

# A QUALITATIVE STUDY OF MOTIVATION AND INFLUENCES FOR ACADEMIC GREEN BUILDING DEVELOPMENTS IN AUSTRALIAN UNIVERSITIES

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## ABSTRACT

*Green building projects have been adopted by many universities in Australia as part of their renovation and expansion. In order to investigate the motivations of academic decision makers to invest in green facilities, a comprehensive analysis of media articles of 24 green academic buildings approved by the Green Building Council of Australia (between 2004 and 2011) were analysed using a qualitative analytical approach based on grounded theory. Findings in this work show that the decision makers in Australian universities are more likely to be driven by the direct benefits green buildings brought to the universities, enhancing universities' reputation and meeting the specific needs for education and research. Other factors that deal with improving universities' financial conditions and environmental protection were found to be a lower significance for investments. However the connections between the motivating factors also reveal the indirect benefits of green buildings which are an enhancement in reputation by fulfilling an environmental protection responsibility and research capacity enhancement by supplying technical study opportunities for students and researchers. This paper proposes an approach to deal with the complex network of vague and subjective concepts of the green buildings comprehension. It supplies researchers with tools for analysing abstract concepts and determining their interactions.*

## KEYWORDS

green buildings, higher education institutions, motivations, trends, qualitative research, grounded theory

## 1 INTRODUCTION

With the establishment of the World Green Building Council (WGBC) in 2002, the energy efficiency and associated environmental issues from construction and maintenance of the building sector have been considerably improved. Green technology has become a mainstream solution to reduce greenhouse gas emissions and improve the national environmental footprint (Woolley, 1997). Since early 2011, there are over 60 Green Building Councils

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at various stages of development in different countries mentoring the emerging sustainable building construction projects around the world (WGBC, 2011).

The main factors affecting wider application of green buildings have been studied in the past. Hakkinen and Belloni (2011) outlined the barriers in promoting sustainable buildings from five aspects—steering mechanisms, economics, client understanding, process and underpinning knowledge. The authors believe the barriers to increasing green building infrastructure can be transformed into drivers if these obstacles can be properly handled. According to Syace (2007), the drivers for building green infrastructure can be divided into market factors and imposed drivers. Market-led drivers mainly refer to the economic benefits generated by sustainable buildings, for instance, reduced operating costs, reduced maintenance costs and increased building value (Ala-Juusela, 2006, Yudelson, 2008). Besides the obvious economic benefits, a greater tenant attraction and reduced vacancy periods, potential enhanced returns on assets and increased property values have been identified as drivers that potentially impact all stakeholders (Sayce, 2007, Lutzkendorf and Lorenz, 2005, GBCA, 2008). For the imposed drivers, regulations established by country or local government can undoubtedly trigger sustainable building adaptation. Therefore, many scholars advocate achieving the purpose of promoting the development of green building through formulating and improving relevant policies (Hakkinen and Belloni, 2011, Priemus, 2005).

Compared to enforced regulations, an environmental sustainable policy promoted at the internal decision-making level of an organisation shows better environmental responsibility. Arkesteijn and Oerlemans (2005) state that the tendency of adopting sustainable technology has a high correlation with the levels of basic prior knowledge and pro-environmental behaviour of the consumers. This implies that a commitment to green behaviour from an organisation that takes environmental protection as its responsibility can be a driver for green building adoption (Ozaki, 2011). Universities and academic institutions are organisations that traditionally lead a vanguard of thought with demonstrated practical solutions in sustainability (Skopek, 2010). The academic institutions do not want to be laggards, especially when it comes to green innovation and building standards (Galayda and Yudelson, 2010).

Compared to commercial buildings, educational buildings have different aims and purposes, therefore the policies for investing in educational green building infrastructure differ from commercial buildings. Yudelson (2008) lists the recruitment of high-achieving students and faculty, and attracting a new donor pool for campus buildings as speculative business benefits for higher education. Nicolaides (2006) argues that a university which promises commitment to environmental protection will enhance its publicity and ensure its competitive position among other institutions. At a policy level, Richardson and Lynes (2007) claim that the internal university green policy plays a significant role for the successful implementation of the green projects and demonstrates the adverse effects caused by weak administrative leadership for sustainability. Cupido (2010) believes that policy development and application is a significant component of sustainability in universities and institutions, but the facility professionals should be also responsible for the development of policy and guidelines with institution's decision makers (Beringer et al., 2008).

The objectives of this study are to examine the drivers affecting the implementation of green buildings, investigate the benefits gained by the green educational buildings in universities from a holistic perspective, and review the factors that are important to promote the benefits from building green into drivers for investing in green university projects. More broadly, this research seeks to highlight the contribution that higher educational institutions make to the overall implementation of green buildings within Australia.

## 2 METHODOLOGY AND APPROACH

### 2.1 Trend analysis

Historical trends in green building development in Australia were studied in this work from two data sources, the Australian Bureau of Statistics (ABS, 2011) and the Green Star Project Directory of the Green Building Council of Australia (GBCA, 2011). The number of building activities carried out monthly in Australia for the period of eleven years from July, 2000 to May, 2011 was identified by building function and value using the statistical information collected through the Australian Bureau of Statistics. The Green Star Project Directory contains a comprehensive list of all green projects evaluated by the GBCA. In this work, all of the green building projects for a 7-year period, starting from the first green building in Australia approved in October 1, 2004, through to the most recent dating in June 15, 2011, were identified. The information analysed from this database contained the certified date, green star rating result, building function and respective district of the project. All of the university green building projects were identified from the Green Star Project Directory, where the educational building projects are divided into three categories according to the progress of the project—Educational Design, Educational as Built, and Educational Pilot. In this study, the stage of the project progress was not a criterion for either inclusion or exclusion from the research. All these three categories were considered to have equal importance to the motivation of the corresponding university's administration to register, design and develop green buildings.

### 2.2 Motivation analysis

The second stage of the analysis was to determine the motivation of the university's decision makers to invest in a green facility. The motivation analysis comprises a collection of data consisting of official promotion of the green building projects by academic decision makers and discourse analysis of the resulting data using grounded theory.

#### 2.2.1 Data collection and sampling

Based on the fact that news media can reach a large audience and exert great influence on them, the motivation analysis was performed using the articles published on the internet and local media. The textual image of what constitutes "green buildings" mediated by the decision makers may have been influenced by their values about green infrastructure (Gluch and Stenberg, 2006), hence it could be the ideal source to investigate their motivation for complying with pro-environmental behaviour. However, due to the feature of press releases that are usually written by internal communication officers and as such may provide favourable evaluation towards the developments, the articles for analysis were carefully searched and filtered from several types of media articles, such as government statement, university publicity, and organization press release to avoid possible bias. During data collection, web searches were carried out for all published articles mentioning the educational green projects in the universities. The name of the building and its relevant abbreviation were used as the specific search terms. For the reasons that the opinions of specialists and recognized authorities are more likely to be reliable and to reflect a significant viewpoint (Booth et al., 2008), the primary data collected for the analysis consisted of the official statements announced by the high-authorities responsible for the green project, such as Innovation Minister, Executive Directors, Presidents of Universities, Vice Chancellors, Deputy Vice Chancellors, and Facility manager of the university.

Furthermore, in order to confirm the validity of information published in the news articles used for this study, interviews with selected individuals were arranged. A group of twelve participants from Macquarie University consisting of university decision makers related to the news releases, and 10 students, users of the green star building, were interviewed. The decision makers were asked to clarify the drivers and barriers for the university to invest in a green facility as well as their expectations from the green building. Their views on the higher education news releases and the reliability of the message delivery were also examined through the interviews. The decision makers confirmed that the news articles were constructed with honesty prior to their release. The student participants were then asked to express their personal opinion of the green facility and rank the difference between the green building and other non-green facility that they had used.

The data collection procedure for the news article analysis was driven by theoretical sampling to ensure that a sample size is fully adequate to support particular qualitative analysis (Sandelowski, 1995). Theoretical sampling plays a pivotal role in the theory construction. It is a process of gathering data guided by concepts derived from the evolving theory for the purpose of comparing the concepts and densifying emerging categories (Strauss and Corbin, 1998, Sallfors et al., 2002, Douglas, 2003b). Following this perception, all educational projects listed in the Green Star Project Directory are initially designated as a data pool. However, due to a projects' data accessibility and the diversity of the introductory materials, only 24 green projects which are located in urban areas were selected as observation objects and their related articles were collected to generate an initial hypothetical theory. Based on the hypothesis, the follow-up data gathering were then refined to obtain the data necessary to further the development of the evolving theory (Strauss and Corbin, 1998).

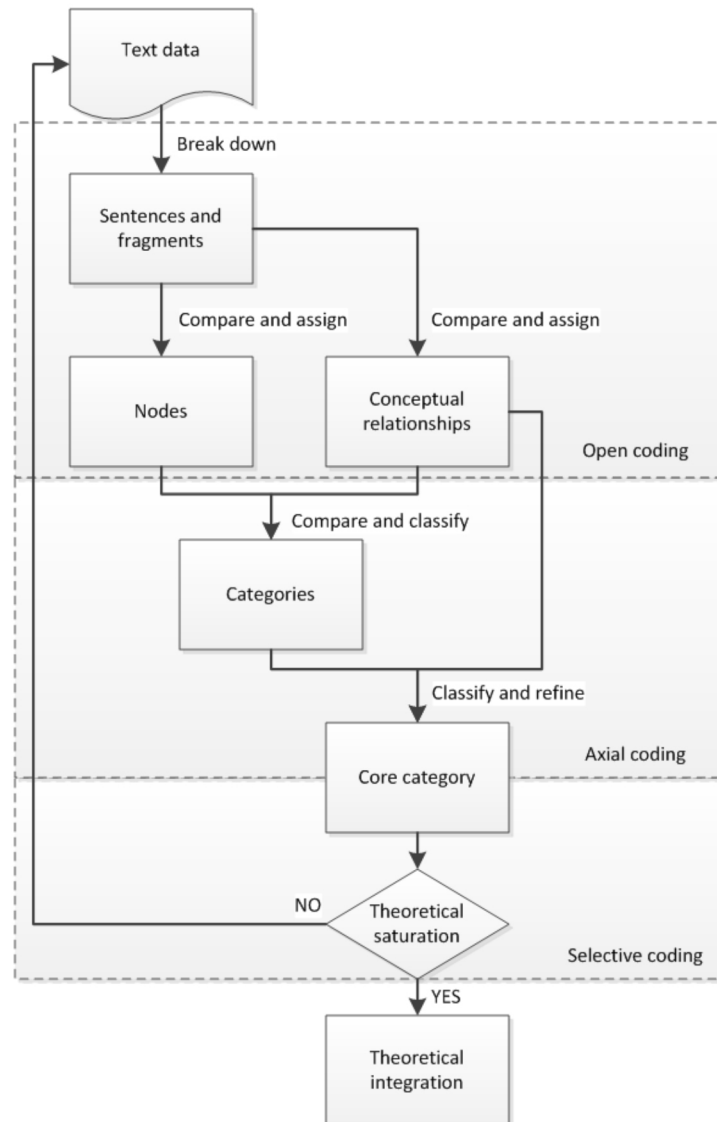
The sample size of this study was decided based on the 'theoretical saturation' approach (Strauss and Corbin, 1998, Glaser and Strauss, 1967). According to this approach, the data collection continues until (a) no additional data reveals a new category, (b) categories are well developed and (c) the relationships among categories are well validated (Strauss and Corbin, 1998, Sandelowski, 1995, Karkanas et al., 2010). For this work, 68 related media articles were collected after all of the above conditions were satisfied. These articles were then imported and analysed using a computer-assisted qualitative data analysis software application (NVivo 9.0).

### ***2.2.2 Data analysis***

The media articles were analysed in line with the grounded theory approach that simultaneously develops an inductively derived theory about a phenomenon with application of a systematic set of data gathering procedures (Glaser and Strauss, 1967, Glaser, 1978). The aim of this method is to identify theory out of concrete data rather than testing hypotheses with existing theory. The core strategy of this analytical phase is based on three types of coding processes, open coding, axial coding and selective coding to define and categorise data (Douglas, 2003a). The data analysis procedure is described in detailed below, and a chart that illustrates the coding process is provided in Figure 1.

Open coding is the first stage of analysis where the text data is fractured and conceptualised (Glaser, 1978, Strauss and Corbin, 1998). In this process, noticeable statements were identified and those with similar meanings were extracted from the content and then labelled as a node (Corbin and Strauss, 1990). To verify and ensure the nodes were grounded in the data, each following statement was examined carefully to compare with other nodes coded previously before a new node is assigned (Glaser and Strauss, 1967, Glaser, 1978). Following

**FIGURE 1.** Data analysis procedure: steps from text data to well-developed theory.



this, the nodes that are discussing the same points in different aspects were assigned to categories, which were more substantial than the initial nodes (Douglas, 2003b, Strauss and Corbin, 1998). Furthermore, conceptual annotation and memos were also noted in order to set up internal links between the categories.

Axial coding is the second process of the conceptual data analysis in which categories are connected by a combination of inductive and deductive thinking in the grounded theory (Strauss and Corbin, 1998). During this process, the categories fractured during the open coding analysis were connected with their subcategories in a set of conceptual relationships, thus forming core categories (Douglas, 2003a). The content of the core categories identified and condensed their relationships so that the conceptual linkages between each of the categories become more specific (Corbin and Strauss, 1990). These categories and their connections formed a framework that give rise to a theory's occurrence.

The final process of the analysis was performed by selective coding which is used to refine and focus the data collection and analysis (Strauss and Corbin, 1998, Glaser and Strauss, 1967). The text data was screened by moving back and forth these three analytical coding processes to discover all possible interrelationships between the core categories. Thus the framework of the theory was filled-in with descriptive details (Corbin and Strauss, 1990). These processes were reiterated until theoretical saturation was reached in which every connection was well validated and no category needed further refinement. By doing so, a well-developed and validated theory was established.

### 3 RESULT AND DISCUSSION

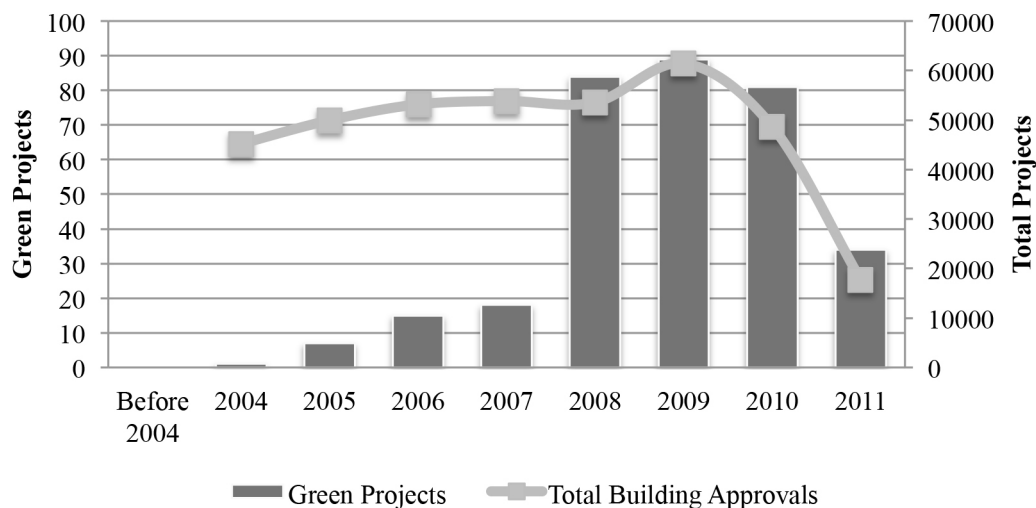
#### 3.1 Trend comparison

Figure 2 shows the number of green buildings compared with total building projects approved in Australia between 2004 and 2011. In 2008 the total building number remained steady while the green projects rapidly increased, possibly by the rapid growth in public awareness of climate change and the need to reduce GHG emissions (GBCA, 2008). By 2008, the awareness of climate change and propensity for action had been bolstered by films, reports and the frequent media coverage of extreme weather events, and hence a fundamental shift in the building industry towards sustainable practice (GBCA, 2008).

After a five-year continuous increase, the number of annual certified green projects is reduced from 2010. The recession of green projects due to the reduction of the number of total building approvals in Australia, which began to decrease from 2009 as one of the negative consequences of the financial crisis in 2008 (Martin, 2011). While the total number of green building projects decreased, the ratio of green buildings to total buildings increased during the same time period. This highlights the importance of development of green building industry in Australia.

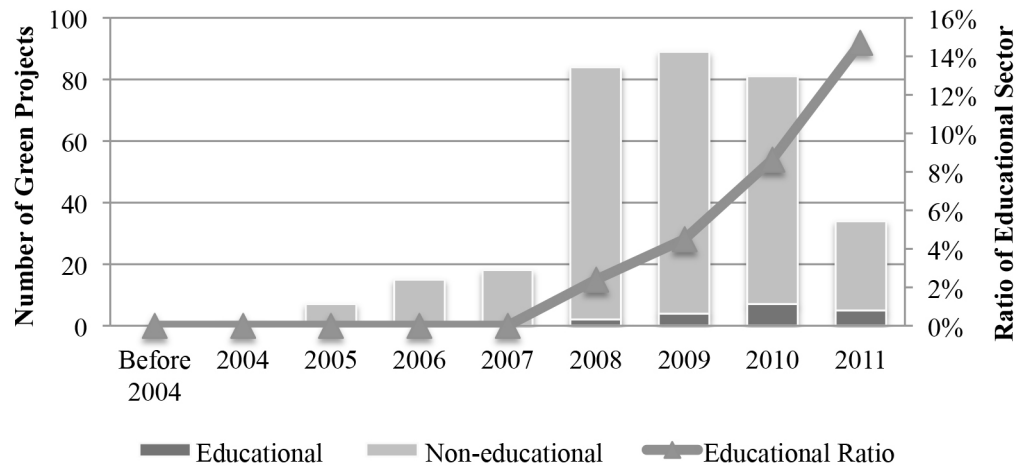
More specifically, if building functions were considered in the trend analysis, the increasing demand of educational green building in universities presents a sharp contrast with the application trend of green non-educational buildings (Figure 3). The first educational green

**FIGURE 2.** Application trend of green projects compare to total building approvals.





**FIGURE 3.** Application trend of educational vs. non-educational buildings.



building project was recorded in 2008, accounting for 2% of all the green projects approved in that year. Although the number of green projects decreased annually in the following years, the number of educational buildings increased at double the rate. Up to the first half of 2011, the educational green projects reached a ratio of 15% of the total green building project applications.

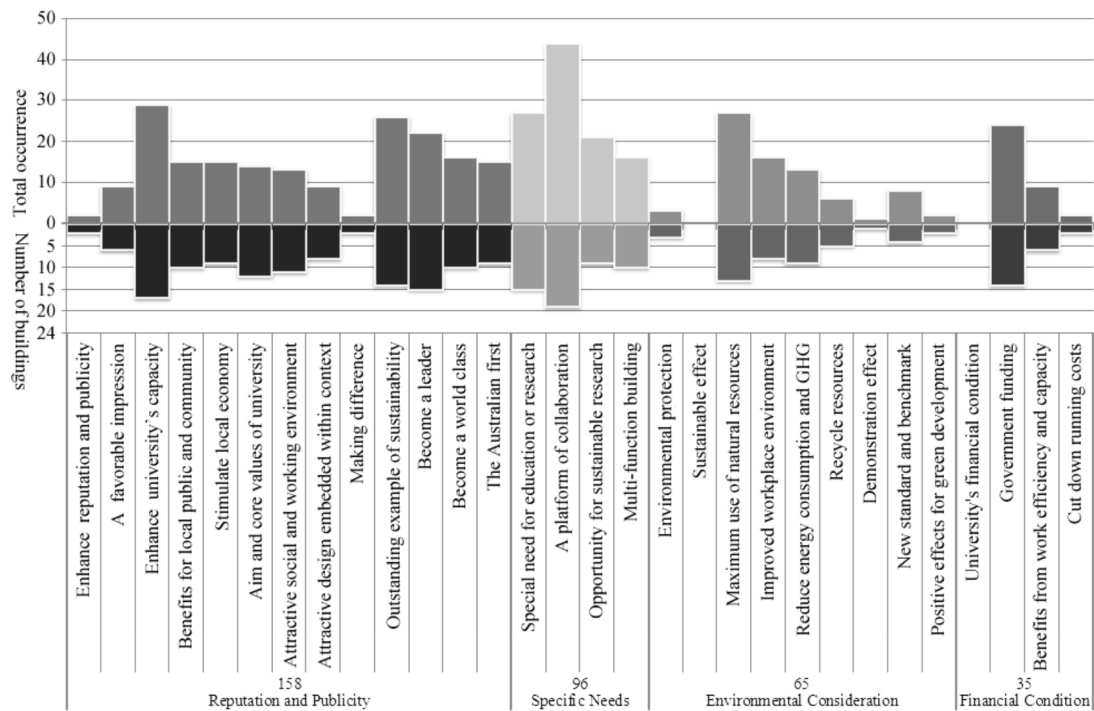
According to Guellec and Wunsch-Vincent (2009), the financial crisis in 2008 could partly explain this rapid growth in the investment of the educational sector. In the consideration of sustainable recovery, the government is more inclined for long-term investments, such as education and research infrastructure (DEEWR, 2008), as a strategic response to the crisis (Schneller and Golden, 2010). The financial situation and the investment strategy in difficult economic times could be seen as extrinsic factors that foster the development of educational green buildings in universities. However, this does not explain the popularity of green building on Australian campuses unless the intrinsic motivations of decision-makers are analysed.

### 3.2 Frequency statistics

On the basis of the coding processes, 68 articles of all 24 green projects were fractured into sentences and examined carefully. Thirty different statements with frequent appearance in context were labelled as nodes in open coding. The nodes that described similar topics were then classified into four main categories as *Reputation and publicity*, *Specific needs*, *Environmental consideration* and *Financial condition* of the universities. The node categories, their total occurrences and number of buildings in which each node was addressed are listed in Figure 4.

A total of  $n=158$  sentences relating to the university's reputation and publicity were discussed in 13 different ways. The category of reputation and publicity of the university appeared to be the most frequently used and is therefore considered to be the most significant to invest in academic green building projects. Meeting the specific needs of research through green facility had the second most frequent appearance at  $n=96$  times in four nodes. Environmental consideration and financial condition were shown to be the third and fourth most important with frequency of appearance at 65 and 35 respectively.

From the total counts of specific node shown above the x axis in Figure 4, seven nodes were identified with a high occurrence rate over 20 times. The high occurrence of *A platform*

**FIGURE 4.** Classification and frequency of nodes.

of collaboration, Enhance university's capacity, Maximum use of natural resources and securing Government funding indicates the realistic goals and the most urgent expectations from the universities. Some nodes with very low frequency of appearance, such as Making difference, Sustainable effect, Demonstration effect, etc., are used in this assessment in order to set up the connections between related nodes in the second part of the study.

Below the X axis, the figure shows the number of green buildings covered by a specific node among the 24 building projects. Nearly half of the projects highlighted the nodes of Aim and core values of university, Attractive social and working environment and Multi-function building. When these nodes were synthesised together to analyse in a holistic way it was found that a green building with multi-functions in a university is built as a platform of collaboration to meet the special needs for education or research. The highly integrated platform and its property maximises the use of natural resource thereby creating an attractive social and working environment which can greatly enhance university's capacity. With the outstanding example of a sustainable educational building, the university is qualified to be a leader among its competitors. In the following these emergent findings are validated by motivation analysis.

### 3.3 Motivation analysis

The second stage of the analysis comprised of a study of motivation of the university decision-making officials to invest in green facility as a long term strategy for the academic development. The analysis in this stage is important to define the strategies of the universities in Australia and project further developments in this field. For this purpose each of the classification groups identified in the frequency analysis was further studied to define the inter-relation between the categories and nodes.



### 3.3.1 Enhance reputation and publicity

According to the conceptual pattern that emerged from the data analysis, green projects influence university publicity by presenting a favourable impression on society and making a difference with other educational competitors.

**A favourable impression.** Since any positive media coverage will give the public a favourable impression, the green projects approved by the university apparently create this opportunity and increase its public identity. An environmentally sustainable educational building which represents the aim and core value of the university will establish a lofty image for the university among its competitors. Professor James McWha, Vice Chancellor of the University of Adelaide's comment offers an example of the University of Adelaide's motivation to invest in green building:

Achieving a 6 Star Green Star rating demonstrates the University of Adelaide's environmental aspirations and commitment to world leadership in providing sustainable learning spaces for our students.<sup>1</sup>

From the above claim it is apparent that a better impression could also be gained by providing sustainable learning spaces for students. During the validation interview, the facility manager of Macquarie University also acknowledged that "... (The green facility) it is an iconic building on the Campus. The students love it." The statement was then confirmed by the student participants. Nine of the ten students admitted that they prefer to study in a green learning space, ranking the green facility at a much higher level than any other non-green building they had used before. Because of the attractive research environment provided by the green buildings, the university could achieve additional benefits. These benefits are outlined by promotion of the green project of Medical Sciences 2 (MS2) at the University of Tasmania.<sup>2</sup> According to Professor Foote's prediction, the project will greatly enhance university's capacity not only by assisting in accommodation of staff and research students, but also by creating a collaborative platform for national and international research communities.

The platform of collaboration and attractive research environment as motivations for investments in green buildings are mutually dependent and promoted jointly. A highly integrated research institute may enhance the research capacity in its particular area by sharing knowledge, specialist equipment and facilities. This in turn, will strengthen the attraction, resulting in rising of university's national and international profile. The following comment from University of New South Wales–Lowy Cancer Research Centre is an example of this connection.

...By combining adult, children's cancer research, the Lowy Centre would continue to attract top researchers and trial funding...It provides a beacon if you like for other great cancer researchers and gives them a reason to come here and work in Sydney.<sup>3</sup>

The universities are focusing on promotion within the academic area, but more so on promotion within the local public and community. During the data analysis process, it becomes evident that several green projects<sup>4</sup> are extensively analysed in the design process to

<sup>1</sup>National Centre for Health and Wellbeing of Australian Catholic University, National Life Sciences Hub of Charles Sturt University, Design Hub of RMIT University, Medical Sciences of University of Tasmania, Economics & Commerce Faculty of University of Melbourne.

assess the history of the site, visual amenity, how the building would sit on the site and what impact the new building would have on the city.

...The new Life Sciences Building is sited to enclose and terminate a new landscaped pedestrian avenue connecting many of the existing buildings and capable of expansion eventually back towards the centre of the campus.<sup>4</sup>

...These stations are all accessible at ground level without any security access and therefore provide an open resource for the community.<sup>5</sup>

Besides the attractive design embedded within its urban context, green educational buildings are sometimes intended to connect with the other existing buildings, providing the locals with a good opportunity to experience an outstanding example of sustainability. In contrast with the commercial green buildings, educational green buildings are usually designed with the aim of offering benefits to the public and community with access links to other main streets and suburbs located nearby. The public has the opportunity to experience the benefits and superior comfort brought by green technologies when they enter or walk through the green building without any restrictions. The demonstration effect will stimulate the public both awareness of environment protection and university's reputation.

Stimulating local economy is another effective way to improve university's impression. These over million dollar green projects can boost local economy as a catalyst, providing hundreds of job opportunities in construction phase as well as additional accommodation for academic and administrative staff. This positive effect is evident in the following comment from Queensland University of Technology (QUT) Science and Technology Precinct:

The Science & Technology Precinct and Community Hub will create around 300 local jobs during the construction phase, and when completed will house at least 1,000 scientists, researchers, teaching staff and students.<sup>6</sup>

**Making difference.** Distinguished features of one university are perceived as an opportunity for the university to outshine the other competing education institutes. Therefore, some of the fundamental expectations of the universities in Australia when approving green projects in their campuses are for the university to become a "leader." A world class research institution provides an attractive research environment supported by advanced green technologies that promote integration with world class research communities. Hence, the national status of the university will be promoted and strengthened in specific research areas. Benefits brought by green projects become favourable external publicity material, as shown in Table 1.

### ***3.3.2 Special need for education or research***

The special needs of each university for education and research are evident through three characteristic nodes, identified as below.

**Multi-functional building.** Nearly half of the 24 university green buildings projects are designed to be multi-purpose facilities. These buildings commonly consist of spaces for learning and teaching, such as lecture theatres and classrooms; research areas which include meeting rooms and laboratories; the break out areas and exhibition areas including café-bookshop, indoor garden and public gallery respectively.

In the education and research perspectives, multifunctional green buildings can provide a modern and open working environment. The open areas and galleries encourage the public

**TABLE 1.** Selection of statements for promotion of university's national status by approving green projects

University	Example comment
Bond University	"The Bond University Mirvac School of Sustainable Development building on the Gold Coast is the first Australian university to attain 6 Star 'World Leadership' status from the GBCA. It is now regarded as one of the greenest education buildings in the world." <sup>7</sup>
Charles Sturt University	"CSU's Albury–Wodonga Campus is Australia's first environmentally friendly university campus and is a developing, dynamic model of how communities can address environmental concerns and create sustainable environments." <sup>8</sup>
Macquarie University	"The Australian Hearing Hub will be a unique, world-class facility purpose-designed to facilitate collaborative research into hearing and related speech and language disorders." <sup>9</sup>
Queensland University of Technology	"The research to be undertaken here will add to the State's reputation as a world class contributor to solutions that will underpin sustainable development and community living in coming decades." <sup>6</sup>
University of Melbourne	"The Centre for Neuroscience has achieved a 5 Star Green Star–Education v1 rating, making it the first 5 Star rating for a University Laboratory project." <sup>10</sup>
University of New South Wales	"The new facility, opening on the 19th August 2010, is the first centre in Australia to bring together childhood and adult cancer research at the one site..." <sup>11</sup>
University of Tasmania	"Australia's most imposing medical science precinct will be created in Hobart when the \$90 million second stage of the Menzies Research Institute is completed in December 2012." <sup>2</sup>

to visit and experience the green concept, which potentially benefits the local community. The following comment from La Trobe University highlights the relationship between the multi-function building and the enhancement of the university's reputation and publicity:

The internal design will facilitate contemporary approaches to learning and teaching with flexible teaching spaces... The staff and students at La Trobe are thrilled at the prospect of working and studying in this wonderful new building, which gives a 21st Century identity and feel to higher education study in Shepparton.<sup>12</sup>

**A platform of collaboration.** According to the specific need of a university or research institution to increase their academic capabilities, 19 of the 24 green projects are built as a platform of collaboration. World leading research teams could be brought together to foster innovation and collaboration by transcending traditional disciplinary boundaries. As shown in Table 2, these teams with alliances have complementary superiority and the cooperation facilitated through the green building will position them as a world leader in their specific profession.

These statements claim that the collaboration platform provides benefits to the academic institutions, but also to the local public and communities, especially in the medical research area. For instance, the Australian Hearing Hub from Macquarie University, which integrates

**TABLE 2.** Statements that triggered the relationship between *a platform of collaboration* and becoming a *world class* institute.

University	Example comment
La Trobe University	LIMS will be a world-class facility for molecular science, biotechnology and nanotechnology research and research training. The Institute will align with the broader Northern Melbourne Science precinct and support growth in the burgeoning Australian biotechnology industry. <sup>13</sup>
RMIT University	...The Design Hub will be a centre for collaboration—a place to develop world-class concepts and initiatives that will raise this city's and Victoria's international profile. <sup>14</sup>
University of Melbourne	The Institute will also house four World Health Organization (WHO) collaborating centres, and will integrate teaching, training, research and public health activities in human infectious disease at the University of Melbourne and the Royal Melbourne Hospital (Melbourne Health) to create a new world-class centre. <sup>15</sup>

the Federal government research organisation Australian Hearing, Cochlear Ltd, and groups from the Sydney arm of the Hearing Cooperative Research Centre to provide research in hearing and related speech and language disorders:

One in six Australians has hearing loss and thus the Hearing Hub has enormous potential to advance research of benefit to the Australian community.<sup>9</sup>

Another example is the Peter Doherty Institute of the University of Melbourne, which allied four World Health Organization (WHO) collaborating centres to “fight against infectious disease”. As Deputy Vice-Chancellor (Research) Professor Peter Rathjen's comments:

As a frontline organization in the fight against infectious disease, the Institute will be an excellent example of aligning University and State Government education and research facilities to serve the people of Victoria.<sup>15</sup>

Apart from integration with related research organisations, the green buildings are seen as an opportunity to encourage industries to lease closely and establish linkages with the students and lecturers. According to Curtin's Pro Vice-Chancellor for Science and Engineering, Professor Andris Stelbovics's comments, the university will profit by the innovation and collaboration:

The industry and careers space will enable students and lecturers to better interact with industry, while the exhibition area is intended as a multi-purpose space that can be used to exhibit design projects and research papers and for industry fairs, conferences and seminars...<sup>16</sup>

**Opportunity for sustainable research.** The green projects on the campus are posited as a learning opportunity for the students who specialise in research for sustainability, by demonstrating cutting edge sustainable technologies that are applied in the building. During the design, construction and use, green projects are expected to enhance students' understanding of sustainable concepts and allow them to gain real world experience. This opportunity is seen as unique and attractive research environment for the university to gather future research fellows

to enhance its reputation and capacity in the respective research area. Moreover, when the students graduate with their personal experience of green technologies, they will be in a privileged position to enhance the profile of green buildings from planning, design and operation of these facilities. Thus could ultimately push forward the sustainable development of the future.

The School's graduates will be much needed industry leaders in implementing responsible and practical sustainability management initiatives in the business world and in the communities in which they will live.<sup>17</sup>

### **3.3.3 Environmental protection**

The universities strive to address the important individual responsibility for achieving greater environmental protection. This can additionally offer increased reputation and identity, which are discussed here.

**Improved sustainability.** The green buildings are largely perceived as facilities which offer improved sustainability thereby and environmental protection assurance (Kibert, 2008). Material and resources recycling technology are readily used to reduce the ecological footprint. High efficiency heating, ventilating and air-conditioning systems and smart control lighting systems are applied to reduce the building's energy consumption and greenhouse gas emissions. Green buildings may also maximise the use of natural resources by solar collection and rainwater harvesting systems which further reduce the carbon emission footprint. The Business and Economics building in University of Melbourne quantifies the environmental benefits:

...sustainable design features that result in a 50% reduction in energy use and 83% less water compared to the average office building.<sup>18</sup>

A significant number of researches have begun to document the impact of a working environment on building occupants. The research consistently indicates that, across all academic fields, students in classrooms with access to natural light perform better than students who are studying in classrooms without natural light (Heschong et al., 2002, Edwards and Torcellini, 2002). Studies also show that a pleasing research environment in symbiosis with nature ensures a substantial increase in productivity, as well as increase in achievement rates, reduced fatigue, and improved occupant health condition (Anna-Maria, 2009, Mora et al., 2011, Kim and Kim, 2010). This can be seen from the statement by the Australian Catholic University Education and Science Sector Director, Mark Kelly<sup>19</sup>:

The building section is organized with all academic offices on the northern side of the atrium with excellent access to natural light...which means better air flow, more sunlight and a happier, healthier workplace.

As a result, the university's research capacity could be indirectly improved by the increasing efficiency and the reduction of absenteeism associated with sick leave. Meanwhile, a working environment that guarantees pleasure and health helps the university to gain a competitive edge in attracting research staff:

According to the Bond University online staff survey having a green building is likely to have a positive effect on attracting and retaining employees as 93% of employees said it is important to work in a green office.(GBCA, 2008)

This statement was also confirmed by the validation interviews. More than half of the student participants claimed that they would consider the green facility as one of the factors that influences their decisions for selecting a University for their future study.

Furthermore, reduced lighting loads, passive solar heating and water conservation measures all lead to savings in operational costs. In the comments of Business and Economics Building in University of Melbourne, this point is highlighted:

The building's rating is part of a pilot for education institutions designed to improve the health and wellbeing of students, as well as to lower absenteeism and operational costs.<sup>18</sup>

**Demonstration effects.** In the engineering practice, majority of the leading sustainable concepts require testing and approval. The prototype of sustainable building project is then shaped as a new standard and benchmark to promote future designs and green industry developments. The Mirvac School of Sustainable Development building is one such example:

It has been a wonderful opportunity to create a building that sets a new environmental standard for universities throughout the world. We will continue to set high benchmarks and to pursue innovative sustainable development solutions with relentless initiative.<sup>7</sup>

### ***3.3.4 University's financial condition***

Green building projects offer direct and indirect financial benefits that universities can expect to improve their financial conditions. One of the direct financial benefits is access to the competitive development grants. In fact, 14 out of the 24 green educational projects in Australia received government funding assistance for the development of these projects. All of the funded green projects received Australian Education Investment Fund (EIF), which is a four rounds fund to provide capital expenditure in higher education and strengthen research facilities to create a world-leading higher education and research sector for Australia (DEEWR, 2008). According to the statistics, nearly 75% of the higher education projects successful with the EIF were green buildings or buildings that address improved environmental performance (DEEWR, 2009). The government funding was applied by the universities to support their special needs for education and research, and to enhance their capacity, which is evidenced from the following statement:

...Our investments in that vital research will support high-wage, high-tech jobs for Australians in our emerging biotechnology sector. The Government is proud to give the researchers of La Trobe the kit they need to remain at the forefront of their field, Senator Carr said.<sup>13</sup>

The green projects supported by government funding directly boost the local economy and increase the number of employment opportunities (DEEWR, 2008). They also indirectly offer benefits to the local public and community, as well as enable green developments to proceed.

Additionally, the university officials expect intangible benefits, which include productivity, staff and student attraction, reduced absenteeism, improved research capacity and enhanced reputation and publicity, as shown by the following comment from Medical Science 2 in the University of Tasmania:



The new development will attract further high-quality professionals to Tasmania, enable us to expand our research by covering more disease areas, increase our collaborative links throughout Australia and internationally, and provide more opportunities for employment and professional development for researchers and medical professionals.<sup>20</sup>

By synthesizing the direct and indirect financial gains, it is evident that the green building plays a pivotal role in stimulating the university's financial condition.

#### 4 CONCLUSION

This paper analyses the application trend of the total and educational green projects across Australia and reveals the motivation of university executives and decision-makers to promote educational green buildings. The number of total building approvals was used as a background data to compare to the number of educational green projects applied over the years. Unlike the shrinking shown by the building industry after the 2008 financial crisis, the proportion of green projects has maintained a stable growth rate. Educational green buildings were found to have a doubling rate of construction in the last four years.

The reasons for the fast-growth of green projects in universities and higher institutions were analysed using a qualitative approach, termed Grounded Theory. During this approach, the motivations for educational green building investments were identified from four aspects of a university's core values and responsibilities, which were increasing a university's reputation and publicity, meeting specific needs for education or research, ensuring environmental protection, and strengthening the university's financial condition. The factors of enhanced university reputation and meeting the specific needs for research were the major influencing parameters responsible for the decision-making to invest in green buildings. The factors that deal with enhancing a university's financial condition and environmental protection were found to be only minor influencing factors, which is contrary to the current situation of economic recession and increasingly serious global climate risk concerns.

The green projects offer direct benefits to the universities. The green identity of the well planned building and its favourable impression to both the academic area and beyond, directly boosts the university's reputation and publicity. The well-designed building which meets the specific needs for education or research purposes also enhances a university's teaching and research capacity.

The grounded theory approach applied in this study also exposed the indirect benefits to the universities offered by the green buildings. The environmentally sustainable property of the green project reveals the great efforts that the university makes to fulfil its responsibility, as well as supplying technical verification opportunity for education or research. Moreover, the environmental protection consideration guarantees a higher possibility for the university to compete for the government funding, which can be used for its expansion.

The findings of this study have a number of important implications for future practice. It proposes an approach to deal with the complex network of vague and subjective concepts in the comprehension of green buildings. It supplies researchers powerful tools for analysing abstract concepts and determining their interactions. However, due to the specific feature of media, the outcomes of this research are limited to education building sectors. For better understanding of the drivers responsible for approving green projects in other sustainable industry sectors with high priority for marketing, further investigation may be needed.

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