

THE IMPACT OF GREEN CERTIFICATION BREEAM ON OCCUPANCY RATES OF COMMERCIAL BUILDINGS IN THE UK

Abdussalam Shibani

School of Energy, Construction and Environment,
Coventry University, Coventry, UK
*ab1732@coventry.ac.uk

Araz Agha

School of Energy, Construction and Environment,
Coventry University, Coventry, UK
* ab4146@coventry.ac.uk

Dyaa Hassan

School of Energy, Construction and Environment,
Coventry University, Coventry, UK
ad4880@coventry.ac.uk

Filly Naomi

School of Energy, Construction and Environment,
Coventry University, Coventry, UK

ABSTRACT

It is still a lively debate on whether Building Research Establishment Environmental Assessment Methodology (BREEAM) certification has a significant increase on the capital cost of a building. There is a previous study mentioned about half of the investors or developers said there is a significant extra cost in BREEAM certified building, but BRE said otherwise. Undoubtedly, the capital cost is one of main considerations for investor and developer to construct a building. Yet, business industry sector consumes about 49% of energy consumption in the UK. Achieving higher financial return then become one the solution to encourage BREEAM certification on the commercial building. Higher financial return often associated with the health of cash flow into the company. In a commercial building, occupancy rate is vital for a company to predict their cash flow. Nevertheless, occupancy rate is also influenced by the rent and sale's fee. Even with low occupancy rates, the building owners still have to pay the building operating cost and property taxes. However, there is little or no study about BREEAM certification's impact on occupancy rates in UK's commercial buildings. The main aim of this research is to increase the BREEAM certified buildings, especially the excellent and outstanding rating, by demonstrating whether BREEAM certification has impacts on Occupancy Rates in the UK's Commercial Buildings. Research method employed in this study is a mixed research method. The result of the analysis from the questionnaire will be complement by interview analysis from experts who are from BREEAM related field. The findings showed that BREEAM certification has positive impacts on occupancy rates in the UK's commercial buildings.

INTRODUCTION

There are many green building certifications, but the focus of this study will be Building Research Establishment Environmental Assessment Method (BREEAM) certification. Currently, BREEAM established by the BRE in the UK and is implemented as the best practice in the UK (BRE, 2018). Moreover, there are many schemes and types for BREEAM projects. In this research, only BREEAM schemes and types available in the UK will be used, such as BREEAM UK Domestic Refurbishment and BREEAM UK New Construction. Furthermore, only Commercial Buildings in the UK and occupancy rates will be the focus in this research. Occupancy rate is the number of square meter or units occupied per the total available square meter or units (Chen, 2018). According to Fraser (2019), in regards of development, BREEAM is a tool to assess project design and evaluation. According to BRE (2018), one of the main of

BREEAM is to reduce the impacts of buildings on the environment. Additionally, one of the objectives of BREEAM is to provide buildings with minimum environmental impact that recognized by market. As a third party, BRE aids the project by sending the BREEAM Professionals.

BREEAM has 5 classification of ratings, which are Pass, Good, Very Good, Excellent, and Outstanding (Li & Chen, 2017). The final rating of the project will be determined after category weighting process (BRE, 2018). Furthermore, evidences are required from the project team to the licensed BREEAM assessor. The BREEAM evidential requirements is perquisite in order to comply with the assessment criteria (BRE, 2018). BREEAM has many schemes that suited to each of the project. For example, new construction project can use BREEAM New Construction 2018, while building that already operating can use BREEAM In-Use. Although there are many sustainable building certifications that widely recognized, BREEAM is still widely used in the UK. Develop by US, LEED (Leadership in Energy and Environmental Design) already have more 90,000 projects internationally (USGBC, 2019). Australia establish Green Star to assess design, operation and construction of buildings to minimize the carbon footprint (GBCA, 2019). CASBEE (Comprehensive Assessment System for Built Environment Efficiency).

In the BREEAM technical manual (2018), other than the nine environmental categories, there is a new one called ‘innovation’ as the tenth category Figure 1. Each category will be awarded by credits, the total credits given in consideration of each category’s performance. Percentage of credits achieved will be compared to the available credit in each BREEAM’s category (Kamsu Foguem & Abanda, 2019). Moreover, BRE has various schemes that suited to each building and project, from infrastructure project to building project (BRE, 2018) (Shibani et al., 2020), (Araz Agha et al., 2020).

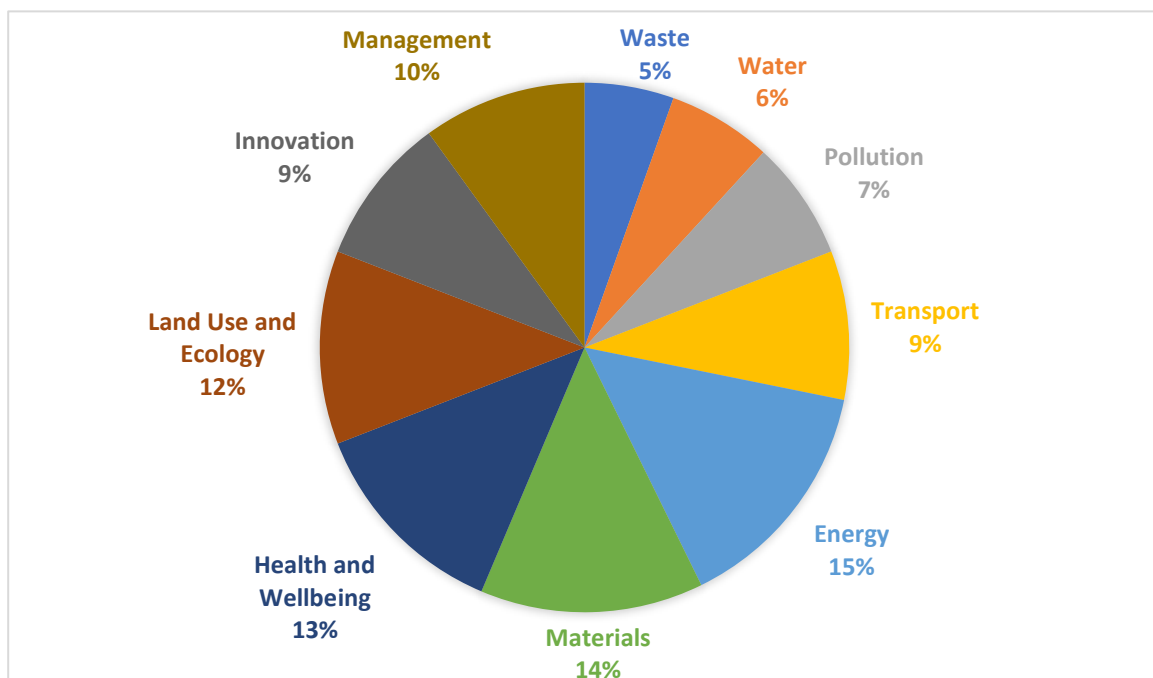


Figure 1: BREEAM categories (BRE, 2018)

As stated by Illankoon (2017), there are seven criteria or categories that rating tools have in common which are 1) Energy 2) Site 3) Material 4) Indoor Environment Quality 5) Management 6) Water 7) Waste and pollution. BREEAM has similarity with the categories mentioned by Illankoon (2017), however, BREEAM has additional categories such as transport and innovation. Furthermore, in BREEAM the term used for site categories is land use and ecology. While for Indoor Air Quality has similarity with health and well-being. Each of BREEAM categories has different weighting, the highest weight is energy (BRE, 2018).

BREEAM's Advantages and Disadvantages

Building consumes 40% of total energy usage in the EU (IEE, 2015). Given the fact, many projects and development trying to cut their carbon emission by using reliable assessment and evaluating method. BREEAM, as the foremost assessment method in UK, has proven its benefit by having minimising the energy usage in the building that have BREEAM certification compared to conventional building by placing ENE credits as the largest weighting composition (BRE, 2018). Furthermore, according to a research by BSRIA (2012) to the BREEAM client, the main benefit of BREEAM is to gain recognition or industry standing. While improving occupant satisfaction and reducing waste and materials used placed second Figure 2. In this section, the researcher classified the advantages of BREEAM in 4 categories, which are environmental, economic, social, and health and well-being.

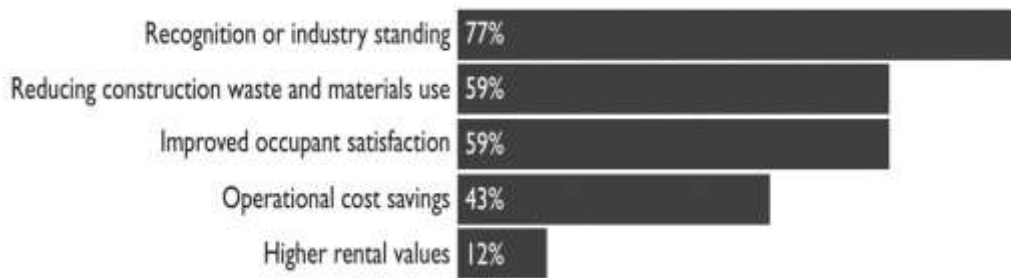


Figure 2: Benefits of BREEAM by client respondent survey (BSRIA, 2012)

UK's Commercial Building Typologies

In a report by Property Industry Alliance (2017), building that can be called commercial properties are retails, offices, industrials, and hotels. Similarly, according to Department for Business, Energy & Industrial Strategy (BIES) in 2018, commercial property consists of Incubator/co-working/accelerator spaces, science/research parks, industrial estate/business parks and single site commercial space. Likewise, BRE (2018) classify commercial building in UK are office, industrial, and retail. From all the resources being mentioned the similar typology of commercial are offices, industrials, and retails. While according to BIES (2018), educational functioned building can be categorized as commercial property as well. It shows the development of typologies in commercial property in the UK.

METHODOLOGY

This study will use mixed method research with quantitative as the core component and qualitative as the supplemental component. Additionally, quantitative approach usually can be seen as positivistic paradigm while qualitative approach can be seen as a constructivist or interpretative paradigm (Kawulich, 2012). This study selects transformative paradigm, which the methodology is a mixed method. Transformative view study aiming for a point of view that can change the action of the participants or individuals (W.Creswell, 2014). For this study, the researcher compiled the research process and sequenced it according to the needs of the research as shown in Figure 3. Firstly, the researcher identifies interesting topic by looking at the knowledge gap after reading many journals. Then, the researcher looks for research rationale, include in this part the problem statement and the benefits of the research. After knowing the research rationale, the researcher began to state the aim and objectives. Next is the literature review, the researcher looking for reliable sources from books and journals in the last 5 years. Literature review will help the researcher to find out whether the research is worth to be conduct or not (Creswell, 2014). For the data collection, the researcher does questionnaire's survey and expert interview simultaneously. Then, data analysis will be process by SPSS software. Lastly, there are some findings that can be made to conclusion and recommendation (Agha, 2020) (Shibani, 2021).

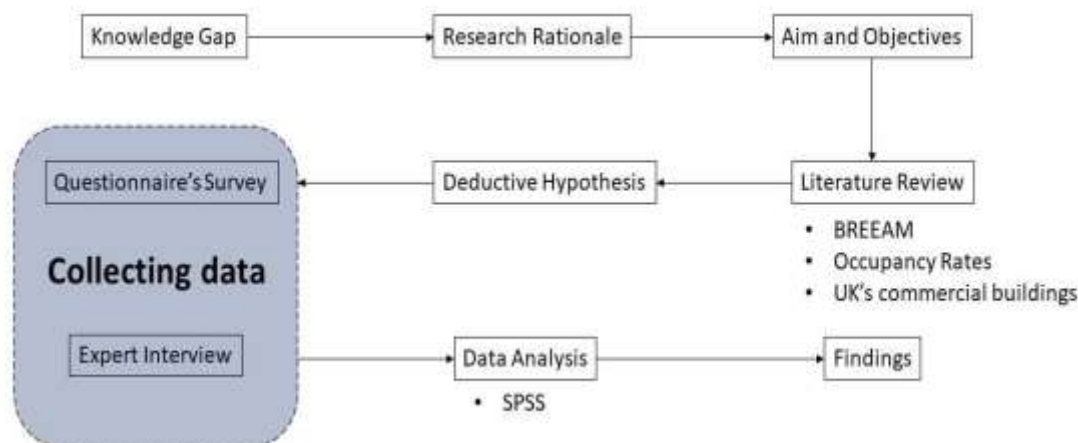


Figure 3. Research process for the study by Author

Mixed Method Research

Over the years, mixed method become more recognizable as an alternative method research other than the usual methods, which are quantitative and qualitative approach (Walliman, 2017). Likewise, according to Creswell (2014), mixed method is an approach for collecting and integrating both qualitative and quantitative data. According to Creswell & Clark (2018), there are several steps in data collection procedures for mixed method studies Figure 4. However, mixed method research is not simply adding quantitative research to the qualitative method or vice versa, it has be integrated or connected at some aspects (Creamer, 2018). Additionally, the aim of mixed method research is to merge the strengths from different methods (Kumar, 2019). There are various methods of mixed method research design, with core component and supplemental component (Morse, 2016). In this study, the researcher used quantitative + qual model, which is using quantitative method as the core component and using qualitative method as supplemental component simultaneously.

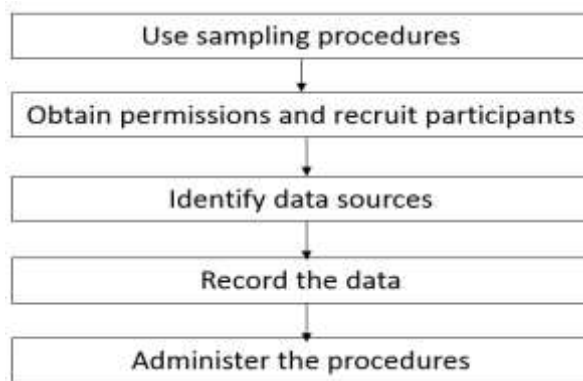


Figure 4: Data collection procedure steps for mixed method (Creswell & Clark, 2018).

Data Collection and Analysis

Questionnaire Data and Analysis

To get a reliable data, the questionnaire was given to the targeted participants that related to the research topic. The first categories are the ones who worked in the construction and design industry, such as contractors and consultants. Similarly, academic institution sample is from the one whom related to the construction and design industry. Second category comes the user of the building, which are building tenants or building's occupants. Real estate developers, investors, and building's owner represent the point of view from the client of commercial property. As much as 74 participants fill in the questionnaire, with the details as follows: 16.67% academic institution, 5.13% investor, 1.28% building's owner, 21.79% building's tenant

or as an occupant of the building, 15.38% contractor, 24.36% consultant, 6.92% real estate developer, and 7.79% others.



Figure 5: (Q1) Demographic Data of Respondent

In the data analysis, the researcher uses frequency analysis to understand the distribution of respondent's response. A frequency distribution is a sum of the number of times each score on a single variable occurs (Leech, et al., 2011). To elaborate question two (Q2) to question 11 (Q11) in questionnaire, frequency table analysis will be presented in this chapter. There are terms in the frequency tables, as follow (Meyers, et al., 2013): a) The first column is the list of the value, which in this study is Likert scale b) Frequency represent the number of cases per value c) Percent provided the percent of cases in each value per total cases d) Valid percent shows the percent in each value compare to valid number of cases e) Cumulative percent is gradual cumulative percent from each value.

Table 1. (Q2) The investors or developers willing to spend more to get BREEAM cert

		Frequency	Percent	Valid Percent	Cumulative (%)
Valid	Definitely Disagree	1	1.4	1.4	1.4
	Disagree	8	10.8	10.8	12.2
	Neither Disagree or Agree	16	21.6	21.6	33.8
	Agree	41	55.4	55.4	89.2
	Definitely Agree	8	10.8	10.8	100.0
	Total	74	100.0	100.0	

In question 2, the researcher wants to discover whether the investor or developers want to spend more for a BREEAM outstanding and excellent in particular. Based on Table 1, the majority of respondent, as much as 55.4%, agree to the statement that investor and developers willing to invest more. To elaborate more, Figure 5 demonstrates the real estate developer and investor response. More than half number of investor and developer choosed agree or definitely agree which indicates they want to spend more to achieve BREEAM excellent and outstanding target.

Table 2. (Q3) BREEAM certification will have a positive impact on occupancy rates

		Frequency	Percent	Valid Percent	Cumulative (%)
Valid	Disagree	1	1.4	1.4	1.4
	Neither Disagree or Agree	10	13.5	13.5	14.9
	Agree	43	58.1	58.1	73.0
	Definitely Agree	20	27.0	27.0	100.0
	Total	74	100.0	100.0	

According to Table 2. 13.5% of respondents answer neither disagree or agree, which indicate they are quite unsure whether the BREEAM outstanding and excellent certification effect positively on occupancy rates. In contrast, out of 74 people, 63 people are giving positive response to the statement in Q3. With the detail of 58.1% agree and 27% definitely agree to the statement. It describes the majority of the answers agreeing to the statement that BREEAM outstanding and excellent will give a good impact on occupancy rates.

Table 3. (Q4) Health and well-being are an important aspect for occupant / building users will increase the occupancy rates

		Frequency	Percent	Valid Percent	Cumulative (%)
Valid	Disagree	1	1.4	1.4	1.4
	Neither Disagree or Agree	1	1.4	1.4	2.7
	Agree	40	54.1	54.1	56.8
	Definitely Agree	32	43.2	43.2	100.0
	Total	74	100.0	100.0	

One of considerable aspect that effect the occupancy rates is health and well-being, because it affects directly to the occupant of the building. Based on Table 3, more 97% give positive response, with the detail of 54.1% and 43.2% for agree and definitely-agree respectively. According to the result, health and well-being is indeed an important aspect to increase the occupancy rates.

Table 4. (Q5) Efficient energy usage consideration will increase the occupancy rates

		Frequency	Percent	Valid Percent	Cumulative (%)
Valid	Disagree	2	2.7	2.7	2.7
	Neither Disagree or Agree	3	4.1	4.1	6.8
	Agree	35	47.3	47.3	54.1
	Definitely Agree	34	45.9	45.9	100.0
	Total	74	100.0	100.0	

Table 4 shows over 93% of respondent agreeing that efficient energy usage is an important aspect for the occupant of a building to increase the occupancy rates. With the detail of 47.3% and 45.9% respondent choose agree and definitely agree. It can be clearly seen that the respondent's awareness for sustainability issue in building is high.

Table 5. (Q6) BREEAM certification can be used to get higher occupancy rates

		Frequency	Percent	Valid Percent	Cumulative (%)
Valid	Disagree	3	4.1	4.1	4.1
	Neither Disagree or Agree	12	16.2	16.2	20.3
	Agree	42	56.8	56.8	77.0
	Definitely Agree	17	23.0	23.0	100.0
	Total	74	100.0	100.0	

Table 5 illustrates Question 6 (Q6) results of whether higher occupancy rates can be achieved by getting a BREEAM certification. More than 79% of total respondents have the same opinion as the statement of Q6. About 56.8% and 23% choose agree and definitely agree to the statement respectively.

Table 6. (Q7) BREEAM certification makes the building easier to rent/sell

		Frequency	Percent	Valid Percent	Cumulative (%)
Valid	Definitely Disagree	1	1.4	1.4	1.4
	Disagree	3	4.1	4.1	5.4
	Neither Disagree or Agree	23	31.1	31.1	36.5
	Agree	30	40.5	40.5	77.0
	Definitely Agree	17	23.0	23.0	100.0
	Total	74	100.0	100.0	

Table 6 presents data of Question 7 (Q7), whether BREEAM certification makes the building easier to rent or sell. Out of 63% of total respondents agreeing to the statement, while 30% is neither disagree or agree. The results suggest that BREEAM certification can be a plausible option as a marketing tools to make the building easier to sell or rent.

Table 7. (Q8) Occupant satisfaction will increase with BREEAM certified building

		Frequency	Percent	Valid Percent	Cumulative (%)
Valid	Definitely Disagree	1	1.4	1.4	1.4
	Disagree	2	2.7	2.7	4.1
	Neither Disagree or Agree	14	18.9	18.9	23.0
	Agree	44	59.5	59.5	82.4
	Definitely Agree	13	17.6	17.6	100.0
	Total	74	100.0	100.0	

According to Table 7, about 76% of respondent have the same opinion about the statement of Q8. To elaborate, 59.5% and 17.6% choose agree and definitely agree respectively. It indicates that BREEAM certification has direct impact on occupant satisfaction in the building. Indeed, there are many benefits for occupants of building in BREEAM certified building (BRE Global, 2016). For example, the health and well-being of the occupants, and lower electricity bills for the tenants or occupants.

Table 8. (Q9) The developers or investors will use BREEAM certification again

		Frequency	Percent	Valid Percent	Cumulative (%)
Valid	Disagree	3	4.1	4.1	4.1
	Neither Disagree or Agree	20	27.0	27.0	31.1
	Agree	37	50.0	50.0	81.1
	Definitely Agree	14	18.9	18.9	100.0
	Total	74	100.0	100.0	

Table 8. illustrates whether investors or developers will use BREEAM certification again for another project after they use it in previous project. It is clear that more than half of the total respondent agree to the statement. Additionally, 18% of the respondent choose definitely agree and approximately a quarter of respondent choose neither agree or disagree. According to the data, the possibility that investor will choose BREEAM certification in their next project is quite high.

Table 9. (Q10) BREEAM certified building is more profitable in long term

		Frequency	Percent	Valid Percent	Cumulative (%)
Valid	Disagree	1	1.4	1.4	1.4
	Neither Disagree or Agree	8	10.8	10.8	12.2
	Agree	39	52.7	52.7	64.9
	Definitely Agree	26	35.1	35.1	100.0
	Total	74	100.0	100.0	

Table 9. presents data of Q10, BREEAM certified building is more profitable in long term considering the energy cost and maintenance cost. From the overall response, about 87% of the respondent have the same point of view as the Q10 statement. Additionally, only a small amount of 10% neither agree or disagree to the statement. Some researches indicate the benefits of green certified building are less energy consumption and reduced maintenance cost (Dwaikat & Ali, 2016). Similarly, the results of Q10 shows that in the long run, BREEAM certified building could be more profitable than conventional building due to the energy and maintenance cost.

Table 10. (Q11) BREEAM certification has significant and positive impacts on occupancy rates in the UK's commercial buildings

		Frequency	Percent	Valid Percent	Cumulative (%)
Valid	Disagree	1	1.4	1.4	1.4
	Neither Disagree or Agree	18	24.3	24.3	25.7
	Agree	41	55.4	55.4	81.1
	Definitely Agree	14	18.9	18.9	100.0
	Total	74	100.0	100.0	

Table 10. gives frequency analysis data of Q11, which is whether BREEAM certification has significant and positive impact occupancy rates in the UK's commercial buildings. Some of the drivers to build a green building is to get a higher occupancy rates and higher rental returns (Darko, et al., 2017). Likewise, around three-quarter of respondent agreeing to the statement, while a quarter of respondent choose neither disagree or agree.

Interview Data and Data Analysis

This section intent to provide the participant's answer on interview question and do the analysis from theirs feedback. Participants come from the workplace which has BREEAM and commercial buildings related practice. The participants are as follows; (i) Participant A is an expert in BREEAM, formerly work in BRE and currently work as a Founder and Director in Sustainability Consultant Practice (ii) Participant B work as a BREEAM Assesor (iii) Participant C work in Green Building Consultant (iv) Participant D and E work in a Real Estate Agency. There are two main purposes from interviews, firstly: to compare the analysis finding on the quantitative data. Secondly, obtain a rich insight from the participant which the researcher can't get from the quantitative surveys. Content analysis technique was used to interpret the answer from each participants and find some common keywords that the participants used. Below are some selected parts of interview questions:

Q. 1: Participant were asked whether there are positives and significant impacts of green certification particularly BREEAM certification on occupancy rates in the UK's commercial building.

Q. 2: Participant were questioned what the most important factor from BREEAM certification for tenant or occupants are to make a decision. Aim of this question is to seek what the main aspects are to increase occupancy rates in the commercial building.

Q. 3 : Will occupant satisfaction increase with BREEAM certified building?

Q. 4 : Whether developers or investors will use BREEAM certification again after having BREEAM certified buildings in UK?

Q. 5 : Will BREEAM certification leverage the occupancy rates in commercial building?

Q.6: Whether BREEAM outstanding and excellent certification create higher occupancy rates in commercial buildings?

Most of participant shared the same opinion that energy efficiency and health and well-being become the prominent factor for higher occupancy rates. They underlined that health and well-being element determined the condition of occupants, and user are more aware and take preference over non-certified BREEAM commercial building. Especially, BREEAM certified building potentially could decrease the Sick-Building Syndrome, resulting in higher occupant satisfaction. The second aspect is energy consideration, participant pointed out that energy bills in UK is still expensive, therefore, energy has a huge part into consideration of the increasing occupancy rates in BREEAM's building. Moreover, participants from real estate agency highlighted that property's offer are always come with energy performance certificate for tenant's consideration.

According to the interview, the chance of investor or developer will use BREEAM again is quite high. After using BREEAM once, the client will get used to how it works next time, which makes it easier. Another notable point, BREEAM is still largely used across the UK, and dominating the environmental assessment certification. It leads to the reason why the client repeatedly uses BREEAM again. Majority of participants believe that BREEAM has positive impact on occupancy, however not significant, because there are other factors that affected the occupancy rates. BREEAM can be used as a marketing tools to gain competitive advantage, especially in commercial building. Moreover, location is also a notable factor for commercial building which used BREEAM certification beyond very good rating. In southern part of UK, mostly in London, very good is a minimum standard for commercial building. Whereas excellent and outstanding rating can be advantageous in property market to attract the tenant.

Visual Analysis and Data Comparison

Visual Analysis

The previous section discusses the analysis per statement in the questionnaire, while this section compares data between each statement. Furthermore, this part provides visual analysis from the questionnaire with Likert scale distribution graph. The Likert scale-based instrument uses to measure the respondent's feedback towards BREEAM certification impacts. Different aspects from BREEAM certification that could affect occupancy rates in the UK's commercial building are stated from Q2 to Q11. Such as health and well-being, energy usage, maintenance cost and others. The graph below shows the summarize analysis from Question Two (Q2) to Question Eleven (Q11) according to the number of participants. As the graph shows, there is a majority tendency towards the agree and definitely-agree response cumulatively. Especially Q4 which has

the most positive response follows by Q5 and Q10 respectively. It indicates that health and well-being, efficient energy usage, energy cost and maintenance cost are the significant aspects from BREEAM certification which leverage the occupancy rates. In later part, the researcher will discuss the result from quantitative data compared to the interview data. To ease the reader identifying Q2-Q10, below is the questionnaire list.

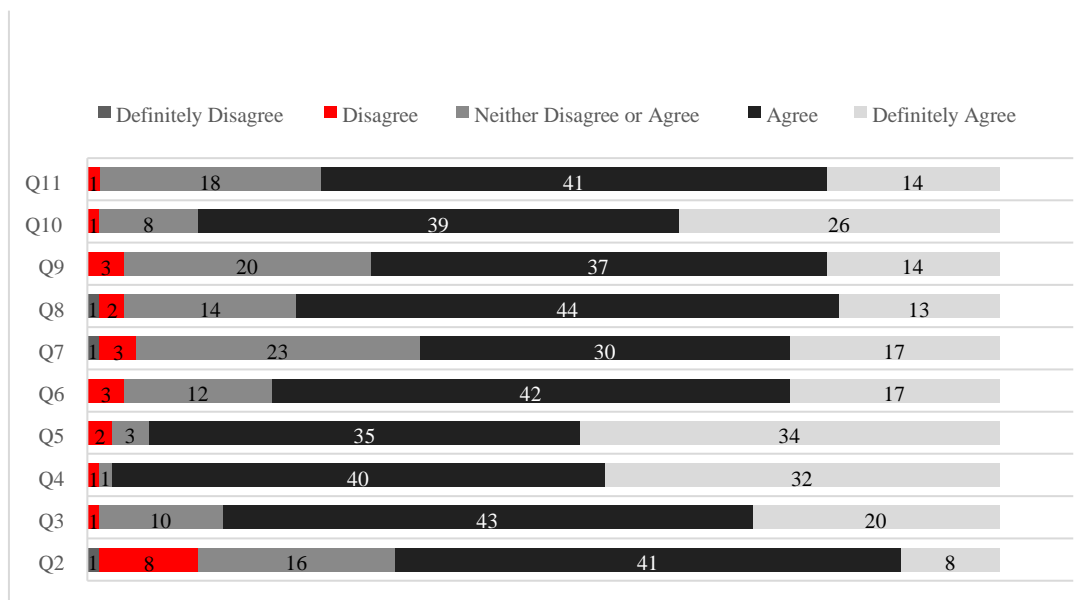


Figure 6: Likert Scale Distribution Graph from Q2 to Q11

Table 11. Questionnaire List

Name	Questionnaire
Q.2	The investors or developers willing to spend more to get BREEAM outstanding and excellent certification
Q.3	BREEAM outstanding and excellent certification will have a positive impact on occupancy rates
Q.4	Health and well-being are an important aspect for occupant / building users will increase the occupancy rates
Q.5	Efficient energy usage is an important consideration for occupant / building users will increase the occupancy rates
Q.6	BREEAM certification can be used to get higher occupancy rates
Q.7	BREEAM certification makes the building easier to rent/sell
Q.8	Occupant satisfaction will increase with BREEAM certified building
Q.9	The developers or investors will use BREEAM certification again
Q.10	BREEAM certified building is more profitable in long term (considering energy cost and maintenance cost compare to conventional building)
Q.11	BREEAM certification has significant and positive impacts on occupancy rates in the UK's commercial buildings

Earlier study shows that environmental rating tools contributes to occupant's satisfaction, especially in term of Indoor Environmental Qualities (Altomonte, et al., 2016). Likewise, the results for health and well-being (Q4) and occupant satisfaction (Q8) are in coherence. Q8 frequency analysis demonstrates that BREEAM certification will increase the occupant satisfaction and Q4 indicates health-and well-being is a vital aspect that will increase the occupant satisfaction. To elaborate more, several factors make up for health and well-

being in BREEAM are acoustic comfort, indoor air quality, visual comfort, water quality, and thermal comfort (Taylor & Pineo, 2015). Those aspects determine the occupant's comfort which contributes largely to occupant satisfaction in the building. Furthermore, the graph presents an interesting data, there are more respondents choose agree and definitely agree towards Q3 rather than Q6. There is a slight difference between the both statements. Q3 is focusing on asking a particular condition, which is BREEAM excellent and outstanding could increase occupancy rates. While Q6 doesn't specified which rating does BREEAM certification can be used to get higher occupancy rates. Based on the frequency analysis data, it can be concluded that the rating of BREEAM's excellent and outstanding is more appealing for the respondents. There are some additional benefits to outstanding and excellent rating. A study shows a greater CO2 emission's saving on BREEAM outstanding and excellent compared to good and very good rating. As much as 66% and 32% of CO2 emission can be reduced with BREEAM outstanding and excellent (BRE Global, 2016). In like manner, Q2 analysis result strengthen Q3 statement as well. Q2 analysis result suggest that investors and developers willing to spend more to achieve BREEAM excellent and outstanding. This implies higher occupancy rates can be achieved through BREEAM excellent and outstanding. In statement Q11, the respondent was asked whether BREEAM certification has significant and positive impacts on occupancy rates in the UK's commercial buildings, the result can be found on the histogram below. Majority of respondents tend to choose agree and definitely agree. However, achieving BREEAM rating from good to excellent leverage the capital cost from 0% to 1.7% for office (BRE Global, 2016). While, based on several studies, building with environmental rating can decrease the operational and maintenance cost in the building. Similarly, results analysis from Q10 shows 87% of respondents believe that BREEAM certified building is more profitable in long term due to lower running cost. Low running cost in BREEAM certification building could be one of the main drivers that encourage developer or investor willing to use BREEAM rating assessment again in their project (Q9). In Q9 data analysis, more than half of the respondent answer that developer or investor want to use BREEAM again in their next projects. Efficient energy usage is the primary factor of low running cost in a building. According to the analysis results from Q5, about 93% of respondent believe that efficient energy usage is an important consideration for occupant / building users which could be a factor to leverage the occupancy rates. Efficient energy usage become vital because its benefit to the investor or building owner to attract the prospective tenants. Typically, commercial's building owner manage the property at least for 10 years and potentially up to 25 years and; highest quality criteria for commercial property usually defined by its green feature (Rydin, 2016). In addition, green certification features, especially reduced operating cost become a competitive advantage for the property market (Fuerst, 2011). Additionally, according to Q7, BREEAM certification makes the building easier to rent/sell. Out of 63% of total respondents agreeing to the statement, while 30% is neither disagree or agree.

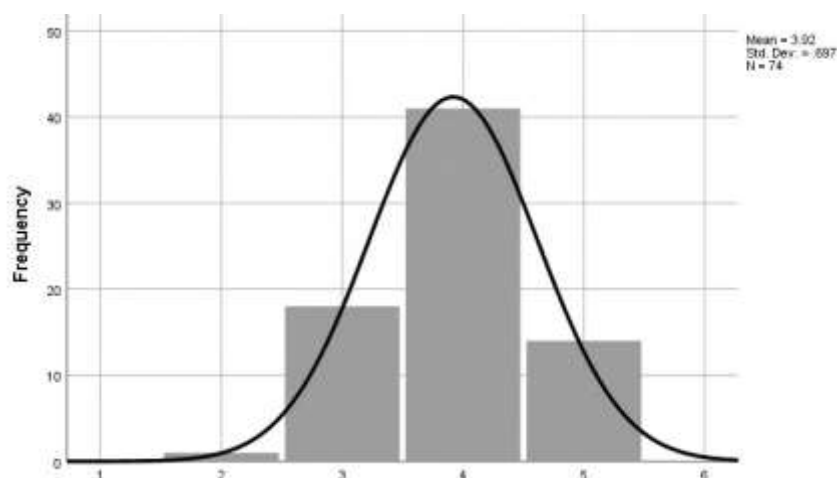


Figure 7: Histogram of 'BREEAM certification has significant and positive impacts on occupancy rates in the UK's commercial buildings' questionnaire.

Data Comparison

In short, from both quantitative and qualitative data analysis, the researcher have similar findings. Some of the findings are;

- a) BREEAM certification have positive impacts to the occupancy rates, however experts are unsure if its significant or not.
- b) Energy and health and well-being are the most important aspects for occupant satisfaction which will increase the occupancy rates.
- c) BREEAM excellent and outstanding can be a marketing tools for the company image and make the commercial building easier to rent or sell.

Validity and Reliability of the Findings

Other than literature review as the secondary data, this study also uses questionnaire and interview data as the primary data. To boost the validity for qualitative data, interview with an expert in the field is necessary (Zohrabi, 2013). Therefore, the researcher took an interview with participants that come from the workplace which has BREEAM and commercial buildings related practice. There are several instruments and procedures to test and increase the reliability of quantitative data. In this study questionnaire with targeted participant is used. Therefore, in the demographic question the participant was asked to choose one of the available options that is the best to describe their job.

Table 12. Reliability Statistics

Cronbach's Alpha	N of Items
0.837	10

For example, real estate developer, contractor, consultant, building tenant or occupant, investors and others. The next step is testing the reliability from the questionnaire data with SPSS tool. Cronbach Alpha is a feature in SPSS and uses to test internal consistency, if the result close to 1.00, it's considered very good (Cronk, 2017). In addition, Cronbach Alpha is typically used for Likert scale type's data (Leech, et al., 2011). In the table below is the result of the Cronbach Alpha test, the reliability coefficient from the test is 0.837. This implies the internal consistency from the questionnaire's result is very good.

CONCLUSIONS

Green Certification impacts always have an interesting issue to study in the construction industry. Such as, the impacts on; occupant comfort, rent fee, capital cost, occupancy rates, and others. And from various green certification, BREEAM and LEED are widely recognized and known as an environmental assessment method. While LEED is largely used in the US, BREEAM is dominantly used in the UK.

This study finds that the value of BREEAM attracts the occupants, resulting in improvement of occupancy rates. Several factors linked to the increase of occupancy rates in commercial building. Energy usage and health and well-being are the main elements from BREEAM, which lead to occupant satisfaction as well as investor and developer interest. Health and well-being have direct impacts to occupant comfort and productivity, while efficient energy usage has a direct impact on lower energy bills and maintenance cost. Thus, it's more profitable for the investor or developer in the long term, since the potential life cycle of a commercial building is last up to 25 years. Furthermore, BREEAM excellent and outstanding certification can be used as a marketing tool and give a positive image for the company. Market trend in the property market and the awareness of the occupant are a few reasons why Investor and Developers used BREEAM repeatedly. Consequently, competitive advantage for commercial buildings can be gained from achieving BREEAM certification, particularly excellent and outstanding rating. This research demonstrates that BREEAM certification has positive impacts on occupancy rates in commercial buildings in the UK. The result obtained by the survey on quantitative method and interview on qualitative method, complement by literature review from several related previous studies. However, from the depth interview analysis content, the researcher found out that BREEAM certification indeed have positive impacts but not significant. There is another main factor that could increase the occupancy rates, which is strategic location.

REFERENCES

- 1) Abdussalam Shibani, Anjli Bhavsar, Dyaa Hassan, Messaoud Saidani, Araz agha, (2021), Investigating the Benefits of BIM for Mid-Rise Timber Buildings in Canada: A Qualitative Study. *Journal of Mechanical And Civil Engineering*. Volume-7, Issue-1. pp 1-32.
- 2) Abdussalam Shibani, Araz Agha, Dyaa Hassan, Yaseen Al-Hadeethi, Mou Choudhury, (2021), Effectiveness of the Modern Methods of Construction in Terms of Cost and Time: A case Study of the United Kingdom, *Journal of Civil Engineering Research*, 11(1): 19-28, DOI: 10.5923/j.jce.20211101.03.
- 3) Abdussalam Shibani, Araz Agha, Thuraiya Alharasi, Dyaa Hassan, (2021), Prefabrication as a Solution for Tackling the Building Crisis in the UK, *Journal of Civil Engineering Research*
- 4) Abdussalam Shibani, Michal Ghostin, Dyaa Hassan, Messaoud Saidani, Araz agha, (2021), Exploring the Impact of Implementing Building Information Modelling to Support Sustainable Development in the Lebanese Construction Industry: A Qualitative Approach. *Journal of Mechanical And Civil Engineering*. Volume-7 Issue-1. pp 33-62.
- 5) Abdussalam Shibani, Omar Mahadel, Dyaa Hassan, Araz Agha, Messaoud Saidan, (2021), CAUSES OF TIME OVERRUNS IN THE CONSTRUCTION INDUSTRY IN EGYPT. *International Research Journal Of Modernization In Engineering Technology And Science (IRJMETS)*, Vol.3 (1).
- 6) Abdussalam Shibani*; Messaoud Saidani; Dyaa Hassan; Araz Agha (2021), Challenges and Barriers to Women in the UK Construction Industry, 11th Annual International Conference on Industrial Engineering and Operations Management, IEOM, Singapore, March 2021
- 7) Agha A, Shibani A, Hassan D, Zalans B (2021) Modular Construction in the United Kingdom Housing Sector: Barriers and Implications. *J Archit Eng Tech* 10:2:236.
- 8) Altomonte, S., Saadouni, S. & Schiavon, S., (2016). Occupant Satisfaction in LEED and BREEAM-Certified. *International Conference on Passive and Low Energy Architecture*.
- 9) Agha, A., Shibani, A., Hassan, D., & Bari, U. (2021). The Effectiveness of using Modern Construction Methods as a Solution to Assist the Social Housing Shortage in the United Kingdom. 11th Annual International Conference on Industrial Engineering and Operations Management, IEOM, Singapore, 7-11 March 2021.
- 10) Araz Agha, Abdussalam Shibani, Dyaa Hassan, Alexander Salmon, (2020), Building Research Establishment Environmental Assessment Methodology on the UK Residential Projects. *International Journal of Construction Engineering and Management*, 9(6): 183-189. DOI: 10.5923/j.ijcem.20200906.01.
- 11) ARCHDAILY, (2013). archdaily.com. [Online] Available at: <https://www.archdaily.com/337430/1-angel-square-3d-reid> [Accessed 26 Jun 2021].
- 12) ARCHDAILY, (2015). archdaily.com. [Online] Available at: <https://www.archdaily.com/778808/coventry-university-faculty-of-engineering-and-comp-uting-arup-associates> [Accessed 20 Feb 2021].
- 13) ARUP, (2019). arup.com. [Online] Available at: <https://www.arup.com/projects/coventry-university> [Accessed 26 June 2021].
- 14) BAM, (2019). Case Study : One Angel Square' The Co-operative Group Headquarter, s.l.: BAM.
- 15) BRE Global, (2016). The value of BREEAM; A review of latest thinking in the commercial building sector, Watford: BRE Global.
- 16) BRE, (2013). bre.co.uk. [Online] Available at: <https://www.bre.co.uk/news/The-Coops-new-HQ-achieves-highest-ever-BREEAM-score-923.html>[Accessed 26 April 2021]
- 17) BRE, (2018). BREEAM Professionals ; A Guide to Understanding their Roles, Watford: BRE Global.
- 18) BRE, (2018). BREEAM UK New Construction 2018, Watford: BRE Global.
- 19) BRE, (2019). breeam.com. [Online] Available at: <https://www.breeam.com/case-studies/offices/one-angel-square-co-operative-group-hqmanchester/> [Accessed 26 march 2020].
- 20) Chen, J., (2018). investopedia.com. [Online] Available at: www.investopedia.com/terms/o/occupancy-rate.asp [Accessed 13 July 2021].
- 21) Chen, Z. & Jiang, C., 2018. Building occupancy modeling using generative adversarial network. *Energy and Buildings*, Volume 174, pp. 372-379.

- 22) Choy, L. T., (2014). The Strengths and Weaknesses of Research Methodology: Comparison and Complimentary between Qualitative and Quantitative Approaches. *IOSR Journal Of Humanities And Social Science* , 19(4), pp. 99-104.
- 23) Colombo, I., Ilozor, B. & Robinson, H., (2015). *Environmental Assessment Tools : An Overview of the UK's BREEAM and the US's LEED*. Oxford: Wiley Blackwell.
- 24) Coventry University, (2013). *Environmental Sustainability Report 2013*, Coventry: Coventry University.
- 25) Creamer, E. G., (2018). *An Introduction to Fully Integrated Mixed Methods Research*. London: SAGE Publications Inc..
- 26) Creswell, J. W. & Clark, V. L., (2018). *Designing and Conducting Mixed Methods Research*. 3rd ed. London: SAGE Publications, Inc.
- 27) Cronk, B., 2017. *How to Use SPSS*. 9th ed. London: Routledge.
- 28) Doan, D. T. et al., (2017). A critical comparison of green building rating systems. *Building and Environment*, Volume 123, pp. 243-260.
- 29) Dwaikat, L. N. & Ali, K. N., (2016). Green buildings cost premium : A review of empirical evidence. *Energy and Buildings*, Volume 110, pp. 396-403.
- 30) Dyaa Hassan, Abdussalam Shibani, Araz Agha, Said Al Sharqi, (2021), Performance of Sustainable Building Fabric to Replace the Traditional Cavity Wall Technique for New Housing Sector in the UK, *International Journal of Advanced Engineering Research and Science (IJAERS)*, 8 (2), pp 173-182.
- 31) Fuerst, F. & McAllister, P., (2011). Eco-labeling in commercial office markets: Do LEED and Energy Star offices obtain multiple premiums?. *Ecological Economics*, 70(6), pp. 1220-1230.
- 32) Fuerst, F., (2011). The Impact of Energy Performance Certificates on the Rental and Capital Values of Commercial Property Assets. *Energy Policy*, Volume 39.
- 33) GBCA, (2019). new.gbca.org.au. [Online] Available at: <https://new.gbca.org.au/green-star/> [Accessed 22 June 2021].
- 34) Giama, E., (2012). Sustainable building management: overview of certification schemes and standards. *Advances in Building Energy Research*, 6(2), pp. 242-258.
- 35) Guest, G., (2012). Describing Mixed Methods Research: An Alternative to Typologies. *Journal of Mixed Method Research*, 7(2), pp. 141-151.
- 36) IEE, (2015). *Energy Efficiency Trends and Policies in the Household and Tertiary Sectors*, s.l.: Intelligent Energy Europe.
- 37) Illankoon, I. C. S., W.Y. Tam, V., N. Le, K. & Shen, L., (2017). Key credit criteria among international green building rating tools. *Journal of Cleaner Production*, Volume 164, pp. 209-220.
- 38) Kamsu Foguem, B. & Abanda, F., 2019. Graph-based ontology reasoning for formal verification of BREEAM rules. *Cognitive system research*, Volume 55, pp. 14-33.
- 39) Kawulich, B., 2012. Selecting a research approach : Paradigm, methodology and methods. In: C. Wagner, ed. *Doing Social Research: A global context*, Chapter: Selecting a research approach: Paradigm, methodology and methods. s.l.:McGraw Hill, pp. 51-61.
- 40) Kumar, R., (2019). *Research Methodology: A Step-by-Step Guide for Beginners*. 5th ed. London: SAGE Publications Ltd.
- 41) Leech, N. L., Barrett , K. C. & Morgan, G. A., (2011). *IBM SPSS for Intermediate Statistics ; Use and Interpretation*. 4th ed. East Sussex: Routledge.
- 42) Mao, X., Lu, H. & Qiming, L., (2009). A Comparison Study of Mainstream Sustainable/Green Building Rating Tools in the World. *IEEE*, pp. 1-5.
- 43) McCusker, K. & Gunaydin, S., (2014). Research using qualitative, quantitative or mixed methods and choice based on the research. *SAGE Journals*, 30(7).
- 44) Meyers, L. S., Gamst, G. C. & Guarino, A., (2013). *Performing Data Analysis using IBM SPSS*. New Jersey: Wiley.
- 45) Morse, J. M., (2016). *Mixed Method Design*. 1st ed. New York: Routledge.
- 46) Parker, J., (2012). *A BSRIA report ; The Value of BREEAM*, Berkshire: BSRIA.
- 47) Property Industry Alliance, (2017). *Property Data REport; Facts and Figures about the UK commercial property industry to year-end 2016*,s.l.: Property Industry Alliance.

- 48) Rydin, Y., (2016). Sustainability and the financialisation of commercial property: Making prime and nonprime markets. *Environment and Planning D: Society and Space*, 34(4), pp. 745-762.
- 49) Shibani A, Yang W, Hassan D, (2020) Evaluate the UK Construction Project Impact and Response Strategies during the Epidemic through Malaysia and China. *J Adv Res Civil Envi Engr* 2020; 7(3&4): 1-10.
- 50) Shibani, A. Arumugam, K. (2015) Avoiding Cost Overruns in Construction Projects in India: *Management Studies*. 3, 7-8, p. 192-202
- 51) Shibani, A. Sukumar, D. (2015) The Role of the Project Manager in Construction Projects in India *Chinese Business Review*. 14, 6, p. 298-324
- 52) Shibani, A., Hassan, D., and Shakir, N., (2020), The Effects of Pandemic on Construction Industry in the UK, *Mediterranean Journal of Social Sciences*, 11(6), 48.
- 53) Taylor, T. & Pineo, H., (2015). *Tools.breeam.com*. [Online] Available at: <https://tools.breeam.com/filelibrary/Briefing%20Papers/99427-BREEAM-Health--Wellbeing-Briefing.pdf> [Accessed 1 Aug 2021].
- 54) Tomas, J. & Rojo, J. C., (2010). Industrial building design stage based on a system approach to their environmental sustainability. *Construction and Building Materials*, 24(4), pp. 438-447.
- 55) USGBC, (2019). usgbc.org. [Online] Available at: <https://new.usgbc.org/leed> [Accessed 22 June 2021].
- 56) W.Creswell, J., (2014). *Research Design; Qualitative, Quantitative, & Mixed Methods Approaches*. 4th ed. London: SAGE Publications, Inc.
- 57) Walliman, N., (2017). *Research Methods: The Basics*. 2nd ed. London: Routledge.
- 58) Zohrabi, M., (2013). *Mixed Method Research: Instruments, Validity, Reliability and Reporting Findings*. *Theory and Practice in Language Studies*, Vol. 3, pp. 254-2.