The Delusion of Green Certification: the case of New Zealand
Green office buildings

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ABSTRACT

This paper examines the resultant consequence of Green certification of office buildings in the construction industry. With focus on Auckland city, New Zealand, it analyses various aspects of the modern Green office building through the review of available literature. Firstly, it investigates the recent shift in motivation for Green buildings as a result of the crusade for Green office buildings. This is followed by an analysis on the change in office buildings’ façade and indoor environment control measures in the 21st century. It is shown that the motivation for Green buildings has shifted from it being the right thing to do to the quest for financial benefits that are attributed to Green buildings. It is also shown that office buildings have become extensively glazed and highly dependent on artificial air conditioning systems. The consequences of these features are shown to be significant mainly in terms of the inefficient use of energy and indoor environment control dilemma. The effect on occupant comfort and expectations are also illustrated. This review is part of a research that investigates Green certified office buildings in New Zealand.

KEYWORDS: Green office buildings, Glazing, Green certification, Glass Architecture, Air conditioning.

INTRODUCTION

Sustainable architecture refers to a design approach which produces technologically, materially, ecologically and environmentally stable buildings (Attmann, 2010) and indoor spaces that are conducive for their occupants. According to the author, Green architecture is an umbrella term which involves a combination of values and seeks to reduce the negative environmental impact of buildings by increasing efficiency and moderation in the utilisation of building materials, energy, and development space. Green thus requires a balance between sustainability, ecology and performance (Attmann, 2010) of which Green architecture aims to achieve. The product of this balance is a Green building (Figure 1). Yudelson (2007) grouped the characteristics of Green buildings into five broad areas: Sustainable site planning, Safeguarding water and water efficiency, Energy efficiency and renewable energy, Conservation of materials and resources, and Indoor environmental quality (IEQ).
21st century Green architecture tends to apply generalised benchmarks that govern Green rating systems across the world. With only slight variations, Green rating tools are applied for different geographical regions with diverse local characteristics. For instance, the NZ Green rating tool is based on the Australian Green rating tools which draw its benchmarks from LEED and subsequently the BRE Environmental Assessment Method (BREEAM) (GBCA, 2009). As pointed out by Cichy (2012), their point-awarding systems are similar to each other. The difference is in the importance given to the credit points in specific categories (NZGBC, 2009). There is even a suggestion/proposal for a common rating system for Green buildings across the globe (Reed et al., 2009). In fact, three of the most common rating tools (BREEAM, LEED and Green Star, Australia (AU)) are seeking to develop common metrics that will help international stakeholders compare buildings in different cities (Kennett, 2009). As a result, there is greater similarity between the rating tools, leading to a trend towards common concepts and technologies across the globe. This is the case of Green office buildings as discussed in this paper.

THE QUEST FOR GREEN CERTIFIED OFFICE BUILDINGS

As argued by Onyeizu (2014), recent corporate goals of pursuing sustainability through productivity have played a significant role in the growth of Green commercial buildings (von Paumgarten, 2003; Henley, 2013; Yudelson, 2008). The promise of increasing productivity and/or long term running cost savings that will offset the initial construction cost has lured many organisations to invest in Green buildings. As noted by von Paumgarten (2003), owners and operators have begun to see Green buildings as a financial business strategy. A real estate survey shows that the market is now attaching substantial monetary value to Green buildings (Fuerst & McAllister, 2008). A report by McGraw-Hill shows that the overall operation costs of a Green building in comparison to a conventional one is said to be lower 8–9% lower (Nelson et al, 2010). Yudelson (2008) stated that projects which are not certified by a national third-party rating system, e.g. Green rating tools, will be functionally outdated the
day they are completed and very likely underperform in the market as time passes. The Property Council of New Zealand released a recent report claiming that Green Star certified buildings deliver an 8.9% return on investment against 6.4% in non-certified buildings (Tunstall, 2012). A real estate specialist Charles Lockwool (2006) pointed out that trillions of dollars of commercial property around the world would soon drop in value because Green buildings are going mainstream and would render those properties less desirable.

Such claims have spurred the growth of Green buildings in the real estate market. Motivation towards building Green has now changed from being the ‘right thing to do environmentally’ to ‘claimed financial benefits’ (Figure 4) (McGraw-Hill, 2012 cited by Henley, 2013).

According to LaSalle (2011a), the main reasons companies pursue sustainability strategies (which can earn them credits from the Green building rating systems) are to significantly increase employee health/productivity. The authors noted that CRE executives may well be pursuing Green strategies that can enhance employee productivity in the workplace. Moreover, a study by Kats (2003) of 33 Green buildings in the USA showed that a change in present value benefits of $37– $55/sq ft were achieved as a result of productivity gains.

Developers also play a significant role in the shift in motivation for Green buildings. For example, Boston Properties’ Bryan J. Koop (n.d.) stated that he had learned from research that Green buildings actually improve the productivity of the people working within them. According to the senior Vice President and regional manager of this Real Estate investment

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**Figure 4: The recent shift in motivation for building Green.** Lower operating costs include savings due to increased productivity. Source: McGraw-Hill. The business Case for Green buildings (Hensley, 2013).
trust, the IEQ of a Green building which is better than a traditional building can translate into a worker productivity increase of up to 18% (Koop, n.d.). Nelson (2008), the Vice President of RREEF Research, noted that the features of a Green building put together can increase worker productivity. The author also emphasised that the business case of Green buildings have become more compelling as the returns are becoming ever-more favourable, particularly when productivity gains are considered. Smith (2007) of Pramerica Real Estate Investors (2007) stated that the features which are typically incorporated into new Green office buildings to ensure a healthy indoor environment can generate significant gains in worker productivity. Perhaps most enticing is the idea by Kats (2003), which measures that generated productivity gains of around 1% would be equivalent to reducing property costs by 10%, which translates into about $3.00 per square foot of space. According to Nelson (2007), enlightened tenants should be motivated to pay a premium for space yielding tangible productivity gains, regardless of their energy-saving and other environmental benefits. Nelson (2007) concluded that Green buildings are fundamentally altering Real Estate market dynamics – the nature of the product demanded by tenants, constructed by developers, required by government and favoured by capital providers.

These results can be used by developers as a marketing tool to sell Green certified buildings. They also make Green certified buildings attractive to companies/organisations in their quest to increase their employees’ productivity and the potential benefits associated with increased productivity. For example, Eichholtz et al. (2009) observed that firms in the oil industry and legal and financial services are major consumers of Green office spaces and support the notion of productivity benefits from Green buildings.

This change in motivation for Green buildings can be associated with the importance of the office worker (who is also the building occupant) to the success of any organisation. This draws attention to the impact of the workplace environment (i.e. IEQ) on their productivity and how this environment can be enhanced to have a positive influence on their productivity. As noted by Vischer (2008), “employers are increasingly concerned that their employees invest their energy in work rather than in coping with adverse or uncomfortable workspace conditions”. Since a performing workplace is designed to optimise worker productivity (Clement-Groome, 2000), many organisations have invested a substantial amount of resources to ensure that workers are provided with the required IEQ that will encourage greater productivity. Green buildings are thus marketed with the expectation that there will be improved organisational productivity as a result of improved IEQ (Charles et al, 2004).

Some organisations which occupy these Green buildings have testified to this benefit by publishing survey results that show an increase in worker productivity. For example, a report by the New Zealand Green Building Council noted an 11.5% increase in staff productivity from a post occupancy study carried out on a certified Green building (NZGBC: Publications, 2010). A study reported by Gabe, Greenaway and Morgan (2007) concluded that there is potential for sustainable Green buildings to increase employee productivity. However, there are other findings that seem to suggest otherwise. For instance, a report by Building Quality of Life (2009) noted that the so-called ‘Green buildings’ introduce unwanted levels of
complication that baffle and overwhelm employees. They were of the opinion that the science of ‘efficient design’ to help make our buildings Greener has often failed occupants and do not take their true needs into account. McCunn and Gifford (2012) observed that Green design in office buildings does not have a positive effect on employee engagement or on environmental attitudes and behaviour.

THE GREEN OFFICE BUILDING

A Green certified building can be defined as one that achieves a given minimum amount of credits under a certain rating system. It is implied that the design of such a building is supposedly Green and that ‘Greenness’ is intrinsic in the very shape, envelope and style of the building. Heerwagen (2000) pointed out that Green accreditation results in a building where certain values of IEQ are achieved; thereby creating comfort conditions which induce higher worker productivity. Improving occupant productivity at a minimal cost is always welcomed in the business world. As such, marketing Green office buildings as the best environment to ensure greater worker productivity has been a major driver in the demand for Green certified office buildings. As a result of the purported benefit of greater productivity returns and more (Fullbrook et al. 2006), Green certified buildings have succeeded in attracting higher market values (Henley, 2010). For example, a study by Jones Lang LaSalle and CoreNet Global in 2010 showed that 48% of Corporate Real Estate (CRE) executives would pay up to 10% more rent to occupy a sustainable (Green) building (LaSalle, 2011a).

To provide this comfortable IEQ, Green buildings are expected to provide sufficient light for visual activities by daylighting to reduce the need for electric lighting while avoiding visual discomfort such as glare. They are also required to provide a suitable temperature for activities with good environmental control and to avoid thermal discomfort. Furthermore, a Green office environment should have good acoustics to enable easy communication and appropriate soundscape while reducing possible unwanted noise (distraction, disturbance). It is also expected to provide appropriate air quality, free from odours and contaminants. All of these should be achieved with minimal energy use (zero carbon footprint)\(^1\). These requirements are explained further in Yudelson (2007). When all these have been achieved, it is then claimed that they have created a comfortable work environment which will inevitably enhance the workers’ productivity while being energy efficient. But to what extent is this theory a reality?

Balancing the need to create a comfortable IEQ for occupant comfort with ensuring energy efficiency seems to be the dilemma of 21st century Green office buildings. Since stakeholders are more concerned with financial gains rather than environmental gains, more attention is given to achieve an IEQ wherein occupants should be comfortable with the assumption that this will make them more productive. As a result, the sustainability and ecological responsibilities of Green architecture are downplayed as more importance has been placed on providing a comfortable working environment for the occupants.

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\(^1\) These requirements are explained further in Yudelson (2007).

The efficient use of energy in operating a building is a major determinant of a building’s level of Greenness (Attmann, 2010). Hence, a building which does not use minimal energy throughout its lifespan may not be regarded as Green. But in the case of some Green rated buildings, the predicted energy savings are not realised. For example, during the design to renovate an Auckland office building to 5 Star Green rating, its estimated energy consumption of 170kW/sqm/yr before renovation (Wendy, 2011) increased to an energy consumption (recorded during occupancy) of 249kW/sqm/yr; an increase of 45%. Bordass (2001) pointed out that carbon dioxide emissions from supposedly Green buildings are commonly two or even three times as much as predicted.

The energy consumption problems of Green certified buildings may be due to the fact that most certification is carried out on building designs, thus on expected not actual performance of these buildings. This is the case with the New Zealand rating system, where there is no requirement to monitor the performance of buildings in-use. Indeed, it could be said that there are no Green buildings in NZ, only Green designs. Irrespective of the predicted performance of building designs, most Green certified buildings have been observed to perform below expectation, especially in terms of energy efficiency (Leaman, Thomas & Vandenberg, 2007). The authors noted that Green buildings place too much emphasis on good intentions at the design stage, rather than the practical reality of their management and use only to find that energy consumption estimates at the design stage are grossly exceeded in reality. Roaf et al, (2009) noted that current Green rating systems do not focus on a building’s energy performance improvement to the extent that has been claimed. They point out that a sustainability assessment which does not focus on real energy efficiency could be misleading. Leaman and Bordass (2007) renamed such buildings ‘Green Intent’ buildings.

A study of occupants in a proven energy efficient building in Melbourne showed that despite its design being consistent with what is considered good practice from a sustainability perspective, the occupants were not satisfied with the noise and lighting levels in the building (Paevere & Brown, 2008). An occupancy survey of a Green certified building in Auckland showed a 10.5% increase in satisfaction after renovation attributed to the Green IEQ of the building; while the actual energy consumption recorded a 46% increase in the estimated consumption (Wendy, 2011). After a survey of sustainability and comfort issues for multi-glazed windows, Menzies and Wherett (2005) concluded that their findings do not support the hypothesis that environmental sustainability necessarily leads to improved comfort and productivity. According to the prevailing view, Green buildings should be environmentally sustainable and comfortable for occupants, but practical evidence refutes this.

The reason for this may be found in the standards and criteria set for comfort in Green buildings (IEQ criteria of Green rating tools). As explained by Onyeizu (2014), the standards of IEQ as laid out in Green rating tools neither capture nor consider in totality the varying environmental requirements and expectations of occupants. They are also not flexible enough to accommodate such variations. Cole (2003) pointed out that buildings designed with excellent Green performance standards can be severely compromised because the
specifications and technical performance fail to adequately account for the users’ needs, expectations and behaviour.

Another reason could be the techniques by which comfort and environmental sustainability are achieved in these buildings. Energy efficiency is better achieved with passive environmental control systems (Drake et al., 2010). This system of control assumes that human beings are able to adapt to a reasonably wide range of temperatures and can modify the environment to suit their comfort preference (Brager & deDear, 1998; Tiwari et al, 2010; Tuohy et al, 2010). On the other hand, comfort is highly dependent on the expectations and perceptions of occupants, who are influenced by popular trends. As noted by Vischer (2008), the modern occupant’s expectations and perception is said to be dominated by trends and technology. This has resulted in a preference for certain IEQ criteria that cannot be achieved by passive means. Instead, they require the extensive use of mechanical systems (e.g. HAVC) to meet these expectations – a shift away from passive control systems. Thus, there is this conflict between satisfying occupants’ expectations and being environmentally sustainable (Figure 5).

Figure 5: An illustration of indoor environment control dilemma in Green buildings. Energy efficiency and adaptable comfort on the right hand side; monotonous environment and low energy efficiency on the left hand side. Source: Author.

However, historical studies indicate that human beings are adaptable to wider environmental conditions than those that have become specified (Kwok, 2000; Nicol & Humphreys, 2002). In other words, it might be possible that comfort can be achieved in passive environments. For example, Moujalled et al., (2005) observed that occupants in free running (passive) buildings are comfortable in a wider range of conditions than those recommended. The occupant satisfaction survey carried out in the Green certified, naturally-ventilated building by Onyeizu (2014) showed high satisfaction with the environmental conditions in this

building. An indication that, in New Zealand, passive buildings are potentially sophisticated enough to provide comfortable IEQ conditions and also be environmentally sustainable.

One way of achieving greater occupant comfort with passive control system is by giving the occupants more control over the IEQ in their local environment. This way, they are responsible for changing their behaviour (and expectations) in buildings. Leaman and Bordass (1999) noted that people who have greater control over their indoor environment are more tolerant of wider ranges of temperature. As argued by Brager and de Dear (2003), quality of life is inherently improved in environments that are enriched by a more variable sensory palette of thermal and other experiential qualities. Furthermore, the option for people to react to a specific thermal situation (as offered by passive control systems) reflects the opportunities to adapt to their environment and the possibility of achieving good levels of comfort (Drake et al., 2010). The level of comfort provided in a passively controlled environment should be tailored to satisfy the comfort needs of each occupant.

**COMMON FEATURES OF THE GREEN CERTIFIED OFFICE BUILDING**

The level of interest in the Green rating system is high as many organisations hope that having a Green rated building will give them more productive employees and subsequently bring in more return on this investment (von Paumgartten, 2003; Henley, 2013; Yudelson, 2008). Kats (2003) suggest that if Green design measures can increase productivity by 1%, this would, over time, have a fiscal impact roughly equal to reducing property costs by 10%. Charles et al. (2004) noted that Green buildings are often marketed with the expectation that there will be improved organisational productivity due to an improved indoor environment.

But then, a closer look into the characteristics of Green certified buildings shows that these office buildings are mostly extensively glazed and air-conditioned. Out of 5 buildings with 5 star Green rating located in Auckland, New Zealand (Table 1) only one is naturally ventilated and it has 50% glazing. According to Kwok and Rajkovich (2010), it is important that we begin to future-proof our buildings with adaptive opportunities for passive, low energy buildings in response to the unprecedented climatic variability presented to us by climate change. The effects of these features were illustrated in Onyeizu (2014). Further discussion on these features is presented in the section below.

**Table 1: Characteristics of five (5) Green Star certified office buildings in Auckland city, New Zealand.**

<table>
<thead>
<tr>
<th>Source NZGBC: (2013a)</th>
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<tbody>
<tr>
<td><strong>5 STAR GREEN CERTIFIED BUILDINGS</strong></td>
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<tr>
<td>1. 21 Queen Street, Auckland</td>
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<tr>
<td>2. 80 Queen Street, Auckland</td>
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<tr>
<td>3. 150–154 Karangahape Road, Auckland</td>
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Glass architecture

Glass architecture (the style of fully glazing building facades) has become very popular as the art of glazing seem to have become an integral part of a Green building. As observed by Byrd (2012), a common characteristic of many Green office buildings is a high proportion of glazing. From tropical Bangkok to warm and sunny Dubai and from continental Toronto to temperate London, highly glazed facades are the vanguard of Green office buildings. Accredited Green buildings in New Zealand often have facades which are more than 80% glazed (Byrd, 2010). Popular Green certified buildings such as 21 Queen Street and 80 Queen Street both located in Auckland are all glass buildings (NZGBC: Case Studies, 2013). The Bullitt Center, commonly known as the Greenest commercial building in United States of America, is mostly a glass building (Wilson, 2013). According to Wilson, some of the world’s most prominent Green skyscrapers [...] wear the mantle of Green with transparent facades.

The popularity of glass as a major indication of a building’s Greenness can be said to be aided by the spread of globalisation. An effect of globalisation is that cities are copied and imitated across the world. For instance, there is a high level of similarity between the cities of New York and Tokyo as well between London and Dubai in terms of commercial infrastructure. So, it is not surprising that office buildings across the globe have the same characteristics irrespective of their locations and meteorological conditions. It has become common practice nowadays to design tall facades with extensively glazed areas. As observed by Bahaj et al, (2008), the skyline round the world is dominated by glass towers. Thomas O’Connor (2003), an architect at Smith Group, Inc., comments

“I like a lot of glass in buildings, and that is the trend in design today. Glass is back, and it’s a 21st century material.”

Glass was used in buildings long before the advent of Green architecture. In the 13th century, glass panes were used in houses as evidence of wealth and affluence (Butera, 2005). Green architecture enhanced its use with the potential to reduce electric lighting by daylighting and the provision of views for the psychological benefit that nature offers, and an associated massive save in energy use. (Ander, 2003; Menzies & Wherrett, 2003). Moreover, glass architecture represents a technological innovation that could be said to improve the appearance of building’s façade (especially high rise) without much effort (Onyeizu & Byrd, 2011). It provides sunlight, ventilation, solar gain/loss in summer/winter and in other cases, emergency exists, as well as regulating the biological clock in the body (Aboulnaga, 2006). The simplicity of its design and installation (despite how sensitive it can be) makes it a favourite building envelope material (Onyeizu & Byrd, 2011).
The incorporation of glass architecture into Green architecture means that “the exploitation of natural light” is now possible and even commendable. As noted by Butera (2005), the architectural language of the last few decades has begun placing more and more emphasis on ‘lightness’ and the ‘transparency’ of buildings, thus pushing towards fully glazed envelopes. The emphasis on ‘lightness’ and ‘transparency’ of buildings is often associated with Green architecture, the idea being that the more transparent and light the building looks, the more Green the building will likely be. Thus, the idea that glazing leans towards sustainability becomes a justification for extensive glazing.

The other common justification for extensive glazing in office buildings is the purported association of daylighting with increased productivity. The studies carried out by the Heschong Mahone Group (1999; 2003) quantified the effects of daylighting on human performance. Other studies have pointed out indirect relationships between access to windows and human health which can enhance productivity (see the abovementioned discussion). While acknowledging these benefits, Straube (2008) has pointed out that floor-to-ceiling glass is not required to achieve that. In fact, other survey results have shown that buildings with higher percentages of windows do not support the theory that environmental sustainability necessarily leads to improved productivity (Menzies & Wherrett, 2005). As quoted by Butera (2005)

“These buildings are the most dangerous type of buildings from the point of view of a dull and uncritical replication, hardly sustainable if well designed and definitely unsustainable if badly designed.”

So, the association of glass architecture with Green architecture is equivocal (Butera, 2005; Gratia & de Herde, 2007). For instance, the unprecedented replication of glass office buildings all around the world irrespective of cultural preference and climatic conditions casts doubts on its sustainability. As mentioned earlier, Green architecture needs to be specific to geographical and climatic regions so as to accommodate local context and not alienate the core characteristics of those regions. The duplication of glass towers on every city in the world conflicts with the agenda of Green architecture and these glass towers are the dominant office buildings and the major contributors to energy use in the construction industry. Many modern office buildings have highly glazed facades (Eriksson & Blomsterberg, 2009). Gratia and de Herde (2007) found that glazed facades (double skin) increase cooling loads, while Byrd (2012) pointed out that the higher the glazing, the more energy is required – blinds must be used to prevent glare and hence, there is subsequent use of electric light to brighten up the interior. As noted by Straube (2008) most of the gains in glazing technology over the past 25 years have been squandered on increased window areas, not on improved performance.

This does not imply that the contribution of glass architecture to Green architecture is all negative. Rather, glazing does bring benefits if it is well employed. Selection of the amount and type of glazing depends on many factors, including the orientation and location of the building. Menzies and Wherrett (2005) noted that well-oriented, high performance windows are a major part of energy efficiency in buildings. The Efficient Windows Collaborative Tools
for Schools (2011) stated that windows should be sized to allow for access to daylight and views while avoiding excessive glare, solar heat gain and winter heat loss. Christoffersen et al., (2000) suggested that there is probably an optimum window size, beyond which windows in direct sunlight reduce the number of satisfied workers. Menzies and Wherrett (2005) observed that discomfort from glare is reduced in buildings if the glazed percentage does not exceed 40%. But it has been noted that sustainability has not been a major factor in the selection of windows/glazing (Menzies & Wherrett 2005). They observed that financial or performance related issues often lead designers and clients to choose less sustainable options in windows and components. Cost as the determining factor for the selection of glazing is short sighted if external shading devices such as blinds are required to reduce the negative effects of poor window components. The extra cost spent on these devices could be avoided by a reduction in glazing in the design.

It could be argued that highly glazed buildings are mainstream for Green certified and non-Green certified buildings, especially high-rise buildings. However, it is imperative that features such as extensive glazing and the standards that stimulate are not encouraged by building regulations let only the Green building system. This is because, as Onyeizu (2014) indicated, there is a conflict between high proportions of glazing and environmental sustainability. As such, it is surprising that Green certified buildings are highly glazed (as illustrated in Onyeizu (2014)). For New Zealand, the LTV (Lighting, Thermal & Ventilation) Method for sub-tropical climates indicates a lower proportion of glazing (lower than 50%) in a building’s envelope (Hyde, 1998). This is in contrast to the 70% – 80% glazing used in office buildings.

**Air-conditioning**

Most Green certified office buildings are air-conditioned. This means that they rely mainly on mechanical systems for their environmental control. The consequence of this is that the occupants of such buildings become finely tuned to these very narrow range/levels of IEQ and might not be comfortable in natural indoor environment conditions without time to reacclimatise (Brager & de Dear, 2000; Roaf et al, 2009). People now typically accept working patterns that are remote from the natural world; they have become accustomed to more sedentary lifestyles, and have come to expect buildings to automatically regulate indoor temperatures (Roaf, 2005). A consequence of this is an increase in the incidence of airborne infections and Sick Building Syndrome (SBS). Clausen et al. (2002) found that filters, ducts and plants of air-conditioning systems are often filthy, introducing air that is dirtier than if one simply opened the window. Row (1992) cited in Roaf (2005) observed that a significant factor in the rise of SBS over the last two (2) decades has been the increased use of air-conditioning systems. Compared with naturally ventilated buildings, the indoor air quality in air-conditioned buildings can be worse (Roaf et al., 2009). Roaf (2005) commented that in post 1960s buildings, designers often appear to be intent on following fashion and adhering to stereotypes – for example ‘minimalism’ or ‘modernity’ – to the extent that they produce buildings which are hard, sterile and inhuman.
Another consequence is the variations found in occupant satisfaction results in these Green buildings. While most post occupancy surveys imply that occupants are satisfied with the IEQ found in Green buildings, in-depth analysis of these results show a discrepancy between the overall and specific satisfaction indices. One example is the study of a Green building (Paevere & Brown, 2008), where it was noted that the occupants’ satisfaction with ‘building overall’ is likely to have a greater impact on perceived productivity than aspects of IEQ. Leaman et al, (2007) also noted that Green buildings have higher perception ratings of image, health, design and meeting needs than ratings on physical indoor environment variables like temperature and ventilation. According to Leaman and Bordass (2007), Green buildings are rated better for more all-embracing summary variables such as ‘comfort overall’ or ‘lighting overall’, but when these are divided into their components, the favourable responses are less clear-cut.

As mentioned earlier in this paper, the energy performance of Green certified buildings often does not achieve the expected result of energy efficient buildings. An intriguing question which, although quite obvious, has eluded Green rating systems is how sustainable 100% air-conditioning could be. Since most Green certified office buildings are fully air-conditioned, the reliability of the Green rating tool in ensuring the energy efficiency of buildings during their operation and the total life cycle of these buildings is in doubt. This also implies that a building can achieve Green building status without reducing its energy use and subsequent carbon impact on the environment. The only difference between such buildings and their non-Green certified counterparts is the Green label achieved through the certification process. As previously noted, the design-based certification of these buildings does not fully account for the actual energy use. Most of the time, the actual energy used in running these buildings exceeds the estimations made during their certification. This is because it is often too difficult to capture the diverse interactions and specific situations that occur in a normal workplace at the design stage. Moujalled et al. (2005) suggests that these complex interactions need to be considered if energy consumption in sustainable buildings is to be reduced.

Green rating tools have also been blamed for encouraging mechanical control systems (HVAC) which rely heavily on energy to function. As illustrated earlier, the points awarded for HVAC systems and the ease of gaining such points by merely installing HVAC encourages designers to opt for them. Hence, designers are no longer interested in the actual design of workspaces to achieve good environmental control, but are instead more concerned with what needs to be done to achieve Green certification – which installing HVAC helps to guarantee.

Finally, studies which show increased productivity that is attributed to Green buildings (Fuerst & McAllister, 2008; Kats, 2003; CABE, 2004; Heschong et al., 2003) have been criticised on the point that people tend to be influenced by predominant trends (Frontczak & Wargocki, 2011). In other words, occupants tend to follow the prevalent fashion in their preference and expectations of comfort. As such, they dislike certain environmental conditions which they are naturally adaptable to. This is most evident in office buildings where the use of mechanical systems such as HVAC is dominant. Researchers have noted that
the introduction and use of new technology has affected workers’ perceptions of and attitude towards their physical environment and workspace (Cascio, 2000; Lai et al, 2002). For example, Brager and de Dear (2000) observed that occupants of buildings with centralised HVAC systems become finely tuned to the very narrow range of indoor temperatures presented by current HVAC practices. The researchers stipulated that these occupants develop high expectations for homogeneity and cool temperatures and soon become critical if thermal conditions do not match these expectations; in contrast to occupants in naturally ventilated buildings, who are more tolerant of a wider range of temperatures.

Another limitation is identifying the point at which level comfort begins to increase productivity (Czikszentmihalyi, 2003; Roaf, 2005). Whereas there might be a consensus on limits to comfort, it has yet to be determined at what point comfort affects productivity; or whether productivity is enhanced when a level of comfort is achieved. It is also worth noting that there is evidence that discomfort can be an enabler of productivity. Pepler and Warner (1968) observed that young people worked best (and were thus more productive) for short periods when they were uncomfortably cold.

CONCLUSIONS

This paper has addressed the implications of current trends and practices, supported by Green rating systems, on the facade of office buildings. A review of the literature indicated that there has been a change in the architecture of office buildings; similar building facades are becoming the norm in cities across the globe. This change is irrespective of local characteristics and the energy implications of such trends for occupant comfort and environmental sustainability.

The drivers for the certification of buildings were identified as including the real estate market value of Green certified buildings in view of the promised increase in occupant productivity. The energy efficiency of Green certified buildings was reviewed and compared with passive design strategies. This revealed that occupant comfort and energy efficiency can be better achieved through passive designs.

A review of the characteristics of Green certified office buildings in Auckland was carried out. It was pointed out that most of the office buildings are extensively glazed and air-conditioned. The implications of extensive glazing and air-conditioning were highlighted.

The findings have demonstrated that the crusade on and thus, quest for Green certification of office buildings lead to inappropriate architectural practices such as extensive glazing and more dependence on artificial indoor environment control systems. These practices are not energy efficient and do not uphold the concept and principles of environmental sustainability. This has resulted in Greenwashing wherein what is obtainable from these Green certified buildings do not illustrate the idea of a Green building.
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