

## MK7227 Postgraduate Dissertation

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# **Project-Stage Attitude Gap in Construction Waste Management within UK: An Explanatory Analysis**

A dissertation submitted in partial fulfilment of the requirements of the  
Royal Docks School of Business and Law, University of East London for the  
degree of  
**MSc International Business Management**

**June 2020**

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I declare that no material contained in the thesis has been used in any other  
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# **Project-Stage Attitude Gap in Construction Waste Management within UK: An Explanatory Analysis**

## Abstract

**Purpose** – Main aim/purpose of this dissertation work is to analyze/investigate project team's attitude along with the construction waste management. Further, it targets to examine the effects that influence the attitude/behaviour gap at project stage within the framework of construction waste management.

**Approach Design / Methodology** – The work layout is descriptive by its nature and aimed to be interpretative. Secondary data and quality design adopted for this study helped the researcher to gain insights of project team's attitudes/behaviours. Generally ten detailed case study interviews have been collected as a secondary data, with a half-structured nature, to mainly respond the research questions that guide the study.

**Findings** – Results reveal the project team's optimistic attitude regarding construction waste environment. Factors found to impede team's behavior at project level were: lack of motivation, complexities between design team and project team, technology system, documentation and legislation awareness, the approaches of senior managers towards workforce.

**Research Implications** – The researcher reported that a behavioural gap exists at project level among project managers. Moreover, main obstacles were established, which clarified the factors that affect ambiguities.

**Practical Implications** – The observations have potential significance regarding senior managers, project directors, policy makers, executives and construction waste management companies; implementing and promoting approaches of waste management awareness amongst project managers.

**Originality** – The dissertation work deals with a literature gap. This research is specific in context, while the attitude/behavior gap has also been researched earlier and focuses on project managers and senior managers.

**Core words** – construction waste management, waste behaviour, sustainability, project team, project managers, attitude-behaviour gap, environmental attitude.

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## 1- Introduction

### 1.1 Overview

The high waste generation rate is a rather common feature of industrialized economies (Martinez-Alier, 1995; Strange, 2002) and there is a direct correlation among stage of growth and generated waste (Bogner *et al.*, 2007). Disposal/leftover is definable as another human and industrial product material without a residual value (Serpell and Alarcon, 1998) and in general in every industry seen as unavoidable. Building industry is considered a central factor in contributing with significantly higher rate to production leftover in the world, though a significant sector for growth (Lu and Yuan, 2011). The need to minimise waste production and the related problems place added force to avoid waste upon this industry that produces the pessimistic environmental impacts. Since sustainability is accepted as a desirable concept (WCED, 1987), various measures were conducted to handle demolition and construction wastes in a way that has become a worldwide discipline (Lu and Yuan, 2011). In the context of building waste management, the researcher aims to explore this gap in attitudes at project stage as this has been found in existing literature. This chapter gives the reader an overview of the study history, the problem statement, the research goals and issues, the methodology employed, the meaning of the study and ultimately its limitations.

### 1.2 Study Background

C&D (Construction and Demolition) industry through its definition cannot be ecologically approachable and safe (Shen, 2002). They act as part of the nature of their impacts on the environment due to pollution and high C&D waste generation. Excavation, construction and maintenance works, location clearing, demolishment, transport road development and rehabilitation contribute for generation of waste (Tam, 2008). Between 20-30% of building

materials are estimated to be waste (Stone, 1983; Fishbein, 1998). About 10-50% of whole generated waste in most modern economy is waste from the construction industry (Lu and Yuan , 2010).

The data in recent years shows that half generated waste (200 million tonnes) in Britain comes through building industry (DEFRA, 2018). About 136 million tonnes of C&D related construction debris are generated in the United States each year, only 25-30% of which are re-cycled (Swingle, 2006). Australian case shows that heavy waste accounts for 15-35% produced is C&D (Bell, 1998). In 2007, roughly 3000 tonnes of construction solid leftover were collected from sites daily in Hong Kong representing 25% of all solid leftover (Environment Policy Department of Hong Kong, 2007). China generates around 30% of urban solid waste (USW) worldwide yearly accounting for almost 40% is made up from construction projects (Yuan and Shen, 2011). The extreme levels of C&D waste generation give the rising to environmental, public and industrial concerns.

### 1.3 Statement of Problem

Over recent decades the focus of building experts and scholars around the world has risen to construction and demolition waste (Beg et al., 2002). There is growing worldwide agreement that greenhouse gas growth and environmental degradation are urgently needed to be the first agenda of the world; and regardingly our construction waste management practises can help develop more sustainable relations with the planet (Najam et al., 2003). Energy levels of the components applied within the building industry; and the substantial environmental consequences increased levels of material reuse in industry achieving huge positive environmental effects (Cole, 2010).

Teo and Loosemore (2001) studied construction operators' attitudes towards waste disposal and destruction. This study explores the actions of the principal contractors to understand their perspectives as well as waste management policies. The site measurements are being applied to

determine a volume of construction leftover transferred to the centre for waste recovery. The methods for calculating building waste are different (Formoso et al., 2002). The waste generation at the site was observed and data collected within two months.

Several concerns identify waste level in construction: 1) wide quantity of resources of landfill are spent on construction disposal (Poon et al., 2003); 2) harmful emissions in atmosphere (Cosgun, 2007); 3) waste of natural resources (Yuan and Shen, 2011) and 4) increase of expenses of building projects. Mentioned problems raise the need to find less environmental damaging alternative materials or techniques in order to ensure that negative environmental effects of waste are managed or controlled, as the use of raw materials (Craighill and Powell, 1996).

Work has also been conducted on waste disposal initiatives at project stage. Earlier research founded variety factors impacting waste production, changes in design, funding of waste control, regulations of government, on-site area restrictions, developing infrastructure and the culture of waste management within the company. Shift in design is regarded as a major waste manufacturer during the construction process. History design may include up to 35% of building waste (Osmani et al., 2008). Research performed by Jaillon et al., (2009) has depicted that due to construction waste techniques, such as manufacture and modularity, accumulation of on site waste could significantly be reduced.

#### **1.4 Research Objectives**

Purpose of the analysis examined the aspects influencing the behaviour/ attitude difference within the waste management system between the project team, including the site managers and senior project managers. The study's main objectives are:

- A. Analyze project team members' attitudes towards the construction waste management and environment
- B. Determine the relationship between project managers' and team members' knowledge and behavior towards waste management
- C. Discover the causes for the gap in attitude in context of project-stage among team members in construction waste management

### 1.5 Questions of the Research

1. To what extent are project managers involved with waste control in construction site?
2. To what degree are project team members aware of construction waste management and sustainability?
3. How do internal and external variables influence project team members' waste management behaviour?
4. What are the major challenges that obstruct members of the project team to correctly practice waste control on construction sites?

### 1.6 Methodology Overview

The research was conducted with an exploratory nature on this paper as a behavioural gap in construction waste management relatively new field of research and it is far from being exhausted (Gottsche and Adjei, 2011).

This dissertation focuses on the potential waste management systems that can be used to dispose of waste effectively. Introductory study illustrated that constructors, architects as well as project managers have been successful in implementing strategies for waste management around the globe. The initial research includes a study of C&D waste management theories/ideas. This work has shown that while waste management in good practise is difficult, it is still an achievable objective.

Secondary research was conducted during this study. For a literature review, secondary data has been gathered to highlight an understanding of the management of building waste at the project level in Britain. Numerous publications, books and guidelines about Waste Management (WM) issues in construction and its side effects on natural environment were written. The researcher acquired strong skills about waste management in the UK after the secondary work was done. The researcher could then identify occurred problems and perform to answer the issues. The research approach includes gathering secondary knowledge about waste management problems and solutions in the United Kingdom. The sample size was composed of people who were randomly chosen as the final sample of research from scientific journals, books, and previous researches. In addition, semi-structured interviews were gathered to obtain rich and detailed insights. The literature review explains the secondary research performed for this study in the following sections.

### 1.7 Significance of Study

The research shows critical importance in order to examine the variables that influence the attitudes of managers, designers, architects and contractors towards construction waste management specifically at project-level. In this study, the key knowledge gap will be the lack of sufficient markets for C&D waste and motivation within the project team. Reviewing the literature, a knowledge gap has been found, including the lack of consideration of the intensity to which major project partners are implementing waste management plans on site; a lack of consideration by key project members as to the final decision makers on waste control; and an incentive for employees to reduce waste on site. Concluding that, research is modern and contextualised; the results will resolve a significant gap in literature. In fact, the results support senior managers to conduct strategies and site managers to frame and implement strategies to motivate project team's attitude towards construction waste making it beneficial for the sustainable development and future environment.

## 1.8 Limitations of Study

Main research limitation was globally spreaded Pandemic Covid-19 that led to outbreak of most construction sites in UK. As a result, it hardly restricted a possibility to primarily observe the awareness of existing waste management activities implemented within the project team. However, the usage of industry experts' opinion improved awareness for waste control within UK. Nonetheless, a range of constraints that occurred throughout the using of collected interviews. The main research limitation for collected secondary data was the relatively small proportion of people surveyed as the British construction industry has the largest projects on waste control. Unfortunately, amount collected sufficiently was not satisfactory to include the findings in a functional set. Contrary, the decision made to examine analyse the replies briefly and design certain summaries. Another limitation was most respondents were executives of the companies, so that the answers may be prejudiced or biased. Such secondary data is considered to provide a clear image of the current practise of the industry in relation to attitudes of major project participants towards waste management. However, work will continue on the attitudes of the principal team participants, after this study has been concluded, to gather further feedback such that the findings can be evaluated statistically. Due to the number of respondents, reached conclusions should not be considered as final, but can also be used as a basis for further investigations in the area.

## 2 - Review of Literature

### 2.1 Overview

Exploration on the literature targets to contribute the observer insights on past research into the attitude-behaviour gap in construction waste management at project-stage; and the variables that affected the gap were identified. Review of the literature consists 5 parts: history/background of construction industry and waste management; behavioral gap at project-stage; internal factors affected the gap; external factors influenced the gap and finally chapter conclusion.

### 2.2 Construction Waste Management

Since the early 1970s, the environmental effects of the construction industry have been of great concern (Chen, 2006). This resulted in individual distortion and air pollution publications (Jones, 1973); heavy waste pollution in the early 1970s in building/construction (Skoyles and Hussey 1974). However, it could not cause trigger the building industry to shift automatically towards better environmental protection. Publications of Spivey and Henningson, in 1974 and 1978 respectively, defined the importance of design officer position in projects to provide advice to construction site managers regarding environmental management (Li, 2006). In the 1990s, however, in 1990 numerous projects initiated by professionals and academics, thus the need for environmental management in buildings became more aware of public (Barrow, 2007). This has been main concerns in sustainability of construction for the environmental assessment of buildings (Ding, 2008).

Project type*	Number of completed projects	m <sup>3</sup> /100 m <sup>2</sup> (average)
Residential	99	14.9
Public buildings	6	23.7
Leisure	4	11.6
Industrial buildings	8	25.4
Healthcare	13	14.8
Education	21	16
Commercial retail	32	14.8
Commercial offices	18	18.4
Civil Engineering	9	24.3

Table 1: Current construction waste project types (Waste and Resources Action Programme (WRAP), 2018)

Note: The statistics have been based on direct volume (not output with surface area). Specifications were assessed in Feb 2018

### 2.2.1 The Construction Industry and Sustainable Development

The overuse of global resources is among the major allegations against the construction industry (Curwell, 1997) and tends to put expanding pressure on the construction industry to find ways to reduce dependency on natural (raw) resources. There are concerns on how to improve building practises to manage their adverse environmental impacts on nature (Holmes and Hudson, 2000). Such issues contributed to the idea of construction sustainability (Ding, 2008). The equitable distribution of resources; consumption of minimum energy; urgency of low energy on the construction materials; re-use and re-cycling; as well as other services are part of sustainable construction management leading to achieve effective and efficient use of natural resources in the immediate and long term (Demarco, 2008; Ding, 2008).

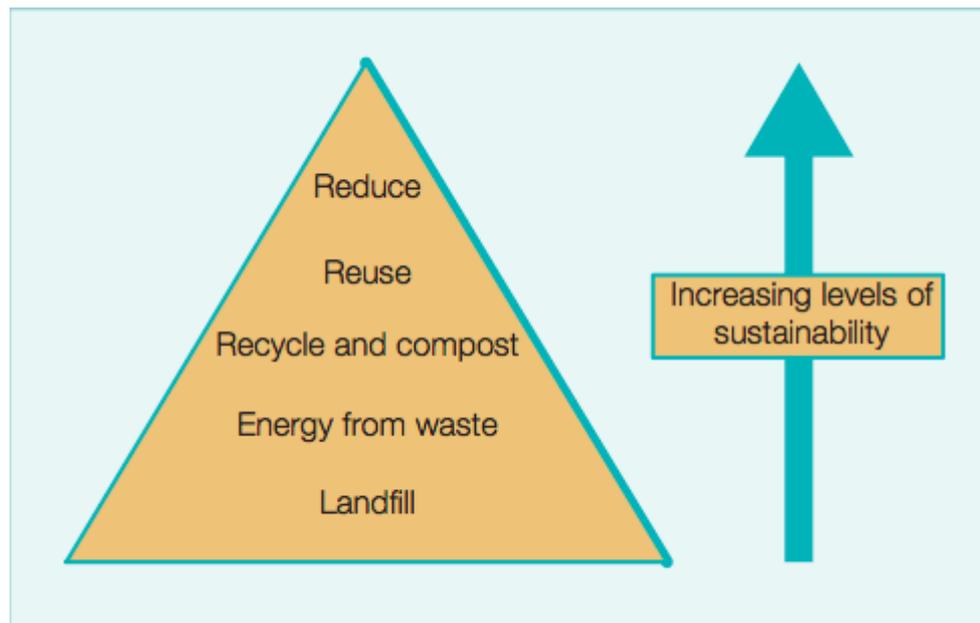


Figure 1: The Waste Hierarchy and level of sustainability (Building Research Establishment Roadmap (BRE), 2015)

Efforts at environmental protection in building industry have risen quickly in pursuit of the goal of sustainable growth to include all industry leaders (Shen and Tam, 2002). Nevertheless, the way society uses resources is difficult to increase and the impacts of excess energy and materials on the environment associated with all these efforts (Strange, 2002). Despite the general problem of waste generation in almost all main industries, the building is well known as main industry waste manufacturer. Thus, waste management projects play a large role in environmental management and sustainable development since they can lead to the conservation of resources and the solution of most environmental problems (Begum, 2006).

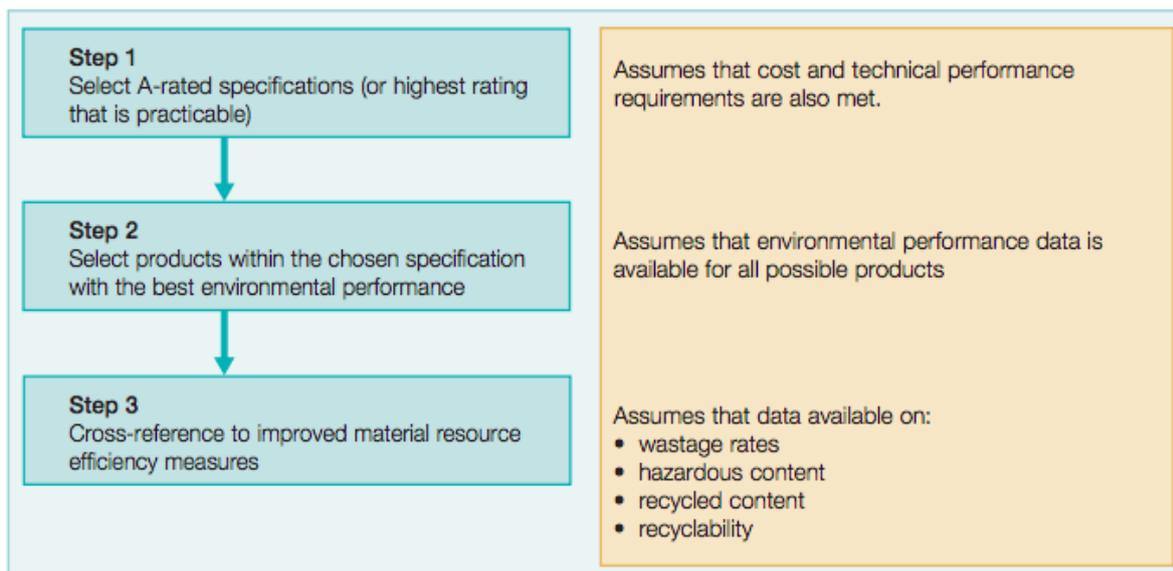


Figure 2: Possible decision-making approach for product selection to manage Construction Waste (CIRIA Report, 2012)

Key characteristic of product/material	Preferred option
All packaging	<ul style="list-style-type: none"> <li>• Reusable and returnable, or</li> <li>• Minimal, single material type and recyclable</li> </ul>
High embodied energy	<ul style="list-style-type: none"> <li>• Reduce resource use to minimum</li> </ul>
High wastage	<ul style="list-style-type: none"> <li>• Identify causes of waste across supply chain</li> <li>• Reduce waste throughout life cycle/supply chain</li> </ul>
Durable/long lived	<ul style="list-style-type: none"> <li>• Enable reuse if removed within service life</li> </ul>
Disposable/short lived	<ul style="list-style-type: none"> <li>• Increase durability, or</li> <li>• Easy to segregate and recycle/recover</li> </ul>
Hazardous waste	<ul style="list-style-type: none"> <li>• Avoid using the product if possible, or</li> <li>• Only use in applications where no suitable alternative exists. Ensure records are maintained to transfer knowledge of hazardous materials</li> </ul>
Heavy, bulk materials	<ul style="list-style-type: none"> <li>• Reuse or recycle on or as near to site as possible</li> </ul>
Light, high volume materials	<ul style="list-style-type: none"> <li>• Avoid excessive transport – compact if possible</li> </ul>
Small amounts	<ul style="list-style-type: none"> <li>• Avoid excessive transport – bulk up through milk round or return haulage to supplier/storage yard</li> </ul>
Low recycled content or difficult to reuse/recycle	<ul style="list-style-type: none"> <li>• Improve recyclability and/or recycled content, or</li> <li>• Seek alternative products, unless this increases other environmental impacts (the overall benefit should be maintained or improved)</li> </ul>

Table 2: Potential policy approach for priority resource efficiency strategies (Construction Industry Research and Information Association Report, 2012).

### 2.2.2 The UK Construction Industry and Waste

However, evidence in generated waste has restorative and preventable value in construction industry (Teo and Loosemore, 2001). During construction and demolition, huge volume of waste results in pollution from the environment; a resource development increases the expenditures of building projects. This creates an increased pressure to reduce costs and improve environmental quality for the construction industry and according to Kartam, et al., (2004) both of these targets can be accomplished by careful management of building waste.

Although the exact construction waste figures created at a building sites are difficult to determine data estimation over 30 years ago accounts for around 10% and 40% of wasted building materials (Stone, 1983; Fishbein, 1998). About 10-40% of all construction leftovers generated in any developed economy are waste from the construction industry (Lu and Yuan, 2010). Waste Management research in Britain shows the building industries are responsible for approximately 50 percent of all waste generated in the Britain in 2018 (DEFRA, 2018). Construction is the largest contributor and plays a significant role in UK becoming largest producer of construction leftovers. Figure 3 and Figure 4 below show comparison of waste production by all main sectors in the UK in between 2008 and 2018 respectively. Clearly, it concluded that overall waste creation in mining and commercial industries shows decreasing condition in Britain, while C&D waste has increased for almost two times more.

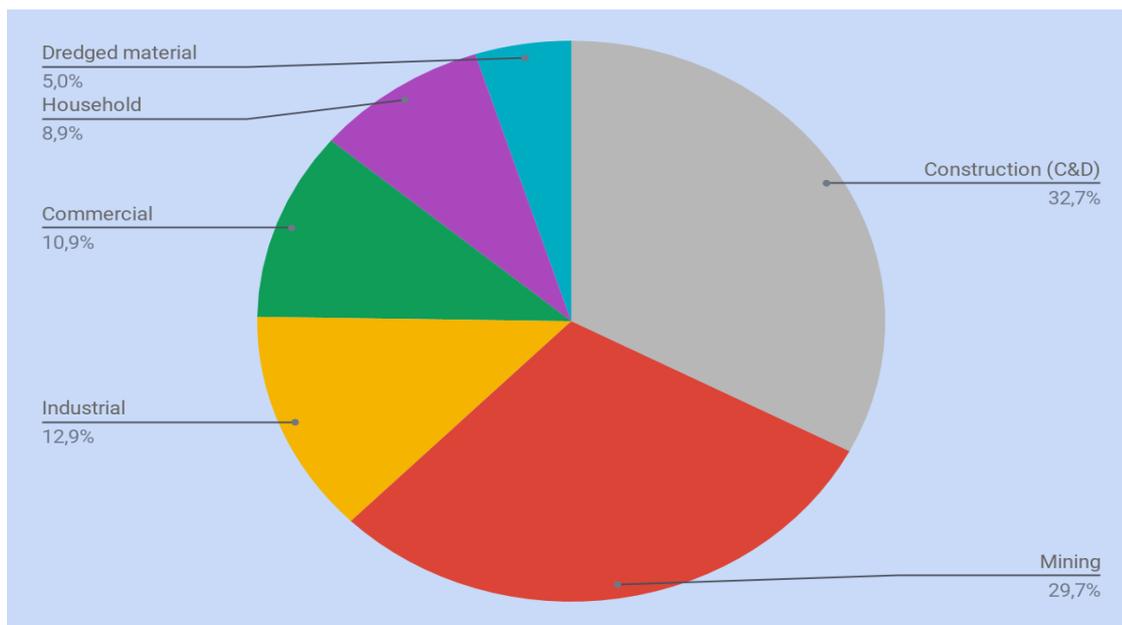


Figure 3: Total waste arising estimated for the year 2008 in the waste strategy for UK.

Note: data combined from a number of sources, mainly from the Department for Environment, Food and Rural Affairs (Defra, 2018)

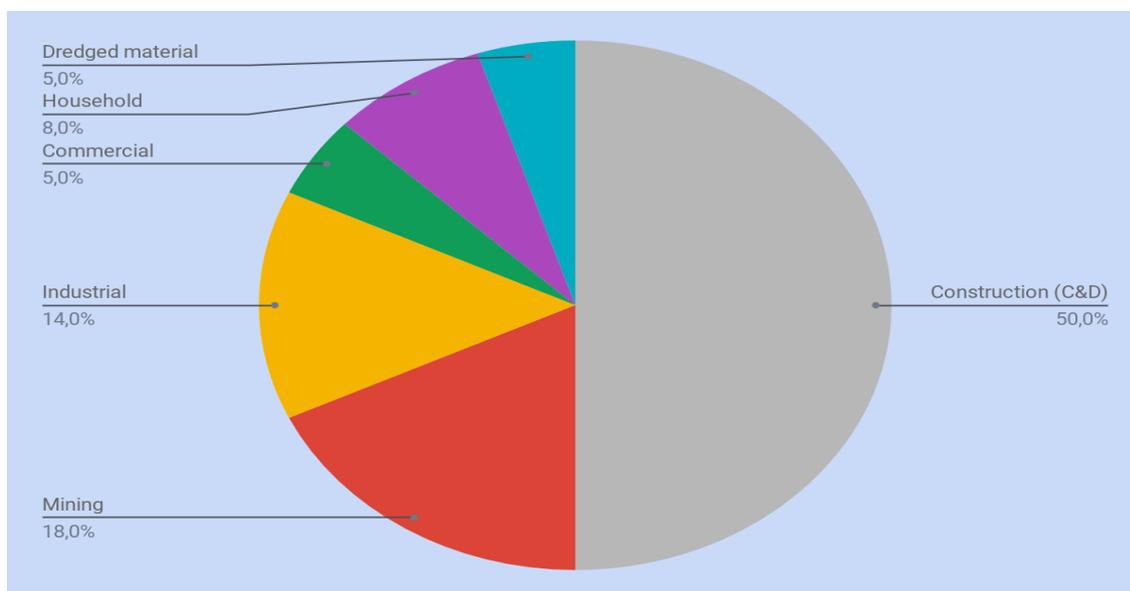


Figure 4: Total waste arising estimated for the year 2018 in the waste strategy for UK.

Note: data combined from a number of sources, mainly from the Department for Environment, Food and Rural Affairs (Defra, 2018)

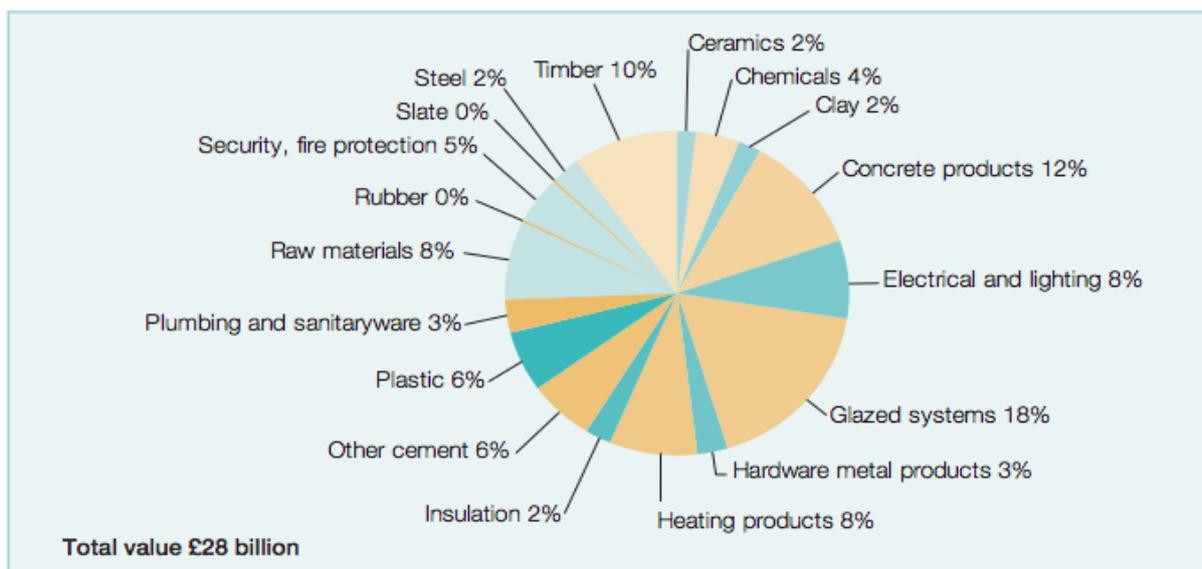


Figure 5: Solid leftovers from construction products by their value (Market Transformation Programme (MTP) reports, 2015)

	Estimation of Construction Waste Materials by tonnes
Home windows	<ul style="list-style-type: none"> <li>Over 170,000 tn in 2015</li> <li>Estimated to increase to 275,000 tn by 2020</li> <li>Mainly come from U-PVC and glass</li> </ul>
Plaster board	<ul style="list-style-type: none"> <li>Predicted to increase 500,000 tn by 2020</li> <li>Additional waste (refurbishment and demolition) estimated between 500,000 and 1 mln tonnes yearly</li> </ul>
Insulation	<ul style="list-style-type: none"> <li>Housing demolition waste estimation from 106,000 m<sup>3</sup> to 3.7 million m<sup>3</sup> per year by 2020</li> </ul>
Flooring items/products	<ul style="list-style-type: none"> <li>Predicted to rise from 1 mln tn to 2.1 million tn products in 2020</li> <li>This growth is primarily due to higher replacement floors and changed market shares of various materials</li> </ul>
Bitumen, Rubber, Plastic (Roofing membranes)	<ul style="list-style-type: none"> <li>Estimated to increase from 124,000 tn (2007) to 160,000 tn (2040)</li> <li>Due to long life mentioned construction items expected decrease up to 105 000 tn.</li> </ul>
Modern Methods of Construction (MMC); (housing only)	<ul style="list-style-type: none"> <li>Due to MMC the amount of waste sent to landfill in 2010 was 6,000 tn</li> <li>Estimated increase 68,000 tonnes of waste to landfill by 2020</li> <li>The future recycling of such products requires further study</li> </ul>

Table 3: Estimation of Construction Waste Materials by tonnes (Market Transformation Programme (MTP) reports, 2015)

## 2.3 Project-stage Attitude Gap

### 2.3.1 Construction Waste Behaviour Theory

Attitudes function represents the assessment of objects or circumstances by people that lead them behave in a certain way (Rokeach, 1972). An attitude of four dimensions are commonly accepted, namely, behavioral, affective, cognitive, evaluative (Ajzen, 1993). People shape intentions as they assist to make a dynamic world structure and focus, providing some continuity and clarification in describing and understanding the objects and circumstances in single person (Olson and Zanna, 1993). Behavioral manner helps to shape protection within insecure condition (for example, conflicts) and increases self-confidence. In addition, attitudes demonstrate the identity and guiding values of an individual. Attitudes are useful for senior staff members due to their determination the course/direction of people's behavior and providing additional insight in the right options of motivation.

### 2.3.2 The Attitudes Formation

Managers have to consider how attitude is created to handle it. Evidence indicates that the way a person views his or her own circumstance or events time by time differs according to a number of factors (Malim, 1997). As an instance, whether a person participated on a project with high results in waste management practises his or her position is probably encouraging. Determinations include the general 'cohort' output that refers to behaviours taken as a result of development in a specific socio-economic, political and historical context (Bratt, 1999). For example, current global warming issues would likely lead future generations to become even more concerned about environmental problems than previous generations. Parents and families play meaningful role in the attitudes formation, as information received in their formative years is widely controlled (McGuire, 1985). More broadly, by enforcing social standards which can evoke a moral duty towards society, the group as a whole has a significant impact on attitudes (Bratt, 1999). In a work environment, employees may influence attitudes dramatically by

pressure from partners creating admission in the community that enhances safety requirements (Robbins *et al.* 1994). Actually, there are various 'cultures' in various professions, which may affect attitudes further, by defining the position and status of a participant in the organisation and expectancy of clear comportement. As an example, building/construction industry employees have a negativity (Barrie, 1999). These working attitudes are mainly influenced by a growing educational context that dictates to their knowledge on a certain subject. Traditionally, consciousness toward environment was less taught in the education programmes for building careers. In recent times, this absence of environmental education has been offset by the most strong cultural impact on human attitudes towards environment: the "global media" (Chan, 1998). As an example, the media's effect on environmental attitudes in the investigation of The Roper Organisation (1990) was television (more than 70%), newspaper (more than 60%) and radio sets (around 40%). Lastly, legislation shapes the attitudes of individuals dividing their views on likes and dislikes in the eyes. In addition, tougher laws are now seen as moderating wasteful activities by various sectors, for example buildings. In early 2000s, for instance, British Government provided a series of tax rates for green systems to enhance the environmental impact of construction regulations (Pattison, 2001). As with the Government of Australia, between 1990 and 2000, has mandated the building sector to manage waste and reduce up to 60%, the construction industry was listed as a fairly weak performer (Environmental Protection Agency, 1998). Nevertheless, Douglass and Pratkanis (1994) had investigated that policy legislation has a fairly limited impact on perceptions as it is frequently segregated from legislation by corporate practises, vague terminology and ambiguity that make it difficult to interpret. In addition, it also assists with opportunities to follow the law. It often helps. The latest attempts of the UK Government to strengthen the safety record of the construction industry have demonstrated this well (Knutt, 2000).

### 2.3.3 The Influence of Attitude on Behaviour

The correlation among attitude and manner, which has emerged to explain it, is far from conclusive. The norm-activation hypothesis is the most influential environmental study (Schwartz, 1977); the convincing behaviour principle (Frey, 1988); and planned/behavior theory (Ajzen, 1993). Schwartz' theory of normal activation argues that environmentally conscious action depends not only on general environmental considerations but on the activation of altruistic moral standards. People feel moral responsibility if they expect other people to experience significant negative results and sensed responsibility for mitigating implications. This hypothesis does not take account of various other mediating forces on the attitudes of workers to waste, like lifestyle of business and projects pressures, but reduces explanation of actions towards disposition-like stage. On the contrary, the norm-referenced behaviour theory is in deciding attitudes and behaviour, it is beyond personal characteristics, concentrating on how intervention factors such as resource limitations can inhibit the expression of pro-environmental actions by humans (Frey, 1988). Unfortunately, social influences in environmental comportements have been largely criticised for ignoring and have largely been unchecked in the environment. Figure 6 has extensively tested and which provides some news/insight into all the variables affecting the behaviours of people within environmental concept (Hamid and Cheng, 1995; Taylor and Todd, 1995; Chan, 1998; Harland et al., 1999). The "comportementale intentions" of a person are essential to the theory of planned action, which indicate how motivated he or she to conduct themselves in some way. Three variables decide this: perceptual, sociable and attitude. The attitude variable bases on a positivism or negativism interpretation of specific behavior form, which is based on individual convictions or skill consequence. The social influence mirrors the social pressure of a person, which he or she calls "subjective norms" in the model. The perceptive factors refer to an individual perception to easy or difficult actions, representing past experience and expected obstacles. The model is known as "perceived regulation of the behaviour".

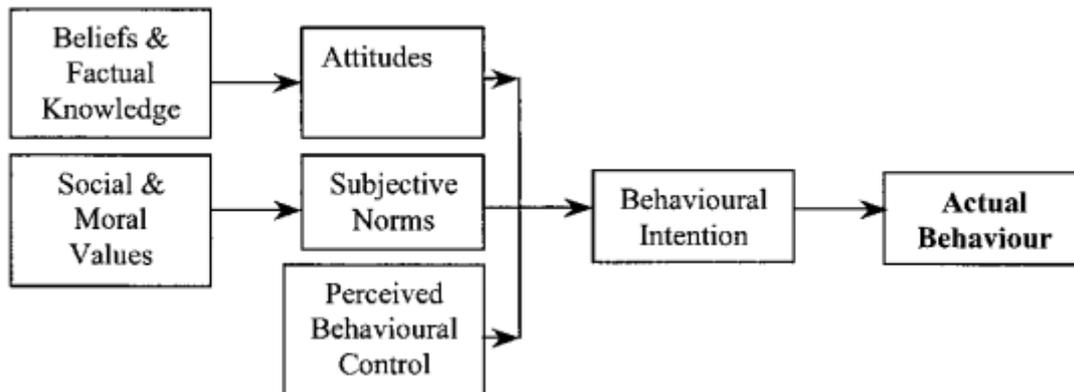


Figure 6: The Planned Behaviour Theory (Ajzen, 1993)

Barr and Ford, (2003) confirmed recycling basics in two classes of variables: internal (situation and psychology) and external (environmental) values and variables. The first group concerns environmental values and to what degree recycling is beneficial to them. Situation variables, like previous skills and experience, are factors that enable recycling. Factors including social norms, effectiveness of reaction, auto effectiveness, perceived risks from non-action, personal satisfaction, altruism, and citizenship are the mainly refer to psychological variables. Moreover, Martin and Williams (2006) addressed this concept and found fundamental intended actions on re-cycling derives from the environment conviction of a person; or not behavioural purpose is dependent on the evolving effects of situational and psychological influences.

Social desirability indicates how much a person is interested in the process (Barr, 2003). An example is that a worker in construction may have a adequate perceptions as necessary of the categorisation of waste, but he or she may not actively participate in this process. The environmental issues related to recycling have a positive relationship with the approach to them. Many researchers find the principle of expected actions in CWM (Construction Waste Management) research as well as entire discipline of waste control (Clark, 2006).

Recycling activity is significantly influenced by attitudinal factors. Sidique and Lupi (2010) identified by four interpretable variables: the attitude, comfort, social pressure and familiarity. In the survey made by Sidique and Lupi (2010) explained that re-cycling is an effective option of reducing emissions to identify respondents' attitudes. Furthermore, time statements for recycling and storage represented a variable of convenience, familiarity and knowledge within recyclable facilities and materials (Joshi, 2010).

According to Ari and Yilmaz (2016), both researchers have positive thoughts about the perceived behavioural tests of a person and the positive effect on their recycling habits. Thus it can be shown that positive idea on building waste re-cycling impacts positively on individuals in their immediate social environment.

It is well known that people are highly subjective in their behaviour, and it is a challenging task to define their performance on waste recovery (Srouf, 2017). However, Bakshan et al. (2017) identified that the conduct of individuals as well as companies are affected. Sub-factors including working experience, behaviour, consciousness of consequences, past experience and social stress have been defined in specific categories. Similarly, El-Fadel (2017) stated that the business category included preparation, supervision and rewards. The behaviour category is also constantly affected by categories of persons and corporations and the behavioural level is rather sensible to in-personal variables in comparison to corporate variables like trainings (El-Fadel, 2017).

According to Hansstein (2017) it has simplified the attitudes from negative to positive with respect to the individual evaluation of the studied behaviour. Further, Echegaray (2017) defined behavioural control as self-efficacy and measures perceived. Therefore, attitude can be defined as person's views of recyclable practises negative or positive regarding C&D waste re-cycling factors. Once all these hypotheses and structures are taken into account, it must be demonstrated that personal attitude to re-cycling the waste are relevant. Moreover, several of the structures explicitly and implicitly describe

the view of the community, including the working environment approach to recycling waste, automaticity and convenience of recycling.

### 2.3.4 The Theory of Planned Project in Construction Industry

Project management in the building industry takes a long time and a number of studies on the relationship between planning and project performance. This is a well-studied area in the construction project management field in comparison with other industries or other project management fields. The traditional definition of planning outlines broadly the things to be done and the methods to achieve the purpose (Gulick, 1936). Pre project planning is defined during construction as the time after planning, when an agreement is entered into and before implementation of the project (Gibson and Gebken, 2003).

Daly (1977) states that the planning specification should be 10%, schedule should be 2%, and final design should be 40 % of total cost. However, during execution not much design is implemented. Differently, Posten (1985), states that pecification should be 16%, schedule should be 6%, and final design should be 25 % of total cost.

Wideman (2000) stated that the the typical effort for building projects during the planning phase is around 20 % of the total hours. Similarly, Nobelius and Trygg (2002) stated that at least 20 % of the project time was spent on front-end activities.

Holm and Buhl (2002) highlighted that senior project management may decide not to use the planning phase estimates. Nevertheless, Aubrey, Hobbs and Thuillier (2008) stated that excessively stringent preparation processes have impeded development. Shenhar (2011) argues that both planning phase, planning processes are needed. Author emphasized “The Planning Process Group” which consist of the processes carried out for the

strength, description and refinement of the goals and development of the course of action necessary to achieve these goals.

Zwikael (2009) identified the importance and analysis of the impact by industry of 4 areas of knowledge to project success. This can affect planning needs and the quality of planning. Similarly, Collyer, et al (2010) stated that The various industries may require various types of projects and have different needs for project management.

Area of Knowledge	Construction	Software	Production	Services
Human resources	3	3	7	5
The Scope	9	9	8	8
The Time	7	1	6	1
The Cost	2	5	9	2
The Quality	6	2	2	6
The Risk	4	4	5	4

Table 4: Relative value of information areas in any form of industry, Zwikael (2009)

Note: Relative importance measured by numbers from 1 to 9

This indicates a major difference in the types of knowledge fields influencing the performance of the project by industry. The study suggests that the importance of planning and the most significant areas of planning can vary from one industry to another. Construction has been found to have the highest planning quality and success while planning quality and performance have been lowest for manufacturing and software companies. The manufacturing sector is considered less concentrated on projects (Zwikael and Globerson, 2009). The services sector is the third most successful in its planning and software the second most successful in its growth. These two final findings can be due to the fact that the software and communications

industries have difficult environmental conditions, perhaps because of variations in the effects of preparation in each industry.

Blomquist et al., (2010) stated that plans are a pillar of any project; planning is therefore a prevalent project practise. Choma and Bhat (2010) found that projects that have lack of significant planning components were the worst results. They found, however, that "projects that took longer to plan in this sample had the worst outcomes". The analysis indicates that too much preparation can adversely impact the progress of a project, or too long planning period may be an indication of a problem. Further, Blomquist (2011) added that the planning is essential for project success.

## **2.4 Internal Factors (Variables) Influencing the Project Team's Behaviour Gap**

### **2.4.1 The Approach of Senior Management towards Workforce**

There have been identified behaviours of local teams, operators and administrators, who have main influence on the area of the CWM (Construction Waste Management). To implement waste management plan successfully senior management must be supported and Kuhre (1998) highly recommended activity to project plan success. Ling and Lim (2002) described the commitment from a high level of management as a success essentials within construction waste management plans, which required participation and involvement by senior managers. It describes waste management initiation from top to bottom because employees do not want to initiate participation by themselves.

Attitudes affect the significance of waste management which will impact the efficiency of waste site project members. According to Manewa et al., (2007), system resources, such as employee efficiency, have a huge effect on project waste generation. But senior management attitudes have been identified as having the greatest influence on the results of CWM as it is responsible for

driving waste management site teams. Similarly, in the reports of Hao et al., (2010), stated that an active management participation will influence on-site waste management. Waste Management trainings also have a bearing on project teams' attitudes as it may direct to a better knowledge of waste management requirements.

#### 2.4.2 Awareness and Education Level of Personnel

Rodriguez et al., (2007), reported that Environmental Management Systems (EMSs) increase workers understanding in construction sites slowly. There were systems for monitoring the performance of the waste management companies involved in this analysis. For different purposes, Waste Management Systems were very important: to help monitor the business goals; to help to determine how well the company performs as well as waste management is concerned about waste; and to provide data for company's report on sustainability.

The integrated management systems were used as part of environmental management efforts to help the company monitor construction waste. In the projects, a senior project managers, who had ultimate responsibility for waste management activities, were obliged to monitor their results. The site teams have their responsibilities to ensure that the goals set for the project are achieved. Some companies have been monitoring the site teams and their efforts for the WM by environmental advisors, which was identified as having a positive impact on the CWM at the project level. Proper waste management monitoring has the ability to have an encouraging effect on the outcome of WM projects, which is why all companies are making efforts to monitor the objectives of waste management.

Project teams must understand the construction waste management, and each company has a plan for this purpose to ensure that the project team has the requisite skills and education of the requirements of the CWM. Wang et al., (2008), reported that the trainings establishment is an adequate

option of solid waste management. Begum et al., (2007), similarly reported that trainings are a central component of CWM strategy. Education and training take 2 formations: in-person training via waste advisor and e-learning trainings. Inductions or toolbox discussions on good practises for the CWM on site project, poster and other onsite display contributes to the trainings of the Construction Waste Management.

### **2.4.3 Documentation and Legislation Awareness of Personnel**

All companies have several documents ready for project team guidance to ensure the visions, approach and strategy at the project degree of CWM on the site. A common document was a report on an environmental policy stated Azzone et al., (1996), as an evidence of the pro-environmental behaviour of a project team's attitude towards environment. It is interesting to note that only a few companies had a certain waste policies document, other corporates considered Construction Waste Management (CWM) a part of environmental management. Some companies used detailed document stating specifical demand to be adopted step-by-step on construction waste management projects, while other companies provided general document that serves to onsite teams' guidance for project. The results are based on detailed documents. Udawatta (2015) reported that details in CWM documentations play a key model in managing project waste generations. Many businesses have a compliance registry to enable them to keep up with the legal changes as part of the provisions to comply with the CWM legislation. The papers provided to site teams for other companies are subject to key legislation and to specific needs affecting their operation on the ground.

In addition, Tron (1995) found that one of the barriers to its implementation was the lack of relevant experiences with the implementations of the waste management plans. Shen et al., (2004) identified difficulties in conducting WM strategies on site which were missing of an organisational policies or sufficient trainings for the workers who handle the wastes.

## 2.5 External Factors (Variables/Drivers) Influencing the project Team's Behaviour Gap

### 2.5.1 Complexities in Design Forms and Shapes

Research by Osmani et al., (2008) reports that design influences and manages waste generation. Therefore, not surprisingly project designing level had the greatest influence on the Construction Waste Management. Although the design strategy varies from company to company, the key goal at the design stage is the reductions in the production waste on project or the prevention of waste, which is one of the goals of the CWM legislation by government. The various approaches to CWM can be summarised by design: the principle for the design of waste; the resources efficiency principle; the specifications of material that produces small leftover on environment; the earliest involvements in waste reuse and reduction at the design stage. Attempts to reduce waste by design often involve the use of technology as a highly efficient in literature like modular construction, pre-casting and offsite manufacturing option (Jaillon et al., 2009; Cosgun, 2007). The working team and construction companies will also participate in the design phase of the CWM at an early stage. In particular, this was true for companies that were not interested in project design. They were ensured that the building teams can contribute to manage construction waste. However, it could not give possibility in project where traditional approaches adoptable to submit their contracts for project after the designing stages.

### 2.5.2 "Preferred" Suppliers on Project

For procurement purposes two main strategies were adopted: sourcing the materials and the use of preferred vendors or subcontractors. The main focus for these approaches was the supply chain arrangements to select subcontractors who fostered the company vision for CWM and adhered to governmental legislation which emphasises the role of subcontractors in ensuring that the CWM is sustainable. That is why all firms are used to have

the opportunity to philtre out their subcontractors to obtain “preferable lists” of providers. Although sustainable use or the CWM were not the first condition included in such preferable list, this was a major requirement for companies that had high environmental or sustainability demands. The responsible sources approach to materials hit the project site that only guarantee specified materials (quantity and quality). Begum et al., (2007) suggested tenders stage attempt to ensure the purchases of reusable or recyclable materials. Responsible source is created to afford such efforts to prevent and encourage waste production.

### 2.5.3 Type of Construction Technology (resource availability)

In the process of producing secondary materials from C&D waste different methods have been used. The recycling method has an effects on the materials produced, which in turn affects the material efficiency. Huang (2002), studied recycling C&D waste with mechanical sorting process. Weil and Jeske, (2006); Mulder and Feenstra, (2007) propose the concept of the recycling within closed cycle construction. Tam (2006) reviewed and suggested recycling techniques that the industry has an overwhelming needs for vital solutions for building material.

### 2.5.4 Time

Mackenzie (1990) stated wide time management concept. The function of time management is required to keep the overall conducted projects properly allocated via successive phase of natural life-cycle. For example, development, concepts, executions and finalizing by mean of the process of time plannings, time estimations, time schedulings, and schedule controls. The projects consist a series of activities for a specific purpose. Time management and expense control are the most prominent fields of project management. Time management's initial objectives were to manage the time and prepare schedule, network, etc. (Babu and Nanina Suresh, 1996). The management of projects include the planning, tracking and supervision of

projects. It involves specifying the task requirements, deciding the quantity of works and estimating necessary resource in projects planning (Scott and Assadi, 1999). Management of project time requires tool and policy usage to create standards for project monitorings and measurement. For the construction projects effectively managed time is vital. Three ways to explain how the projects are handled: the procurement method, time management method and principle tool for time management, were discussed by Chartered Buildings Industry (CBI) (2008). Task-assigned individuals must be able to manage and capture time via usage of tool (Mcgraw, 2009).

Parties	Drafting a planning method statement (%)	Involved in project planning meetings (%)
Architect	6.71	4.68
Client	13.41	9.36
Contract manager	5.49	-
Foreman	0.00	0.00
Mechanical and electrical engineer (M&E)	13.42	7.02
Project manager	14.63	15.20
Quantity surveyor	6.10	5.26
Relevant specialist/subcontractor/supplier	6.71	4.09
Scheduler	7.93	10.53
Site engineer	-	11.70
Site Supervisor	-	6.43
Site manager	9.15	12.28
Structural engineer	7.32	7.02
Sub-contractors	7.93	6.43
Tradesman	1.22	0.58

Table 5. Involved parties in drafting a planning methods, statements and meeting (CBI report,2008)

The table above shows clearly that project managers had the largest proportion of preparation approach and planning meeting. According to Nash et al., (2010), in three phases: pre-contracting, pre-construction and construction, the project managers indicated to have a consistent high levels of power.

## 2.6 Summary

The chapter began with an overview of the UK construction industry, waste management and sustainable growth. In particular, a gap in existing literature was identified which examines project team members as regards to construction waste. In addition, inconsistency has been created among positive attitudes and a true behaviours, which is often refers to as the reading attitudes/ behaviours gap. While previous research addressed this subject, the factors that cause this discrepancy between positive attitude toward the environment and waste management behaviours are not clear. Variables were listed in prior literatures dedicated to influence the project team in the management of construction waste. In the chapter, key factors which influence the attitude/ behaviour gap at project level were further explored. The factors were split into internal variables and external variables.

## 3 – Methodology

### 3.1 Overview

Current chapter presents the methodology process for exploring the topics of investigation and for achieving research objectives, having established the theoretical framework. Methodology is regarded as a key aspect of a research papers because using and sampling are the best affordable method results in the analysis (Silverman, 1993). In the chapter methodology, the scientist describes the way the research is performed and justifies her decision further. Third chapter contains ten subsections.

### 3.2 Objectives of Research

Relating to Cameron and Price (2009) research purposes are considered important as a map for baselines that guide the projects. The research contains three aims to achieve the research goal. Between two and five goals are enough for study (Cameron and Price, 2009). The study aimed to explore the variables affected the attitudes/behaviours gap among project team including senior managers, project directors at project-level in the context of waste management. The study's main objectives are:

- A. Analyze project team members' attitudes towards the construction waste management and environment
- B. Determine the relationship between project managers' and team members' knowledge and behavior towards waste management
- C. Discover the causes for the gap in attitude in context of project-stage among team members in construction waste management

### 3.3 Research Questions

Blumberg (2008) highlighted the significance to ensure a successful study process with specific issues relevant to science. To achieve the objective of study, the researchers must respond the requests:

1. To what extent are project managers engaged with construction waste management on site?
2. To what degree are project team members aware of construction waste management management and sustainability?
3. How does internal and external variables influence project team members' waste management behaviour?
4. What are the major challenges that obstruct members of the project team to correctly practice waste management on construction sites?

### 3.4 Research Philosophy

Literature suggests that positivism and interpretivism are the two dominant science of philosophy/ideology (Bell, 2011). Philosophy can be the view in which he/she screens the world (Saunders, 2012). Above mentioned, that the model for study takes a huge impact on the nature and execution of any study (Saunders, 2011). The paradigm can be referred to a globalview that presents a fundamental sets of belief guiding mankind activity (Creswell, 2009). Corbin (2008), defined philosophy guideline underlying the theory, methods and information. Pollack (2007) defined the philosophy along with a common sets of values, assumption and community that are guide to see real world. Reviews of conceptual globalviews suggested to form the basics of the research method and also influenced techniques used for data collections and evaluations. Paradigm is not only work that determines what view is taken, but also how they are questioned and discovered (Fellows and Liu, 2008).

Effective researcher takes a deductive approaches (Gill, 2008). Positivism, also recognised as objectivism, argues that reality can be autonomously controlled, and thus perceived by all focus on analytical observation, logical truth and deduction (Tan, 2002). The positive researchers are thus seen as a tangible analyst/interpreter without affecting or becoming affected by study subjects. The positive paradigm mainly refers to the quantitative research approach aimed at gathering factual information, studying the relation between facts and how the facts are consistent with previous research literature theories and findings (Liu, 2008). Therefore positivism refers to call for proof.

Interpretivism, however, implies where a phenomenon can not break natural rules but is perceived on the basis of the belief and /or interpretation of the truth (Bailey, 1987; Walliman, 2001). The interpreter does not observe or model reality, so it can be described only (Sutrisna, 2009). Subjectivism is included age variables where the real world is personal; social product constructs in the sense of human belief and value systems as social actors (Gamage, 2011). The constructivist reality bases on the individual result of the differences in observation and perception as well altered by socialism (pupil, educational and trainings), it is likely that the reality will be different from that of the others. This is why interpretivism promotes the multi-reality concept.

### 3.5 Design of the Research

Yin (2014), defines research designs along with logical sequences which relate empirical evidence to initial research questions of a study and ultimately to its results. For Bryman and Bell (2003), research design offers a research frame and applies to the means for data collection and analysis to address questions from research. Denzin and Lincoln (2000) suggested a research designs provide guideline for the connexion of the methodology elements used in the study. Examination of the different definition

suggested that design of the research is a key for the entire process. Design of the project/research could be viewed simply as a research piece which completes the research's puzzle by connecting the other pieces of research (research questions and findings) with one unit. Because the final research requires more stronger or suitable research design.

A number of factors affect the choice of the research design, particularly the nature and the question types that seek to address. This will mean that the issue of evidence collection is avoided but does not answer the initial investigation issues (Yin, 2013). The chosen research strategies / designs shall be defined by: the question(s) of the study; objectives; the conceptual foundations or research paradigms; the reach of existing knowledge; time and other available resources (Saunders et al., 2007). In the following section the study strategy is presented.

### 3.6 Research Strategy

Since the research demonstrates that it is not aimed at generalising law but at analysing personal behaviour and perceptions, it refers to as a study's inductive approaches, a common approach in interpretive practise (Bryman and Bell, 2011). It includes searching for observational pattern. The researchers are trying to derive meaning from the collected data by using an inductive method to identify important trends (Bryman and Bell, 2011).

As studied previous research philosophies and designs, the author can easily decide whether the research approach is better qualitatively or quantitatively. The quantitative and the qualitative analysis approaches exist. The quantification of data is emphasised in quantitative research, while qualitative researches emphasise terms, rather than quantifications (Saunders et al., 2012). Qualitative researchers study the feeling of the participants and their relationships. As already stated, study has a positive and inductive nature and hence it is most fitting to follow a qualitative approach.

### 3.7 Collection of Data

The following point for the investigator is to select the best approaches to data collections.

At a time when researchers around the world collect and archive enormous amounts of data, the practical use of existing research information is becoming more common (Schutt, 2011). Secondary data analyses the data obtained from primary purposes by someone else. Using of current data offers researchers an affordable choice with limited time and money (Andrews and Higgins, 2012).

Secondary information is collections for many other purposes at a various times in the previous period by the researcher that collected these data, but not necessarily relate to the research content of previous studies. Using the data the researcher is secondary knowledge for the existing explorers (Kotler and Kevin, 2012). This can be accessed either in printed, electronic or typed formats. The researchers may collect information about a sector, potential product applications and the environment from a variety of secondary source of knowledge. Secondary informations are often used to provide initial insight into the question of analysis. The secondary data is either internally or externally identified by their source. Inbuilt or internal data is secondary data that collected within the organisation where research is conducted. Secondary data from external sources used to obtain externally.

Alongside the reuse by some authors of a implemented secondary datasets for secondary evaluation, some forms of “sortings” of data is more common. (Heaton, 2004). For different reasons, sortings might applied: sorting to identify the primary participant population sub-sample (Kearney et al., 1994); selecting interview content from observed information (West and Oldfather, 1995); sorting relied on a single data form (Szabo and Strang, 1997); quantitative data accuracy sortings (Clayton, et al., 1999); sortation

analysis may be limited selectively to specific subjects or topic (Gallo and Knafl, 1998).

### 3.8 Sampling Strategy

In this analysis, the scientist used simple random samples of the secondary data obtained. According to Blumberg et al., (2014) the researchers do not have to query the whole planet, but may confine themselves to a selection of individuals to perform research. A sample is also called the community of people who participate in the data collection. This is a group of individuals chosen for research (Bryman and Bell, 2011) when people describe a huge number of unit to be chosen for the sample (Bryman and Bell, 2011). The advantages of sampling include reduced costs, better test precision and faster data collections speed. However, this is critically affect to sample connection with the study subject (Blumberg et al., 2014).

The scientist considered efficient samplings to be a cost effective and affordable strategies as the researcher relied on population of the study (Saunders et al., 2012). However, the explorer ensures a sampling technique is sensitive to choosing prejudice and sampling mistakes (Bryman and Bell, 2011). The researcher ensured that participant from different ethnic background and age had a mixed sample size. In addition, the geographic distance was confined to the staff working in UK in building waste management.

### 3.9 Analysis of Data and Interpretation

Corbin and Straus (2008), defined analysis as a method to find out what it is and how it functions. As mentioned in Miles and Huberman (1984), methodologies of research are not well developed, which is a severe and core problem in the use of qualitative data. For this reason, Miles and Huberman advised that, the approach to qualitative data analysis should be

clarified, which requires a commitment requiring a good degree of explicit structure. Data in qualitative analysis adopts a dialectical approach rather than a method where some data is collected and interpreted more precisely (Agar, 1980; Wolcott, 1994).

A descriptive analysis (description) is used to make sure that researchers are kept closely with the data originally recorded from field notes and informant words (Wolcott, 1994). According to Bernard (1988), descriptions are designed to make complicated matters understandable by reducing them to their part. This process is to "speak for itself or speak out for themselves" data (Wolcott, 1994); and to determining what happens within or on the field of data. Secondly, the qualitative data, the study that proceeds carefully, systematically to define key (extremely important features) variables; and the interrelationships between them expands and extends descriptive account. The third way to analyse the data as proposed by Wolcott (1994) showed that the first or second process may come out with the goal of understanding or clarification beyond the limit of what can usually be explained with analysis. The perception processes show the different significances of events, object experiences or a study (Straus, 2008). The differentiating factors in qualitative data are relevant and this is the main element of qualitative data analysis to the understanding of these significances (Gibbs, 2005).

### 3.10 Validity and Reliability

The researcher must consider the validity and reliability of their methods in order to ensure high quality research (Polonsky and Waller, 2015).

Following on Saunders et al., (2012) reliability means that data collection techniques and analytical methods can result in clear conclusions. However, the coherence due to the nature of the analysis is difficult to maintain in qualitative data. According to Schutt (2012) the qualitative study reliability depended on the analysis instrument and the probability of reproducing the

similar finding. The author, however, ensures that her research methodology was explicitly acknowledged. The researcher must also take into account the validation. Regarding to Saunders et al., (2012) validity responds to the degree where an accurate measurement method is taken by the data collection process. The researcher considers that the research is valid. Cameron and Price (2009) for the researcher's fulfilment and reputation, validity is important. It is not necessarily generalizable, as stated earlier, because of the nature of research. Furthermore, Cameron (2009) mentions the interview as interpretations that can misrepresent the inference. Consequently, in collected interview samples the researcher checked the constructions and conclusions.

### 3.11 Challenges and Limitations

To begin with, the author acknowledges that the results cannot automatically be generalised because the study does not automatically represent the entire population's attitudes and behaviours. Furthermore, the researcher stated that limitations and challenges resulted by Global Pandemic Covid-19 which required lockdown of industries and self-isolation of all population in UK. In addition, waste management in the construction sector includes actions on the part of contractors, consumers, distributors, vendors, and law-makers (enforcement agencies). However, this study was restricted to assess the building firm without input from customers, manufacturer, supplier and lawmakers. The efforts of all other players and their influence on the results of the Waste Management (WM) in the construction sector should have been explored.

The author also acknowledges that the comfort sampling technique has vulnerability to collect sampling errors (Bryman and Bell, 2011). Additionally, extensive interviews were collected using the selected secondary data collection process. In addition, participants could feel social pressures to respond to some degree by having a social desirability factor (Carrington et al., 2010).

### 3.12 Conclusion

The chapter provides readers an insight into the research scientist's methodological processes to achieve the desired goal. An author also enjoyed a high degree of versatility because of the exploratory aspect of the analysis. The study involved the collection of qualitative data, as the study questions were answered by human participants. Moreover, the chapter explains the application of a half-structured in-depth interviews and provided the readers with an overview of the analysis and interpretation process of the results. Detailed description of the research process is provided in this chapter: design of the research process; case selection; secondary data collection; and ways of ensuring research design quality. The methodological issues underlying study design choice were addressed and the choice of multiple case studies as the best secondary data collection method for this research were explained. The next chapter describes in detail, how secondary data were analysed to address the themes and sub-topics on which the results were presented.

## 4 - Analysis of Data

### 4.1 Introduction

The analysis of the data gathering from the secondary data interview files will be presented in this chapter. The investigator analysed the attitude of the participants towards waste management; their understanding of sustainable development and environmental concerns; how does their attitude towards building waste impacts on their operation at the project level; and finally identified main responsibilities and challenges preventing the project team from handling construction waste effectively in British construction site. Therefore, regarding to the interview files, the analysis contains in following parts namely: 1) concerns relating the environment; 2) the approach of senior management towards workforce; 3) awareness and education level of personnel; 4) main factors influencing the attitude of team members at project level.

### 4.2 Concerns towards the Environment

In a work environment, employees' attitudes may influence dramatically by pressure from partners and by creating acceptance in a community that provides safety requirements (Robbins, 1994). For sure, there are different "cultures" in various professions, which may affect the attitudes further, by defining the position and status of a participant in the organisation and expectation of certain comportement. For instance, the construction industry and thus its employees might have a negative environmental attitude (Barrie, 1999). These working cultures are mainly influenced by a growing educational context that dictates their access to knowledge on a particular subject. Traditionally, environmental consciousnesses were not taught in the education programmes for building careers. In recent times, this absence of environmental education has been offset by the most strong cultural impact on human attitudes towards environment: the "mass media" (Chan, 1998).

Company A acknowledges waste generation as a negative environmental factor and aims to incorporate sustainability into its projects in order to

establish sustainable solutions for its customers. The company aims to minimise environmental damage by waste management, as shown in the company's environmental policies.

*Company A is committed to reduce potentially adverse environmental impacts of its business operations and contribute to sustainable development by balancing its corporate goals with environmental concerns by adopting a responsible and pro-active approach to environmental matters. (Senior Environmental Manager, Project A)*

However, as stated in the company's Sustainability Report for 2012, Company B wanted *to be known as pioneers in sustainable designs, constructions and construction services to allow (their) clients to construct longer, better lasting houses, and function better.* Company B as a major contractor has signed a debris agreement in order to demonstrate its commitment to being a responsible company and this *"to prove that we behave as a responsibility company"* (Senior Project Manager, Project C).

The company's activities are motivated by concern for the environment and the need for environmental conservation, and also by the environmental advantages of CWM.

*Of course, in context of resource efficiency, the environmental benefits are crucial. You just speak for itself, if you re-use the soils at your place rather than dig them and give them away for disposal because of the waste and then you buy a lot of new content. Then we crush concrete bricks and reuse them as a hardcore instead of importing stuffs in relation to the resource efficiency and soils (Site Manager, Project B).*

*It ensures that the processes and projects we create and build are in line with the design, size and environmental aspect of our work in office units and project sites. One main environmental objective as set out in the environmental policy is: to work under the environmental procedures of the business in order to achieve our set environmental targets and to prevent environmental pollution (Project Director, Project C).*

General improvements in attitudes towards waste concerns have been observed in the industry so as to affect CWM activities at the site. These working attitudes are mainly influenced by a growing educational context that dictates to their knowledge on a certain subject. Traditionally, consciousness toward environment was less taught in the education programmes for building careers. In recent times, this absence of environmental education has been offset by the most strong cultural impact on human attitudes towards environment: the "global media" (Chan, 1998).

*I think, perhaps ten years earlier, people have less knowledge of the necessity and importance of the construction wastes. They understand, the average member of the workforce, that if you hold a piece of metal and stand before a metal basket or a wood bin, the right thing to do is put it in the metal basket; I would say it was just a consequence of the changes in the construction sector in the last few years (Senior Site Manager, Project A).*

Company D has a single page of the Company's environmental policy, giving the company's position on the WM. The company had no specific WM policy paper. However, environmental requirements are all defined in environmental policies, interpreted by the Senior Environmental Advisor for the company. A common document was a report on an environmental policy stated Azzone et al., (1996), as an evidence of the pro-environmental behaviour of a project team's attitude towards environment.

*As such, we have no waste management policy; I have here only the public environmental policy. So what environmental policy does, by encouraging recycling resource use and recycling materials, decreases waste production and dislocates waste from waste sites. This is our CWM policy effectively impacts the waste reduction (Senior environmental advisor, Project D).*

### 4.3 The Approach of Senior Management towards Workforce

To implement waste management plan successfully senior management must be supported and Kuhre (1998) highly recommended activity to project plan success. Ling and Lim (2002) described the commitment from a high level of management as a success essentials within construction waste management plans, which required participation and involvement by senior managers. It describes waste management initiation from top to bottom because employees do not want to initiate participation by themselves.

At the project stage, the companies have site managers who are responsible for waste control. In order to allow the next company to compare the output of its project, it records waste data generated. The Environment Director also allows project managers or supervisors to accomplish the goals set out on their contract papers (depending on the project). There is a project director / manager at the project level for each project responsible for overall waste and environmental activities. 2 or 3 Site Managers may assist the Project Managers, depending on the size of the project.

*We primarily want to ensure that our subcontractors ... because we are a management contractors, we do not receive any trainings, so all of the waste created by subcontractors can be taken and given us a carrier / destination licence, or a range of ships are divided and it depends on how the project is and what kind of thing is involved. This relies primarily on top project managers and site managers (Site Manager, Project A).*

Similarly, Waste Manager of Project B stated:

*Senior project manager is responsible for monitorings the performance of waste management in the projects. The integrated management system of the company was used as a system to collect all project data; to support the performance monitoring of project directors on site. The waste manager ensured that the correct processes and documentation for all waste handling and transfer occurred. Monitoring and maintenance of receipts for waste transfers and copies of sub-contractors' permits (demolitions contractors,*

*asbestos removers, waste dealership tip permits) is also involved in the monitoring of activities. Subcontractors for projects received notes and licences for their work, which were monitored and uploaded by the site team at the IMS (Integrated Management System), particularly waste collected from the site. Furthermore, the subcontractor responsible for the procurement of separation slips was responsible for disclosing the amount of waste to the site team. (Waste Manager, Project B).*

Nevertheless, limited waste management resources that have difficulties, major projects involve too many workers and factors which make it difficult for everyone to control.

*It is quite frustrating if you see something happening on a workplace and you know there are better way to do it, but with huge jobs, like this, you know the problem is that it is quite difficult to change things quickly (Assistant Site Manager, Project B).*

Within this term, senior management at the site's relationships or approach to employees management largely affect WM. This illustrates the importance of the workers in achieving their WM priorities and goals. The maintenance of a strong relationships between site teams (hands on people) have a great influence on the world championships found in projects C.

*And, in the same way, I talk to everyone about working conditions. Alright, it's part of the work but the trick is to connect with the guys on-site. You have to deal with the client. He said to me, "If you can take care of the people, your task will look after itself," years ago – he hadn't been very old – and I believe that there's a lot in this truth. Well, it is technical and detailed, but you will gladly work for the people if you keep them happy. It involves relationship building (Site Manager, Project C).*

#### 4.4 Awareness and Education Level of Personnel

*Construction Waste Management trainings on sites take the forms of sites briefs and tool-box talks and is handled by the sustainable development department. We have an e-pod system (distance) where you can access various modules by the website staff (Project Manager, Project C)*

Many of the modules concentrate on waste management on the project site.

*Education and training on waste has taken the form of induction at sites where all the staff including subcontractor staff are trained in health and safety and waste management practise. Documents of the waste management guide and the waste management cycle are all part of on-site waste management training materials (Senior Manager, Project A).*

Education was considered to be a major part of CWM in all three projects (A, B, C), mainly through toolbox discussions, web input, and the use of on-site advertisements and campaigns.

*We need a toolbox conversation each month per subcontractor, then the remaining 3 weeks are safety and health. So, in the one community and I believe we have a fair shares of education, literacy and so on. We run campaigns and have a noticeboard for the community. I will give you a case study in the canteen where you are sitting eating and I inspect and I will give you a toolbox talk as a memory aid to use all in that month, and I will give it each month! I will give them a new case study and a new toolbox chat. I believe, therefore, that the message gets through education, visual displays (Environmental Manager, Project B).*

## 4.5 Main Factors Influencing the Attitude of Team Members at Project Level

### 4.5.1 Complexities between project team and design team

Similar waste reduction approaches were adopted for both projects, focusing on: management; design (specifications); design review; building or process technologies; and packaging material or handling techniques. With regard to project A, the project team placed the greatest emphasis on preventing waste. The approaches to waste reduction through designs has been made possible way by the construction and design of the project. Similar approaches to waste management were presented at B.

*We are in charge of working with the designers because it's a building project. How can we ensure that we achieve the programme target and the waste streams we will produce? When I sit down and get through with regard to materials - we know that we choose low waste materials during design (Project Manager, Project A).*

*As project leaders, we organise the assessment of how waste savings from the design can be accomplished (Project Manager, Project B).*

In order to cover the choice of materials and construction technology, the strategy was developed for reducing waste.

*When we get to building, it will be by planning and selecting materials to minimise waste in general (The project manager, Project C).*

#### 4.5.2 Type of Construction Technology Tools

Company D has a method of project management, which is *intended by the organisation to reduce the environmental effects of its activities* (Project Manager, Company D).

*About four years ago, we used the portal programme with a company that was known as (name withheld) as the waste broker, and we handled it manually. So, we sent them our paper model and they have created a portal that looks and feels very close. This system provides the basis for the pre-cast monitoring and decision-making of waste management goals based on project data* (Project Manager, Company D).

Similarly, project manager of Company A pointed about precast monitoring tool and added *“these come in off the back of a wagon, we pick them up and drop them into place, fix the steeling - off you go - make sure they’re plumb and you can see they’re propped there whilst they set them up - off you go - next floor. Pre-cast is the way ahead.”*

#### 4.5.3 Planning

In project A1, the demolition project included a specialised businesses which, according to the waste managers, *helps to understand what to expect from destructive test at the site.*

Project C states the same position in terms of planning at project-level.

*Planning allows us to consider possible savings. For example, if we come up with a situation in which we need to imports a large quantity to fill up a little land to achieve its level, well if we could use the material that comes in from the demolition process and minimise it, we could make savings on both sides. There is therefore the opportunity for us to pay attention at how the work is programmed in order to use the resource we have on the sites* (Waste Manager, Project C).

In project managers' opinion, CWM (Construction Waste Management) planning will start at the project design stage, where more incentives exist to take informed decisions on CWM.

*We will build a lot more momentum, build a lot more effectively and more the waste if we spent much more time plannings and doing jobs well from the beginning (Project Manager, Project B).*

CWM planning is part of the Environmental Management Plan at the project level. As the project resource planner, the Senior Site Director outlined the planning approach as follows:

*We will run through several checklists before the beginning, define the constraints on a project, the goals and the options for it (Resource Manager, Project A).*

Daly (1977) states that the planning specification should be 10%, schedule should be 2%, and final design should be 40 % of total cost. However, during execution not much design is implemented. Differently, Posten (1985), states that pecification should be 16%, schedule should be 6%, and final design should be 25 % of total cost.

The project teams calculate the amount of waste required as part of the planning strategy which is then included in the waste management plan on the spot. The site manager clarified, for example, in Project B, that they measure the waste by offering a general percentages based on the types of content.

*At the beginning of the job, we examine what kind of bricks are and decide how much waste is going to be. This job, for example, because these bricks have a bit temperamentality and very fragile, I assume we have gone from the normal one of 2% to 5% and this is just due to the kind of brick (Site Manager, Project B)*

#### 4.5.4 Motivation of Project Site Teams

Behavioral manner helps to shape protection within insecure condition (for example, conflicts) and increases self-confidence. In addition, attitudes demonstrate the identity and guiding values of an individual. Attitudes are useful for senior staff members due to their determination the course/direction of people's behavior and providing additional insight in the right options of motivation (Ajzen, 1993).

Project B implies that things are easier to dump than handle, and it would be a more motivating factor for people to achieve an increased degree of waste management. He announced that in his reply to the role of incentives.

*It would be much easier for someone to say, "Throw it into the lump when you've finished with that and we're going on." However, at the end of the week no-one will give you specific prizes for your waste management activities so if you really wanted to getting things right and fighting for the environment, there have to be some tips or tickle, some prize at the end of entire day (Site Manager, Project B).*

It was also endorsed by a project C site manager who believes that rewards make it simpler, regardless of the educational situation you offer to people on site.

*To be honest with, I don't think you should teach people anyway, that they can't watch pound notes fall out of their pocket from behind, they 're not going to. I don't say we should pay people for doing so, it is a very shortsighted incentive sometimes and that seems like the only incentive to work sometimes.*

## 5 - Conclusion

The importance of this study consists in obtaining an understanding of the difference of attitudes in waste management at the project level that is more detailed and contemporary. As mentioned previously, while the behavioural divide is not the newest area of research, it remains far from flustered. The research also has essential academic and management consequences. To the researcher's awareness, this study is to primarily look at the project level behaviours gap in the management of building waste. The study is not only revealed that there is an attitude-compliance difference in building waste between project managers but also established key challenges and clarified the consequences of this discrepancy. Its managerial implications may contribute to building and implementing strategies by policy leaders, top managers, and building professionals to promote and the project team in building waste management. As this study has identified key barriers of project team's waste management behavior.

The research highlighted the significance to ensure a successful study process with specific issues relevant to science. To achieve the objective of study, the researchers must responds the requests:

1. To what extent are project managers engaged with construction waste management on site?

The research unveiled that project team members including senior project managers, site managers are concerned with the environment. No one expressed any unethical views among all participants. However, the extent to which the participants differed. Although some project managers' answers seemed very interested in the environment, others did not. In addition, the researcher found that different motivations underlie the environmental concern of the participant.

2. To what degree are project team members aware of construction waste management and sustainability?

The researcher found that project team members showed wide knowledge on waste management and sustainability. They also demonstrated a good attitude sustainability development and the benefit of managing construction waste.

3. How do internal and external variables influence project team members' waste management behaviour?

Although project team members explained their actual waste management behaviour, without being affected by their environmental concerns, expressed a positive environmental attitude. This leads the researcher to believe that there is a behavioural gap at the project stage in waste management.

4. What are the key difficulties that hinder project team members to correctly practice waste management on construction sites?

The research explorer explained an emerging patterns in regards of core barriers influencing the attitudes/behaviours gap of project team members. Mainly, motivation appeared to be the influence factor. Finding implies that company needs to match the way to support project team that they are ethically integral and not quite keen to make money out from managing construction waste. Further, the results showed that other core barriers are less impacted to project team productivity. Findings implicated that project team needs to be persuaded that their managing activities could create a difference by serving the environment to reduce construction waste. Additional variables are positively affecting project team's attitude on managing construction waste. Those are: design, planning availability of resources, communication, education, and top managers' responsibilities towards workforce. Above mentioned factors exceed the moral requirements and compassion for the construction waste at project team's attitudes.

To sum up, finding of this paper shows that project managers' attitude and behaviour are hard to predict. The research shows that the attitude-behavioural gap at project level has a complicated structure and varies by

multiple factors among project management team. It should be clear that project team has different motivational factors and thus personal barriers. Although the investigator has discovered parallels with available literature through terms of major difficulties, not all key obstacles have not been identified in this study. Nevertheless, the researcher considered the exploratory nature of the research was responsible to this.

## 6 - Recommendations

This chapter aims to provide recommendations for management practices and future projects on the basis of the findings, having previously concluded that the research results contribute to the current literature's scope on the behavioural gap.

The outcomes of the dissertation were mainly consistent with previous research publications. However, there are some core barriers that point out validity of this work and strengthen its significance in terms of behaviour on project-team level. However, the author attentioned that this dissertation work has been very insightful and the questions of research have been answered overall. The secondary information set and its benefit have prospective for further examination in attitudes/behaviours gap within the waste management in the construction sector.

### 6.1 Managerial Recommendations

Taking into account the results, the author would recommend steps to deep exploration within the behavioural context at the project stage. Firstly, the results of this study will allow senior managers to understand the obstacles for the project team's on-site waste management. Understanding these hurdles will be very useful as it will help top managers to adapt their strategies in order to encourage in more efficient way of reducing building waste among site managers which can have a positive environmental impact. Saunders et al., (2012) highlighted a value of exploratory research recommendations. It might assist readers understand to what extent findings in the study would support project operations in the future (Waller, 2015). This section has perceived by the author as useful in showing her ability to not only do research but also interpret the results in meaningful way.

## 6.2 Future Research Recommendations

From above mentioned, next researchers need to aim to explain a better knowledge of the behavioural gap according with the nature of the study due to actuality of the field by virtue of the exploratory nature of the study and the fact that the field of research is still far from out of reach. Next, the research explorer would propose in further research the impact factors of the attitude differences not only from senior managers' perspective but also from the workforce's point of view. In addition, future studies should consider/discuss the different barriers/variables and how the disparity in attitudes is affected by a particular factor such as time or workers' salary. Finally, for future research on the attitude gap at project level a quantitative analysis and survey might be taken allowing the researchers to learn the development patterns in this area.

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