Toward a Pre-Assessment Framework for Green Star: A survey on New Zealand building professionals

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Abstract: A relatively large number of buildings around New Zealand have been certified through green building rating systems, signalling the interest of the building market to expand the use of different sustainability approaches. However, existing green rating systems are still not capturing full market potential and the attention of building professionals and/or stakeholders to foster widespread adoption of green building rating systems in the country. This paper investigates the barriers involved in implementing green building certification systems for New Zealand buildings, with a focus on Green Star, by using a qualitative approach based on surveys offered to building and design professionals and Green Star accredited professionals. The questionnaire process involved the collection of email addresses publicly available on professional organisation websites. The questionnaire was set-up using the Qualtrics survey tool that is offered by The University of Auckland. The questionnaire was conducted through an anonymous online survey over a month. The most significant barriers identified in the research were: insufficient knowledge about green building rating systems guidelines/manuals; time pressure and increased time investment; additional unforeseen costs usually 'hidden' in the certification process. Additional information emerged about critical aspects related to specific topic areas and credits of the Green Star rating system. This study offers direct, first-hand, knowledge about specific barriers to consider at each stage of the certification process for New Zealand buildings.

Keywords: Barriers; Green building rating system; Green Star certification; Pre-Assessment Tool

1. Introduction

As a result of a growing movement and pressure to link the construction and property industry with sustainable investments, sustainability has not only raised the awareness on the commercial property market but also its implementation has increased remarkably over the past decade (Harrison & Seiler, 2011). However, the level of involvement with sustainable activities in the building industry does not mean the same level of their interests to participate in sustainability. Smith and Baird (2007, as cited in Ministry for Environment, 2006) stated that the implementation of Green Star NZ rating system can only be successful if the rating system is commonly recognised and used by members of the building industry. The uptake of the voluntary tool will not occur and its implementation will be slow unless key stakeholders are willing to adopt it. "Even though the New Zealand Green Building Council (NZGBC) and government have taken targeted measures, considerable hesitation and scepticism are existing in the property market from both an investor's and building owner's perspective" (Myers, Reed and Robinson, 2008, p.298). The New Zealand property industry had been pressurised by the government to implement green-rated buildings and thus all new constructions must achieve Green Star-certified buildings with at least 4-star rating, which is one of the eligibility criteria of Green Star NZ. However, this policy was abolished in 2010 because green buildings were not regarded as a top priority for the government anymore. In recent years, the NZGBC and the Property Council of New Zealand have

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announced a new policy plan for the built environment at the Green Property Summit in 2017. They have focused on how the construction and property sector in New Zealand work with the government collaboratively to make better homes and buildings, especially commercial buildings, communities and cities. They aim to meet lower carbon emissions for the environment and to create healthy cities for New Zealanders. This plan will combine building green and provide suppliers and innovator with certainty that could convince them to invest in development funds for new techniques and products for building green. In this sense, developing policy plans is likely to start increasing the number of certifications or the use of rating tools (NZGBC, 2017).

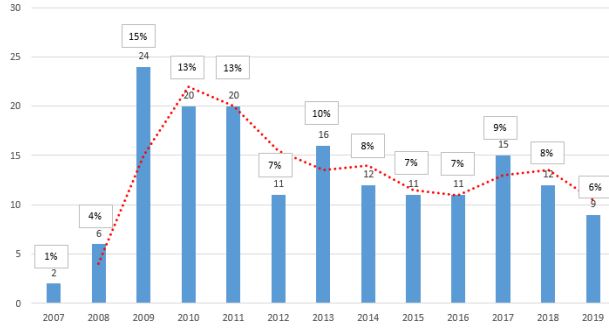

Figure 1: The number of Green Star NZ™ certified projects in New Zealand between 2007 and 2019

Figure 1 shows the number of Green Star NZ certified projects for about 12 years. There was a positive trend from 2007 to 2009 reaching a 15% increase of certified projects which shows a higher perception and influence of the importance of sustainable buildings design in the New Zealand building industry. It is assumed that many of the first project registrations would have occurred in 2007 and since then these registrations have resulted in the number of certified projects from 2009 to 2011, showing the highest growth from 14% to 16%. However, the trend seems to have deteriorated thereafter and the number of actual certified projects is still comparatively low from its first introduction. Doan et al. (2017) also mentioned that the number of Green Star certified buildings is still limited. There could be a possible reason why the number of certified projects has decreased between 2009 and 2019. Therefore, the following section is created to identify respondents' variety of perspectives on main barriers to the implementation of a green building rating system and the reasons for the downturn of the certified green buildings in New Zealand. Hence, it will help to understand how they can see opportunities to promote green-rated buildings or certification in the New Zealand building industry.

2. Research Methodology

The research methodology involved the development of a questionnaire for stakeholders and/or experts who are involved in the New Zealand building industry sector and/or who have had experience with the Green Star. The purpose of the questionnaires was to grasp the current situation of the green building market in the New Zealand building industry and to investigate building professionals' awareness of a green building rating system, including the drivers, obstacles and reasons for implementing green building certification. The targeted population for the questionnaires involves Green Star professionals

who are directly involved in NZGBC, especially in the application of the Green Star NZ rating tool, and comprise Green Star Accredited Professionals, Green Star Practitioners, Green Star Accredited Energy Modellers, Green Star Consultants, and NZGBC Assessors. About 400 email addresses of participants were obtained from the public list of the accredited professionals that are available on the New Zealand Green Building Council (NZGBC) websites. An email was sent to all of these contacts directly, inviting them to take part in the online survey and asking them to voluntarily fill the questionnaire. This questionnaire took approximately 15-20 minutes of their time and was conducted through an anonymous online survey for one month. Ethical Approval from the University of Auckland was required in order to conduct a questionnaire with people involved in the design and building industry. The survey was approved by the University of Auckland Human Participants Ethics Committee (UAHPEC) on the 25th of January 2019 for a period of 3 years, which is part of a wider study for Doctoral research. The online tool used for the web-based survey was QualtricsXM, offered by The University of Auckland. Responses are stored in a survey database and processed automatically, creating visual reports like charts and graphs for presenting trends and patterns of data. The online survey included an introduction explaining the research intent and the specific aims of the questionnaire. A reminder email was sent to the participants who had not completed the online survey. The survey was constituted by a set of a question, mainly multiple choices, Likert scale and open-ended questions. A scalar format with ordered response categories has been adopted, and the scale was expanded to a 4 point scale with options as extremely easy, somewhat easy, somewhat difficult, and extremely difficult. Other closed type ended questions consisted of 'tick all which apply' categories or single 'yes' or 'no' answers. The survey investigated the professionals and stakeholders' knowledge and the current barriers to conduct a green building certification process. Section 1 of the survey collected basic information on the respondents in the building industry. This section also sought to survey their awareness of the Green Star rating system by asking how they knew about it for the first time. Section 2 of the survey focused on those respondents who have been involved in the certification process and who have worked with Green Star NZ projects. This section sought to capture their views or experiences on a range of issues around their involvement in three barriers related to knowledge, cost, and time. Section 2 of the survey was divided into three parts. Part 1 was designed to evaluate the knowledge and practical experience of participants with the Green Star rating system such as understanding the difficulties or challenges they faced in the past. Part 2 was created to identify time barriers caused by delayed schedules that impedes the progress of the Green Star certification. In Part 3, respondents were asked if they had any experience with an increased budget to achieve the certification for their buildings.

3. Green Star professionals' perspectives on Green Star NZ rating system

3.1 Respondent Background Information

The survey on Green Star NZ was sent to about 400 professionals. Of the total respondents, only 34 completed the survey. The majority of the respondents were Green Star accredited credentials (78%), followed by Green Star Practitioners (19%). When asked how they knew about a green building rating system for the first time, 25% of respondents had prior experience with green building projects and 19% were involved in green building projects as part of a contract requirement. However, no one has responded they knew about the green building rating system through case studies. The reason for this response is that building professionals commented that they want to see case studies that have more data and analytics showing how green buildings have performed efficiently or how much green building

certification is worth in the building sector. 69% of respondents have been involved in green building certification projects, especially Green Star office projects. However, the other 31% who have not been involved in a green building project before said that it is hard to put the Green Star certification into practice (18%) and they have not had any suitable projects to put it into practice (26%). Many respondents responded that they cannot easily put them into practice in their building. It can be seen that many opportunities to implement green building certification have been limited in the New Zealand building market even if respondents have knowledge of a green building rating system and became Green Star accredited professionals. Other respondents (32%) noted that it is because "green building certifications (or credits of it) are not required under New Zealand Building Code which is what projects are built to (i.e. minimum standard as best practice)". Besides, there were common views about lack of support from main contractors and subcontractors. In some cases, clients and building owners have not chosen to follow the Green Star process and their budget has not allowed for a green building rating system.

3.2 Barriers to green building certification with Green Star NZ

3.2.1 Knowledge barriers

The respondents were required to answer what is the most important thing to know before the engagement on the Green Star certification process and then how difficult it is to accomplish several aspects in the Green Star certification process. The survey found 3 categories related to knowledge barriers: complying with the requirement; understanding the certification process; satisfying the minimum rating levels. Respondents regarded compliance requirements (47%) and the certification process (26%) as somewhat difficult (Figure 2). According to the Green Building Market report, the survey result also showed that lack of information on certification requirements (38%), the difficulty of the certification process (35%), and time of the certification process (33%) are considered as the most important barriers to green building certification throughout South East Asia (Krups et al., 2014). Although some respondents have done training programmes on a green building rating system or passed the GSAP exam it was not sure if they were technically trained to understand the essential information about the Green Star rating system and to effectively work on Green Star projects. They also commented that "people do not truly understand the process until they go through it, no matter how well Green Star is taught" and "lack of Green Star Knowledge embedded in the industry because of employment of GSAPs consultants rather than existing project team members". Markelj et al. (2014, p. 8778) stated that "most of the existing building sustainability assessment methods are either not adapted for independent use by the architects or are the requirements for criteria fulfilment quite complex and require specific knowledge of an expert consultant". Despite the importance of the level of expertise and knowledge through green building education, the public or any group of stakeholders are not likely to be content with green building practices unless they are educated and informed. Therefore, the role of education and training systems could be important for the public to be motivated towards green building development and to promote the green building market significantly (Niroumand et al., 2013; Smith, 2008; Udawatta et al., 2015). Also, the respondents additionally commented that "knowing the required design parameters and strategies and knowing where to access evidence or files which do not have any information in the technical manual is also an important aspect before starting with the Green Star certification process". They also wanted to know about the implementation costs (e.g. costs of design features) and benefits of green buildings for the owner and users that can drive Green Star certifications. Meanwhile, satisfying the minimum rating levels was rated as easy to be accomplished by

respondents (58%) (Figure 2). Technically, buildings will be able to achieve a Green Star rating from 1 to 6 star, but at least 4 Green Star rating (a total of 45 points) must be awarded to receive formal certification. It could be possible to achieve a minimum requirement with a basic credit that is usually easy to obtain, regardless of a building's basic information (Park et al., 2017).

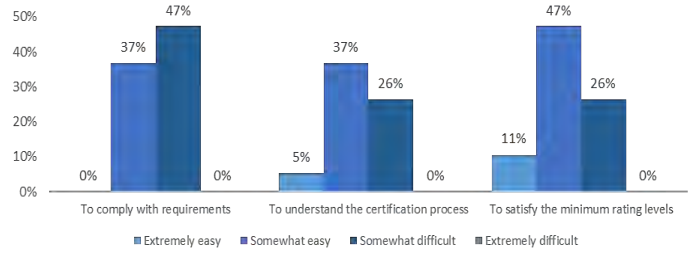

Figure 2: How difficult is it to accomplish the following aspects in the Green Star certification process?

Figure 3 shows that a lack of public awareness on green building certification (23%) was still the most difficult barrier to a higher success rate of green building projects. It is interesting that even though the green building movement has been increasingly grown in recent years, limited knowledge on the benefits of certified green buildings (15%) and lack of research on certified green buildings such as limited data on the performance of New Zealand case studies (13%) was perceived as the current barriers faced by New Zealand professionals. Samari et al. (2013) also remarked that limited knowledge and low awareness of the benefits of green building are barriers to adopting green building rating systems among the construction industry professionals. 22% of respondents choose that "lack of coordination or consistency between green building professionals and designers (or the other professionals involved)" and "poor level of compliance with the New Zealand Building Code" was considered as another challenge in acquiring Green Star certification which can result in a lower success rate. NZGBC (2017) claimed that the current building code hasn't been updated from 2007 and thus its policy is inadequate to build sustainability.

Figure 3: What are the specific barriers to knowledge?

3.2.2 Time barriers

The second section investigated the time barriers that the building industry professionals commonly faced when undertaking green building certification. The time barriers are related to the whole period of completing the submission documentation and predicting the certification timeline. Figure 4 shows that respondents deemed submission documentation (68%) and the certification timeline (43%) to be difficult aspects. According to Krups et al. (2014), the additional time needed for researching suitable materials and training on the whole green certification process are perceived as barriers by contractors, owners, and professional services.

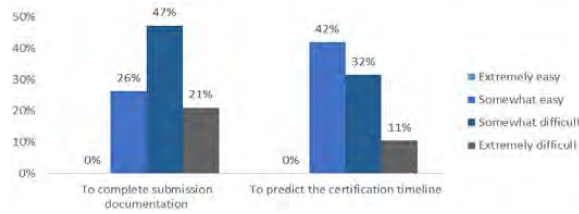

Figure 4: How difficult is it to accomplish the following aspects in the Green Star certification process?

These results are also related to figure 5 showing that additional time needed for preparing the submissions documents (37%) was considered as the biggest obstacle that arises frequently in many previous works of literature. Besides, 28% had protracted periods of project time and 26% had additional time for the certification process, as the main time barriers (Figure 5). These identified barriers are correlated to the time taken by the certification process. Most building professionals who are indirectly or directly involved in the certification process said that they devote long hours to the job, especially for the submission documentation. Other comments were about lack of demand from the clients who just wanted green buildings to rate it themselves rather than go through the official measures offered by rating systems.

Figure 5: what are the specific barriers that increase the time for obtaining the certification?

When asked at what stage of the building process was usually discussed with clients to pursue green building certification, the majority of respondents said that this happened during the “Initial discussion” (31%), in the “Pre-design phase” (15%) and the “Concept & preliminary design phase” (23%). This shows

that they discussed at the early stage of the design process which is a crucial time for all stakeholders, professionals and clients. Hence, all the information related to certification should be as accurate as possible at the schematic design stage, presenting how the certification process flows and how professionals can assist in the management of the certification. However, 8% of respondents discussed at the stage of "Contractor procurement". It seems very late in the process because the early stage of discussions of the certification should be encouraged to provide information on appropriate details to the clients and reduce conflicts and constraints during the construction process. The other respondents (23%) answered that discussion about green building certification was carried out in all the process of building work. They also commented that "Design rating is usually on the basis of construction issue documentation and can take 3-6 months from design drop. For a built rating stage, as-built and commissioning data are required which can take anywhere from 3 months to 1 year following the principal contractor (PC), but it depends on how readily documentation can be provided to GSAP".

When office projects took longer than planned in the certification process, the responses to the question were a few months (27%), half a year (55%), and more than a year (18%) respectively. The whole certification process of Green Star took normally about 6 months longer to be completed. Then, there was the open-ended question related to the previous question asking the reason why the delay happened in the certification process. Many respondents pointed out chasing the information for the documentation from required people such as consultants, contractors and suppliers. They had difficulties in getting the submission documentation together from subcontractors, particularly when they were no longer involved in the job related to HVAC and their O&M information needed for multiple credits. Besides, there were delays to meet the compliance requirement. Respondents said that the delay usually happened after the first round of assessment and assessors required more time than usual. One of the respondents said that "Documentation is not provided promptly by subcontractors, in particular materials data. This depends on the type and quality of systems set up to procure and record information during construction works. Once they have been paid it is also typically harder to get further documentation". Most of the respondents highlighted that it was caused by the delayed documentation from third parties who provide project teams with the information or submission for evidence. The Green Star rating system is a documentation-based assessment which should be managed and maintained by individuals or companies. "The difficulty of achieving a credit depends on practical procedures such as paperwork, the proportion of time-consuming work, and confirmation also greatly affect the difficulty" (Park et al., 2017, p.4). One of the respondents noted that it is hard to get partial and/or full documents from people involved in a timely manner. Also, the length of the project, the type and quality of the system and the processing time of assessors were other reasons that led to a delay in the Green Star certification process.

3.2.3 Cost barriers

The third section asked respondents about what cost barriers make Green Star certifications difficult. It is clear that the prediction of the extra cost related to green building certification was difficult as shown in Figure 6. Some respondents commented on the difficulties in achieving a specific credit when building industry professionals are new to the certification. For example, they experienced that "The additional cost is usually needed during the design process, as a result of incorporating design features or strategies into the building in order to comply with the Green Star requirements". Geng et al. (2012) also argued that the movement towards green building practices requires the need of additional costs related to new technologies for renewable energy exploitation which need the employment of skilled

workers or experts. Others stated that specialist modelling for energy, daylight and comfort caused extra costs to achieve a specific credit under the Green Star rating tool. For this reason, the leading challenge of building market is that nobody will show the willingness to embrace additional costs involved in building green (Perrett, 2011).

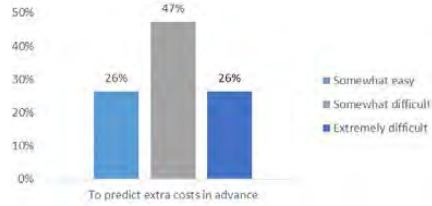

Figure 6: How difficult is it to predict extra costs in advance?

The key to this question is to find out what is causing their cost increase. Respondents stated that a higher upfront cost, whether actual or perceived, is the major barrier to promote green building certifications (23%) (Figure 7). It was followed by expenditures for certification (15%), lack of incentives from a central government (15%) and additional consultant costs (15%). Unexpected or hidden costs (14%) are also the barriers that generate uncertainty for the cost of attaining green building certification Other respondents (4%) also mentioned lack of documentation management or governance between project teams for streamlined submissions and lack of funding for certification. They often believe that “There is a perception of higher associated costs so it is avoided by clients unless they are owner- occupiers”.

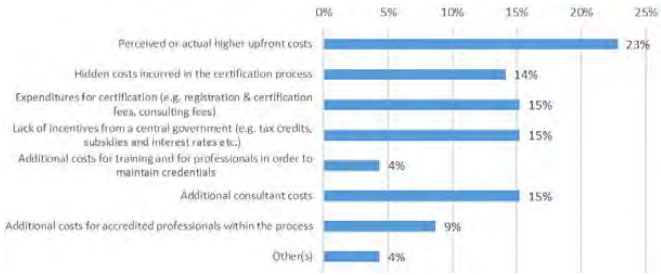

Figure 7: what are the specific barriers to cost?

The next question was about whether or not the building professionals have discussed with clients about the possibility of exceeding the budget in order to increase the number of points or the rating level to be achieved. 67% of respondents answered that they had a discussion and amongst the people who said yes, 56% of respondents were able to increase the certification level or the number of points after the discussion, while the rest of 44% said that it did not happen. Additional comments on why those people did not increase the rating level or points were also received. One of the comments was that “The concept design includes a list of recommended features for an initial budget. At later stages that are not usually desired to increase budget were not agreed initially. We have been able to increase

rating via cost neutral 'innovation' opportunities". Another respondent commented that "A discussion was whether we could push an additional few points to potentially hit 6 stars. This was not quite possible in the end" and "The business case that has done had a budget and the business was not in a position to spend more as there were other projects in the pipeline too".

Most respondents said that extra costs incurred at the step of 'Preparing for submission'. At Eligibility and Certification Registration stage, respondents can notice extra costs such as registration fees when they register their projects through the application as these costs can be found on the NZGBC website. However, extra costs are needed more at preparing for submission than the other stages. This is because one of the respondents noted that "Assuming preparing for submission includes managing the collection of all documentation from the design team. If people target both design rating and built rating, then costs can double. Implementation costs, additional design features, additional on-site monitoring by the main contractor and GSAP engagement (design team and contractor/on-site) can be extra costs". Other respondents commented that "Additional fees are usually needed to address the assessor comments depending on what they have asked for". For example, "Assessors' comments typically result in additional consultant fees at Round Two". Moreover, "Significant staff time in evidence documentation or file organisational structure was also related to extra costs".

4. Conclusions

This paper provided building professionals' views on the current barriers to the implementation of the Green Star NZ rating system in the New Zealand building industry. The results of the survey showed that people seem to think that a green building rating system is a 'nice-to-have' requirement rather than a 'must-have' requirement in the decision making of their investment. Although the property investment is increasingly used to apply sustainable strategies to the investor's business initiative, it has not been higher than in other developed countries and has grown relatively slowly in the New Zealand market. The most sensitive barriers to the use of rating tools seem to be the complexity of understanding Green Star rating tool, time-consuming procedures and additional costs that are hidden in the whole process, all of which spread scepticism about the process of rating systems. These barriers are often evident in the certification process of Green Star NZ. First of all, all those professionals who will be responsible for green certification such as the design team or project managers may have difficulties in approaching the assessment process by themselves without employing consulting services. Also, understanding at first sight how the submissions are prepared and approved holistically can be challenging. This results in the need for the repeated explanation of the requirements for the criteria, even if they are educated on the subject or have taken a Green Star course. The second problem is caused by the fact that unskilled people cannot determine how long their projects will need additional time to collect the required information and documentation. Also, people cannot predict the exact time of the certification process to be prepared and to be finished. Thirdly, additional costs are one of the major barriers to promote the Green Star rating system. Many building professionals mentioned high upfront costs such as registration fees, consultant costs, implementation fees, and documentation fee etc. Other fees can be charged in some situations, such as additional reviews and appeals before NZGBC final approval, as well as additional project enquiries and credit interpretation requests. However, there might be other hidden costs for preparing the Green Star credit requirements. Therefore, understanding what barriers building professionals have faced through the survey could lead to the improvement of the application of the Green Star rating system and project teams could be able to more effectively accept the implementation of Green Star in future. For these reasons, further studies are necessary to develop a pre-assessment

framework to overcome some of the issues highlighted by this survey. This will constitute the latest development of this research.

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