have high return on investment not only in saving operational costs but also in improving employee productivity. Sustainability should not just be used as a tool to increase productivity, however; it is a mindset that must be adapted and incorporated into values and strategic planning. There are several guides and case studies available to give organizations ideas on how to incorporate sustainability,

however, each organization is different. Employees should be involved in sustainability planning and it should relate to the organization's strategic plan and long-term goals.

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CHAPTER 1

INTRODUCTION

An organization's success will depend on how well it maximizes the creative capacity and productivity of its workforce. Much literature goes into detail about the importance of human resources activities such as planning, recruiting, selecting, training and developing, rewards and recognition, evaluating, and creating a positive and safe work environment (Selden & Jacobson, 2007). This last component, creating a positive and safe work environment, specifically in regards to sustainability, is the focus of this paper.

Posed is the question, "What effects can sustainability initiatives in the workplace have on employee productivity?" Much research has been done to demonstrate that workplace productivity is influenced by the work environment itself (Heerwagen & Zagreus, 2005; Paevere & Brown, 2008). In fact, one study determined that one third of sick leave could be attributed to the work environment (building conditions, specifically) alone (Sustainability Victoria & the Kador Group, 2007). Since the cost of labor can be a significant portion of an organization's expenditures, it makes sense to make efforts that will maximize workforce productivity and minimize absences.

One potential way to do so is to incorporate sustainability initiatives in order to not only lessen the negative environmental impact of operations, but also to enhance the atmosphere and wellbeing for the building occupants. There has been a recent societal trend of "going green" by incorporating a variety of sustainable practices. The purposes of this paper are to synthesize research that has demonstrated the effects of a *sustainable workplace as a whole*, summarize research that has documented effects of various *sustainable components*, and based on the

findings, make recommendations on which sustainability initiatives should be incorporated from a *productivity standpoint*.

CHAPTER 2

BACKGROUND

Productivity

In order to assess what effects sustainability initiatives have on productivity, a definition for productivity and a standard for measuring it must be determined. In some literature, "productivity" is used as a broad term for describing how much and how well an organization performs (Bernolak, 1997) but in other literature, "performance" is the chosen term. In "Measuring Performance in Public and Nonprofit Organizations", Poister (2003) defines performance measures as "objective, quantitative indicators of various aspects of the performance of public programs or agencies," (p. 3). Using this understanding of performance, productivity is just one dimension of performance among several others including effectiveness, operating efficiency, service quality, customer satisfaction, and cost-effectiveness (Poister, 2003). At times, productivity is defined narrowly, such as, "output per unit of input," or more broadly, "how much and how well we produce from the resources we use," (Bernolak, 1997). This last definition will be used for this paper and productivity should be understood broadly, synonymous with the term "performance".

Productivity can be affected by a variety of things, such as job satisfaction, building satisfaction, distractions, absences, sickness, focus, stress level, mood, degree of collaboration, loyalty, health, comfort, sense of purpose, and management style. The organization's overall performance is also affected by retention levels, ease of quality recruitment, and the organization's reputation. All of these factors can influence productivity but the extent of influence can be difficult to determine and will vary from organization to organization.

Likewise, measuring productivity in general is difficult, particularly for cognitive tasks (Heerwagen, 2000). Sometimes output can be quantified and measured. Many studies focus on one or two ways of measuring productivity and since many different approaches to measurement are taken, it can be challenging to compare the results. Overall, there is a lack of an effective and standardized way to assess productivity. Productivity assessment is not built into most organizations, is not consistent among them, and does not translate well from one type of work to another (Heerwagen, 2000).

Some researchers do use a plethora of variables in their assessments. For example, Heerwagen (2000) describes measuring success using the following criteria: product quality, customer satisfaction, capacity for innovation, quality of work life, retention, perceived value of goods and services, operational efficiency, and social responsibility. Since studies vary so widely, one versatile method of measurement is employee productivity self-reports. While these reports are not always extremely accurate, they can be compared over time to identify whether individuals in an organization increase or decrease their productivity (Heerwagen, 2000). Productivity measures for this paper will consist of directly quantifiable measures (self-productivity reports, work output, absences, and sickness) and occupant satisfaction, since this is a frequently measured variable that is seen to have strong correlation with productivity, with a brief discussion of how sustainability initiatives produce other effects that have a potential positive effect on productivity.

Sustainability

Since the focus of this paper is how *sustainability* initiatives affect productivity, the understanding of the term and application is important. Sustainability, for some, is an obvious solution to address the world's growing enviro-social problems. For others, it seems to be just a

recent trend to “go green”. By and large however, a more holistic approach to wellbeing and viewing oneself as an integrated part of the larger environment have come to be expected in many areas of life. New sustainability trends and standards have risen in homes, at work, in medicine, in education, and in purchasing habits and other decisions involving use of resources. As society progresses towards sustainability, it is important for public administrators to give careful consideration to incorporating more sustainable practices into their operations and strategic plans. Identifying how sustainability initiatives affect employee productivity will even further help administrators make wise decisions for their organizations.

Navigating how to incorporate sustainability and whether it is cost effective is a challenge for agencies. There is considerable research and projects that can be used for guidance. Environmental or sustainability studies are often published, touting comprehensive sustainable development and design, presenting information regarding occupant satisfaction, increased productivity, and improved health as positive benefits (Heerwagen & Zagreus, 2005; Paevere & Brown, 2008).

Besides just looking at a narrow view of productivity, the decision to make an organization’s physical space or daily operations more sustainable has clear benefits to the environment and a variety of other positive results. Some of the impacts can include increases in the following areas: resale value of the property, savings in operations, quality of the workspace, workforce attraction and retention, quality of life and health for employees, marketability, customer relations, and employee satisfaction (Heerwagen, 2000). It is widely believed in the design community that sustainable building design should improve occupant comfort, satisfaction, health, and performance, all of which, from a human resources management

perspective, are very good for the health and productivity of an organization (Heerwagen & Zagreus, 2005).

Whether sustainable design and initiatives truly do increase employee productivity is an important question. If the answer is yes, then which initiatives, at what cost, and to what extent do they affect productivity? If it is true that sustainable design and modifications can affect overall wellbeing and productivity, it is of great importance for human resource managers to commit to incorporating sustainability into strategic planning, decision making, and operations.

To measure sustainability's effect on productivity, there must be a clear understanding of what exactly is considered sustainable. Definitions of sustainability vary; in fact, almost each organization that engages in sustainable activities has either their own definition of sustainability or a specific mission statement. The US Green Building Council defines green buildings as ones that have significantly reduced or eliminated negative impacts not only on the environment but also on the occupants of the building (Abbaszadeh, Zagreus, Lehrer & Huizenga, 2006). A sustainable workplace can be described as one that takes on social responsibility, ethical responsibility, improving health and safety, and improving the natural environment (Danish Trade Union Movement's Centre for Competence Development, 2004).

As demonstrated by these two examples of sustainability definitions alone, it is evidenced that the definition should include more than just impacts on the ecological environment. Things that are described as sustainable should limit any waste of resources and also limit the negative impacts on society and the physical environment. Sustainable philosophy understands the relationship between the wellbeing of people, animals, and the ecological environment and promotes ways of protecting all interests, as well as financial, in a common action.

Sustainability initiatives are practices that do at least one of the following: limit pollutants either indoors or out, conserve resources, and promote health of people or the larger ecosystem.

Implementation

The above definition for sustainability initiatives is quite broad; therefore, tens of thousands of different practices could be considered "sustainability initiatives". One should not simply utilize any so-called sustainability initiative and expect quality results in terms of impact on productivity. As in any decision, it is important to make a quality investment to get a respectable return. Government studies, green building rating systems, "greening your workplace" guides, and other research provide some guidance on which initiatives are common and/or recommended. It is also recommended to "think outside the box" and find creative ways that fit the organization's needs and unique situation.

The US Green Building Council rating system utilizes five categories: sustainable site, water efficiency, energy and atmosphere, materials and resources, and indoor environmental quality (Abbaszadeh et. al., 2006). These categories give some context for identifying different types of initiatives organizations might incorporate.

The Government Service Administration did a study to determine the seven most effective strategies to reduce negative environmental impacts and lower operation costs. These included: adjust the building temperature in accordance with the seasons, replace HVAC (heating, ventilation, and air conditioning) filters, consolidate printers and copiers, transition from cathode ray tube to LCD (liquid crystal display) monitors, use task lighting, improve access to daylight, and upgrade windows. For the Government Service Administration, these changes would translate to conserving 568.2 million kilowatt hours per year, calculated in 2009.

Additionally, when trialed in some buildings, each of these seven strategies led to improved occupant satisfaction (General Services Administration, 2009).

An assessment of green buildings by Heerwagen (2000) found the following to be common features: advanced ventilation and mechanical systems to increase air flow and reduce airborne microbial agents, low toxicity materials and furnishings, high quality and efficient lighting, increased contact with the natural environment, and HVAC improvements.

In actuality, there is a stark contrast between many guides for "greening" an office and the research that has been done on sustainability initiatives in the workplace. Greening guides, for the most part, refrain from suggestions regarding structural changes like ventilation and lighting, and make suggestions that are more geared toward behavior changes. Many guides suggest various energy conservation methods using behavior changes, waste reduction programs such as recycling and new purchasing policies, and that each office involve their own workforce in brainstorming strategic planning sessions to address potential areas for improvement (Danish Trade Union Movement's Centre for Competence Development, 2004; California Sustainability Alliance, 2012).

While green guides promoting energy conservation, waste reduction, and employee participation are abundant, there is little to no research studying the effects of these types of initiatives on productivity or occupant satisfaction. This is unfortunate because it is very difficult to ascertain, then, how these initiatives might impact productivity. The influences that these types of initiatives do have on employee productivity can only be inferred from other human resources literature that discusses the effects of participation, employers' concern for employees' wellbeing, and sense of purpose. Research that explores how these initiatives impact

employee productivity would provide a more complete picture of sustainability's effect on employee productivity.

CHAPTER 3

OBJECTIVE

The objective of this paper is to provide a synopsis of data that demonstrates the impacts of sustainability on productivity. This is accomplished by first synthesizing research measuring employee productivity changes in a sustainable workplace and second summarizing data that has measured impacts of certain components of sustainability. The other objective of this paper is to provide recommendations for organizations based on the relevant research that would guide organizations in utilizing sustainable initiatives in a way that would be most effective at enhancing employee productivity.

CHAPTER 4

METHODOLOGY

Research was gathered for this paper by conducting a search using a peer-reviewed academic journal database using “performance measures and sustainability in the workplace” and synonymous terms such as “green”, “productivity”, “impacts”, and “environmental”. Studies were chosen that used scientific methods to demonstrate a correlation between some type of sustainable initiative or a sustainable workplace as a whole on employee productivity and satisfaction. Sustainable and productivity were defined as earlier described to filter out whether studies were usable for this analysis. Studies that found positive, negative, and no effects were all included in the search. The studies were then divided into research conducted on a sustainable building as a whole, more of a case study type, and research that explored individual components of sustainability.

Because there were a variety of studies that claimed to measure the impacts of a sustainable workplace on employees but each took a different approach and used different forms of measurement, it was determined that choosing representative studies from each type that included a range of results would be synthesized to provide a general overview of the data available from sustainable workplace case studies. Four studies in particular were chosen because of the quality of the studies and their methods, the data integrity, the representative nature of the findings, and the comparability of the data for effective synthesis.

The data from these studies were converted into common units. One study provided productivity and satisfaction scores on an index while another used a 7 point scale of satisfaction, still another used primarily percentage increases in satisfaction and productivity, and another used both a 7 point scale of satisfaction and percentage increases in satisfaction. The data was

converted to two units, percentage increase, and satisfaction scores on a 7 point scale in order to be most simply synthesized. I then reported the average percentage increase on each of several common variables along with an average satisfaction score and the range.

The other group of research, which included impacts of sustainable components on employees, consisted almost entirely of data on indoor environment quality (IEQ) indicators such as air quality, temperature, and lighting. Much of the existing research conducted on IEQ effects on employee productivity, also include cost benefit data which is included where available. I summarized by type of IEQ component the available research, primarily from studies with the highest citation rates in peer-reviewed scholarly articles.

Summarizing the data from both groups of research helps inform my recommendations for incorporating sustainability into the workplace. Additionally, workplace green guides were used to suggest important steps in the implementation process.

CHAPTER 5

SUSTAINABLE WORKPLACE RESEARCH SYNTHESIS

Various studies have measured the impacts of sustainable workplaces on employee productivity and occupant satisfaction; four of these studies have been selected for a representative research synthesis. These four studies in particular were chosen because of the quality of the studies and their representative natures.

Overview of the Studies

One study measured occupant satisfaction, indoor air quality, employee wellness, and productivity of employees in a newly constructed government office compared to a previous non-green office and also with nation-wide benchmarks (Paevere & Brown, 2008). Another study conducted surveys in over 181 buildings and compared responses of employees in "green" versus "non-green" buildings. The survey reports on differences in satisfaction and perceived productivity between sustainable buildings and non-sustainable buildings; 80% of which are government offices (Abbaszadeh et. al., 2006). The third study conducted a pre-and post-survey of employees that relocated to a sustainably refurbished floor within their very same office building. This study provided quantitative productivity data, sick leave data, and occupant satisfaction (Sustainability Victoria & the Kador Group, 2007). The final study selected for this composite looks at a LEED Platinum building's employee satisfaction. This study represents a population that is more inclined to appreciate sustainability as the organization that inhabits the office space is an environmental conservation agency (Heerwagen & Zagreus, 2005).

Common among these studies is data on overall occupant satisfaction, lighting, acoustics, thermal comfort, air quality, and productivity. Two of the studies reported satisfaction for these variables on a 7 point scale (-3 to +3) and the other two studies reported percentage increases or

decreases in satisfaction and productivity. One study in particular looked at productivity data quantitatively and also tracked changes in sick leave and sick symptoms. Synthesizing this data will provide a representative view of the studies that have documented the impacts of sustainability in the workplace.

Results

Three of the four studies gathered data in a non-sustainable space and also in a sustainable space. For these three, there is a percentage increase or decrease in satisfaction. All four studies reported a satisfaction or productivity score. Two used a percentage satisfaction and two used a satisfaction score on a 7 point (-3 to +3) scale. To compare the data, all scores were converted to the 7 point scale. The results are summarized in Table 1 which reports the average that satisfaction with a particular variable increased when comparing the sustainable space with the non-sustainable space and also the satisfaction score in the sustainable space.

	Average % Increase	Average Satisfaction Score (on a scale from -3 to +3)
Air Quality	30.7%	1.5
Overall Occupant Satisfaction	21.4%	1.9
Thermal Comfort	18.4%	0.7
Lighting	5.5%	1.0
Acoustics	-0.9%	0.2

Table 1: Average Occupant Satisfaction Scores and Percent Increases in Satisfaction in Sustainable Offices

Overall occupant satisfaction increased an average of 21.4% from the non-sustainable workplaces to the sustainable workplaces. Scores ranged from 1.30 to 2.36 with an average of

1.86 on the satisfaction scale. Two of the four studies specifically addressed the correlation between satisfaction and productivity. They found that where satisfaction was high, productivity and perceived productivity were also high. Occupant satisfaction captures the overall impact of the workplace, not just a compilation of the components. In fact, overall building satisfaction is ranked higher than any of the components in many building studies, suggesting the whole is even greater than its parts (Heerwagen & Zagreus, 2005).

When occupant satisfaction is high it can be supposed that productivity might increase as there are less things to inhibit and distract the employee. In fact, the evidence in many studies that ties satisfaction to productivity are the reason satisfaction scores are included in this synthesis. While one cannot assume that lighting, thermal, acoustic, and air quality satisfaction scores will translate directly equivalent increases in productivity, it is very possible that they will have a real and noticeable impact.

Air quality satisfaction increased by 30.7% in sustainable buildings. The average satisfaction score for air quality was 1.5 with a range from 1.1 to 2.1.

Thermal comfort increased by an average of 18.4% in three of the studies. The overall average score for comfort was 0.7 with a low score of .36 and a high of 1.32. These studies demonstrate that air quality and thermal quality are significantly improved by incorporating sustainable design and, specifically, sustainable HVAC systems.

Satisfaction with lighting in the sustainable workplace decreased in one study and increased in two others with an average increase of 9.6%. The average score for lighting satisfaction was 1.01 with a high of 1.76 and a low score of 0.7.

One of the studies did not measure acoustics so the percentage increases and satisfaction scores are based on two studies and three studies respectively. In the two studies, the satisfaction

with acoustics decreased in the sustainable space, by an average of .9%. The satisfaction scores ranged from -0.3 to 0.6 with an average of 0.2. In many of the buildings included in the studies, open floor plans were incorporated which attributes to much of the dissatisfaction with acoustics.

Two of the studies also measured impacts of the building on sickness. In one of the studies, building related negative health symptoms decreased by 1.9% in the sustainable workplace. In another study, symptoms decreased by 15.8% and sick leave decreased by 39%. The stark contrast between the results in the two studies demonstrates that dramatic differences cannot always be suspected. It would be helpful to gather more reliable data to determine what kind of effects on sickness and absences we should expect from a sustainable work environment as a whole.

Each study measured productivity in a different way so it is hard to compile the data into an average statistic. In one study, 36% more employees said the workplace had a positive or neutral effect on their productivity in the sustainable office than in their prior office. In this study, the perceived productivity gains, using Building Use Study benchmarks, were calculated to likely be 10.0%. Another study found simply that satisfaction in any variable directly correlated with perceived productivity gains. One study measured both perceived productivity gains and obtained actual productivity measures. In this study, perceived productivity gains were 0.0% for one group but their quantified productivity measures demonstrated an 8% increase in productivity. Another group in the same study perceived their productivity gains to be 12% however no quantifiable productivity data was collected. All studies demonstrate some type of productivity gains whether that be perceived or actually measured. The evidence is strongest that sustainable workplaces will have increases in air quality, occupant satisfaction, thermal comfort, and productivity.

CHAPTER 6

SUSTAINABLE COMPONENTS RESEARCH SUMMARY

The previous studies demonstrate the effects on productivity when an entire workspace is outfitted sustainably. It is also important to look at individual sustainability initiatives (or components) and their impacts on productivity. Research studying the correlation between indoor environmental quality (IEQ) and employee productivity is the most abundant; other components of sustainability are less documented. Indoor environment quality includes temperature, lighting, ventilation, and pollutant density.

Temperature is most often cited by employees as a cause of discomfort in the workplace (Sustainability Victoria & the Kador Group, 2007). In fact, giving employees the ability to adjust the temperature in their personal space just ±3 degrees Celsius can increase productivity by 3-7% depending on the task being performed (Fisk & Rosenfeld, 1998). Heerwagen (2000) also found strong relationships between temperature and productivity. Perceived productivity increases and the number of absences decreases when occupants are provided control over the climate and access to natural ventilation (windows). It is important to recognize, however, that thermal comfort does not always lead to the highest level of productivity. Slightly cool temperatures can increase performance on most tasks and slightly warm temperatures are most conducive to problem-solving and creative thinking tasks (Heerwagen, 2000). Another study found that temperatures higher than 25.4ºC (77.7ºF) decreased productivity (Federspiel, Liu, Lahiff, Faulkner, Dibartolomeo, Fisk, & Sullivan, 2002).

Appropriate levels of lighting can improve productivity by 0.5%-5%, which translates to $12-$125 billion in overall savings for offices in the United States, according to a study done in 1998 (Fisk & Rosenfeld).

Poor indoor air quality can have a range effects on employees' health and symptoms they experience and, therefore, productivity. Many studies on air quality gauge these symptoms and corresponding health impacts and call them "sick building syndrome" symptoms. Sick building syndrome (SBS) is the term used to describe negative effects that a building can have on its occupants' health. Symptoms associated with SBS include headache, lethargy, nausea, dizziness, lack of concentration, irritability, and irritation of eyes, throat, nose and skin. Symptom type and severity vary from individual to individual in the workplace and are not usually easy to link to a specific source or cause (Heerwagen, 2000). Sick building syndrome symptoms are a pervasive problem; they are experienced by 23% of United States office workers and teachers (Fisk, 2000).

Improving the indoor environment quality would decrease SBS symptoms thereby making it easier for employees to work more productively. Nunes, Menzies, Tamblyn, Boehm, and Letz found that those experiencing SBS symptoms worked 7.2% slower and made 30% more errors (1993). Another rather well known single-blind study measured participants' task performance when an old carpet containing dust, mold, and other pollutants was and was not present. Performance was 6.5% better when the carpet was absent (Wargocki, Wyon, Baik, Clausen & Fanger, 1999). These results demonstrate the importance of "clean" and "fresh" air for employee health and productivity.

The annual cost of SBS for the United States was estimated to be $60 billion per year. Research suggests that symptoms could be reduced by 20%-50%, resulting in $10-$30 billion in savings (Fisk and Rosenfeld, 1998). In 1998, Fisk and Rosenfeld evaluated studies on respiratory disease, asthma and allergies, and SBS symptoms to predict a potential amount of savings if corrections were made to increase the IEQ. Fisk and Rosenfeld predicted percentage ranges that represent a practical level of improvement and translated that to cost savings. With a potential

10%-30% reduction in respiratory disease symptoms, savings would amount to $6-$19 billion for the United States workforce in 1998 (the savings include productivity and absence losses, as well as healthcare costs to the employer). A 10%-30% reduction in allergy and asthma symptoms is possible with a resulting savings of $1-$4 billion. Fisk and Rosenfeld concluded that 20%-50% reduction in SBS symptoms is practical, resulting in savings from $10-$20 billion (1998).

Ventilation itself, as a separate component of air quality, also has documented effects on employee productivity and well-being. One rigorous study found that illness with fever incidence was 50% higher in a building that used recirculated air, not fresh. It also suggests that doubling ventilation rates increases overall performance by 1.9%. Furthermore, the absence rate was 35% lower for high-ventilation buildings (Fisk, 2000). One hundred percent fresh air ventilation was found to increase performance in another study by the results were not found to be statistically significant (Federspiel et al., 2002).

Fisk analyzed available research to calculate a benefit to cost ratio for increased ventilation and better filtration, since these two things largely affect the IEQ (2000). The cost of the structural improvements was compared against expected gains in productivity. Increased ventilation was found to have a benefit to cost ratio of 14:1. Better filtration was found to have a benefit cost ratio of 8:1 (Fisk, 2000).

Also of note, Montgomery, Heubach, Weimer, & Heerwagen found that an upgrade in the HVAC system, acoustics, layout, and aesthetics decreased turnover by 60% and reduced absences from 96 hours/person to 45 hours/person per year (1994). This study combines multiple components however the impacts are clearly high. Overall, evidence is in overwhelming support of the positive impacts better IEQ has on employee productivity, health, and attendance. While it

is true that some data does not demonstrate a strong increase in any of those areas, most of the data does support a moderate to strong increase in at least one of the three.

CHAPTER 7

RECOMMENDATIONS

From both the case studies and the collection of research that has tied a variety of variables and symptom expression to productivity, we see that potential gains are quite possible.

Occupant satisfaction had the highest increase in satisfaction compared to any of the other variables which demonstrates that it might be a combination of all of the sustainable components that makes the broadest impact on an employee. Productivity and occupant satisfaction were correlated in each of the studies that measured both.

Noticeable increases were made in other areas of IEQ, specifically air quality and thermal comfort, however, the tie between IEQ improvement and sustainability is not always a direct one. From the earlier discussion of sustainability, it can be argued that any improvement made to the HVAC system changes can be considered "sustainable" since it would improve the IEQ for the occupants. However, some improvements to the HVAC system could be less sustainable if they use more energy, for example, or use extensive resources. The ideal sustainable HVAC solutions would increase the indoor environmental quality, be minimal in terms of resource use, and consume energy more efficiently. It is clear that overall occupant satisfaction is tied to sustainability, not just a quality HVAC system alone, so keeping sustainability in mind is important for the most optimal results on employee satisfaction and therefore productivity.

Air quality satisfaction scores were the highest in the research synthesis and both groups of research demonstrate real impacts that increased air quality has on employee health and productivity. Air quality should be a priority for offices that aim to incorporate sustainability, especially during new construction and renovation when it is easier to make HVAC and window placement decisions. Air quality is also influenced by the presence of pollutants and toxic

materials that can come from sealants, paints, furnishings, and equipment. Sustainable options are available in each of those categories.

Since thermal comfort has been documented to be one of the most prevalent causes of discomfort for employees, it becomes a matter of high importance as well. Thermal comfort can be increased by sustainable updates, as well, as documented in both groups of research. The most effective way to make thermal changes is to, to a certain degree, give employees individual temperature control options, adjust temperature ranges by the season (i.e. colder in the winter and warmer in the summer), and for energy efficiency and productivity's sake, do not allow temperatures to rise above 77.7ºF.

Sustainable lighting techniques have been shown to sometimes enhance and sometimes detract from satisfaction and productivity. Issues typically arise from attempts to limit the amount of light generated by electricity. Sustainable designers often aim to provide access to views and daylight and provide dimmer overall lighting with the option of task lighting for employees. Without proper planning and proper training so that employees know exactly how to use shades and task lighting to meet their needs, sustainable lighting techniques can detract from productivity. However, simply changing low-efficiency lighting to high-efficiency lighting will always be one way to enhance sustainability without risking employee comfort or productivity.

Acoustics in sustainable offices have also shown to cause issues with productivity and satisfaction. The problems typically arise from the fact that open floor plans are often utilized in sustainably designed offices. Open floor plans are highly debated in office best-practice conversations. The benefits are that less materials are needed to build interior walls and duct work, there is greater access to daylight and window views, there is more ventilation, and open floor plans enable greater communication and interaction among coworkers. The disadvantages

are lack of personal temperature and air flow control, lack of privacy, distractions from noises and other conversations, high rates of interruptions, and confined personal space.

The potential productivity gains from access to daylight and window views and higher levels of collaboration can be minimized by the acoustic disadvantages. Some literature argues that the productivity still increases despite the interruptions and noise levels but in most occupant surveys employees will report dissatisfaction with the noise levels and distractions (Heerwagen, 2000). It is best for each organization to seriously consider the pros and cons of an open floor plan and decide whether privacy and focus are more important or if collaboration and access are going to spur on higher quality and more efficient work. Perhaps there could be an open floor plan for a few units or a few employees that need to collaborate but there could be walls to separate others and ample space provided that is private for phone calls, meetings, or simply private work space. Ultimately the organization must determine which is most advantageous.

Overall evidence in support of sustainable initiatives' effects on productivity gains is substantial. Productivity increases have been found to range from 0.5-5% attributed to ventilation only, to more common overall productivity increases around the 8-10% range, to even higher increases and dramatic reductions in sick leave and turnover. The longevity of the gains has not been assessed, but one can infer that as long as the sustainable initiative still meets its intended purpose, the gain would remain relatively steady. Granted, there is a placebo effect with any change to an office, the newness may alter productivity, but the effects are seen even in isolated blind studies so one can assume that a conservative 8% increase in productivity is not at all unreasonable.

Additional Benefits

Numerous other benefits beyond the scope of occupant satisfaction, employee productivity, and reduced sick leave can be attributed to sustainable workplaces. While the focus of this paper is specifically on how sustainability initiatives affect employee productivity, it is beneficial to have a very basic understanding of the other benefits of sustainability. Research has found that daylight and contact with nature is associated with positive moods, stress reduction, and increased job satisfaction (Heerwagen, 2000). As demonstrated in the LEED Platinum building case study, employees take pride in their workplace when their employers make commitments to sustainability and the wellbeing of their employees (Heerwagen & Zagreus, 2005). The study also recognized the importance of values to wellbeing and job satisfaction. Additionally, employees respond and work better when they know their employer is taking care of them and allowing them to participate in something greater than themselves.

Heerwagen breaks down the benefits of sustainable workplaces into four categories of organizational performance (2000). Financial benefits include reduced resource consumption, reduced operation costs, reduced risks, increased overall productivity, increased resale value of property, and reduced absenteeism. Business process outcomes include process innovation and increased work process efficiency. Stakeholder relations are improved through public image, increased marketability, community outreach and education, and ability to work with community stakeholders. Human resource benefits include quality of work life, personal productivity, wellbeing, reduced turnover, and increased ability to recruit high quality workers (Heerwagen, 2000, p. 6).

Similar financial and public image benefits are mentioned by the Danish Trade Union Movement's Centre for Competence Development, in addition to an investment in human capital (2004). Heerwagen also mentions reduced legal and insurance costs and reduced regulatory

inspection load are associated with sustainable design (2000). Even the UNEP (United Nations Environment Programme) Finance Initiative states that it makes financial sense to add environmental, social, and governance issues into the portfolio (2006). One of the studies included in the research synthesis reported that the 10% increase in productivity lead to over $2 million in savings a year. In one of the others, sick leave costs were reduced by 44% and energy savings amounted to $15,000/year. The financial incentives are abundant and well-documented in other research.

CHAPTER 8

GUIDE FOR ORGANIZATIONS

If an organization does indeed decide to incorporate sustainability, there are certain steps it should take in order to do so most effectively. Granted, each organization has a different product, budget, built environment, and style of management and will therefore have its own unique way of incorporating sustainability. There are, however, some guidelines and recommendations that are helpful in any organization's pursuit of sustainability.

Integrated System

One of the most important considerations when incorporating sustainability into a workplace is to do so in a genuine and integrated fashion. Sustainability should not be a perk or a program but a commitment and a value. Fisk suggests a paradigm shift where instead of seeking to provide an adequate work environment, an organization and its leadership should look to provide and sustain an excellent environment that maximizes health, satisfaction, and performance (2000). Valuing sustainability includes recognizing the importance to limit negative impacts to the "three P's", people, planet, and profit, and committing to gaining knowledge and taking action. If sustainability is viewed only as a tool to increase productivity, it will be less effective at reaching that goal. Sustainability should be an integrated system; the organization should create a comprehensive plan that identifies current conditions and sets goals and action plans that correspond with the organization's strategic plan, understanding the impact this commitment will have on the budget, the workers, and many other components of the organization (Heerwagen, 2000).

Also, employees need to understand the reason an organization is committing to sustainability so that they can participate and support it. An organization should not do structural

sustainability changes without informing the members of the changes and how to properly occupy the space. Heerwagen describes this as “green” versus “gray”. For example the building might be “green” but the people will be “gray” if they are uninformed and lack commitment to the ideals. The organization might be “gray” as well if it incorporates sustainability initiatives but does not embrace a sustainable mindset (2000).

People must be involved in sustainability planning. In almost any guide describing how to “green your workplace”, a crucial component is involving the employees in the process of assessing and planning. “Involvement is not just a means. It is also a core value of the sustainability concept that people have the right to have influence on their own working lives,” (Danish Trade Union Movement’s Centre for Competence Development, 2004, p. 15). Additionally, employees will take ownership in the organization when they are allowed to participate in sustainability planning. This also develops innovation and teamwork. It is vital, though, that the leadership commits itself to sustainability and does not view sustainability as simply a means to an end. Employees will be able to tell if the employer is genuinely interested in and committed to their wellbeing or if the employer is just trying to increase profit. People see through shallow attempts but respond very positively to employers making real investments in their employees, their wellbeing, and the environment.

Steps to Pursue

Again, an agency’s sustainability initiatives should be well-planned and comprehensive. Many guides already exist that describe the process of assessment and action planning. So first, an organization must make a commitment. If it is a small commitment and a gradual easing into sustainability, that is fine, as long as it is intentional.

An organization should look at their consumption. After assessing water use, electricity use, purchasing impacts, waste stream, and maintenance habits, certain areas should clearly stick out as wasteful or having the potential for improvement. Goals and plans should be made to address those areas. The California Sustainability Alliance has a very helpful guide that goes through the entire planning process and identifies in section five a great list for particular initiatives in each of the aforementioned areas (2000).

Additionally, the organization should assess the health and wellbeing of the employees and identify any sources of distraction or poor IEQ. It was clearly evidenced in literature that ventilation and filtration and climate control can have large impacts on employee satisfaction, health, and productivity. Updates and changes to the HVAC system should be made, if necessary, as soon as possible but should include energy-saving methods and use materials that are renewable or pollutant-free, when possible. Changes to lighting are also advantageous but can be risky if not planned out to be exactly what the workers need.

Whenever a building is being renovated, built, maintained, or refurnished, the organization should take into consideration using paints, sealants, and other products that make a healthier indoor environment. Energy and water-saving components should always be chosen over more wasteful ones. Ventilation systems, access to windows, and personal temperature controls will likely enhance occupant health and satisfaction. Furthermore, the architect or contractor will be able to point out potential areas to make the building more sustainable.

It is also important to remember to provide access to daylight and nature, as they have positive effects on employees. The open floor plan helps with this as well as limiting interior walls and other resources that are required for building full-fledged individual offices. However, we have seen that caution must be given because the acoustical problems can be quite a

distraction for employees and negatively affect satisfaction and productivity. Each organization must consider their needs and determine to what degree an open floor plan might be beneficial.

Finally, it is important to track the sustainability initiatives and constantly assess whether they are meeting the specified objectives. There will be some trial and error which is to be expected as long as adjustments are made as needed. All employees should be given the opportunity to contribute in planning and all should be informed and trained on how to benefit from and use the workspace they inhabit.

Many organizations make the mistake of making decisions based purely on upfront cost. It is easy to focus on cost because it is easy to document compared to productivity gains and savings. Productivity, satisfaction, and health outcomes are not always immediately apparent and are often not tracked or incorporated into financial decisions (Heerwagen, 2000). Organizations should look more holistically than upfront cost and bottom line and realize that with each sustainability investment, payback comes in a variety of forms, not just in operation cost reduction. The research summarized above, however, has demonstrated that real financial gain should be expected from an investment in sustainability.

CHAPTER 9

CONCLUSION

Sustainable initiatives do provide occupant satisfaction, health, and productivity improvements in most of the available research. There are a variety of different types of initiatives that workplaces can incorporate ranging from HVAC improvements to recycling programs. Research thus far has focused on sustainable workplaces as a whole or specifically on the effects of IEQ on productivity. More research should be done to document effects that non-IEQ-related sustainability initiatives have on employee productivity and wellbeing.

Sustainability initiatives are shown to enhance productivity directly through quantifiable output and quality measures. Additionally, absenteeism decreases, ill symptoms decrease, and presenteeism decreases in most cases. Other more indirect impacts to productivity are abundant, such as increased satisfaction, increased focus, increased communication, and sense of purpose.

With this evidence, organizations may be tempted to adopt sustainability purely as a means to increase production, however, a commitment to sustainability in the workplace should be more than a structural change or lip-service. Genuine commitment to sustainability will allow employees to embrace sustainability and it will serve to holistically improve the workplace through pride, security, teamwork, innovation, and shared purpose. Sustainability initiatives do result in productivity gains but if profit is the sole motivator, not a genuine interest and value in sustainability, the outcomes will be less than what they potentially could have been. Investments in sustainability make sense for organizations not only financially, but also because of the human capital gains and for protection of the environment.

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