The identification and elimination of excessive production in FM cleaning operations within UK shopping centres.

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Abstract

Research surrounding lean and Muda is plentiful within a manufacturing and production context, however, limited in facilities management (FM), particularly in a cleaning operation within UK shopping centres. The literature reviewed for this study indicated that although no effort has been previously made to integrate the Muda concept into FM cleaning operations within UK shopping centres, efficiency improvements are available in operations outside of manufacturing and production environments. And that UK shopping centres contain FM cleaning operations in which these efficiency improvements could be possible.

In consideration of this research gap, the aim of this study was to explore the identification and elimination of excessive production in FM cleaning operations within UK shopping centres. This study used a quantitative methodology, based on the researcher's positivist research philosophy, and explored the research problem utilising survey questionnaires. 107 survey questionnaires from front-line cleaning operators UK shopping centres were statistically analysed to explore relationships between the six defined independent variables, FM service delivery, in-house/outsource, management presence, shopping centre classification, continuous improvement (CI), and performance measurement, with the sole dependent variable, excessive production. The respondents spanned all four UK shopping centre classifications (REVO, 2018), across a total of 12 UK shopping centres.

Two significant relationships were found in this study. Both the utilisation of CI and performance measurement are <.001 significant in reducing the level of excessive production in FM cleaning operations within UK shopping centres. It is therefore suggested that in order to improve operational efficiency in this researched environment, a focus on both CI and performance measurement would be beneficial to both the FM service provider and property management. On the contrary, the remaining four independent variables, FM service delivery, in-house/outsource, management presence, and shopping centre classification, all provided insignificant relationships with the dependent variable, therefore proposing no benefit to operational efficiency improvements.

This study contributed academically to many theories relating to the independent and dependent variables. This study contributed to the academic understanding of UK shopping centres, proving that irrelevant of a shopping centre's characteristics, such as square footage (sq. ft.) and amenities (REVO, 2018), the level of excessive production in FM cleaning operations within UK shopping centres will not be negatively affected. Also, a division in the reviewed literature between lean supporters and objectors has been challenged, with supporters arguing that lean is not merely a production method, but a way of thinking that raises efficiency and rejects waste, and objectors arguing otherwise. The findings of this study confirmed that not only is CI, and therefore lean, present in FM cleaning operations within UK shopping centres, but that it positively impacts the level of excessive production, thus improving operational efficiency. Similarly, this study confirmed also that performance measurement utilisation reduces the level of excessive production, and therefore improves operating efficiency, advancing the current theoretical understanding.

Key words: Excessive production, Muda, lean, continuous improvement, performance measurement, facilities management, cleaning, UK shopping centres

Declaration

I declare that the work in this thesis was carried out in accordance with the regulations of the University of Gloucestershire and is original except where indicated by specific reference in the text. No part of the thesis has been submitted as part of any other academic award. The thesis has not been presented to any other education institution in the United Kingdom or overseas.

Any views expressed in the thesis are those of the author and in no way represent those of the University.

Signed …….. Date …….

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This study is truly dedicated to my wife, Sarah, and son, Stanley. Loves you mind, you are the best.

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Table 1 - Table of Abbreviations

ANOVA	Analysis of Variance
APSE	Association of Public Service Excellence
AVE	Average of Variance Extracted
B2B	Business to Business
B2C	Business to Consumer
BICSc	British Institute of Cleaning Science
CAGR	Compound Annual Growth
CI	Continuous Improvement
FAC	Factor Loadings
FM	Facilities Management
GDPR	General Data Protection Regulations
GLA	Gross Leasable Area
ICSC	International Council of Shopping Centres
IFMA	International Facility Management Association
MANOVA	Multivariate Analysis of Variance
MDS	Multidimensional Scaling
MRSA	Methicillin-Resistant Staphylococcus Aureus
MSU	Major Space Unit
NHS	National Health Service
REVO	Retail Evolution
RII	Relative Importance Index
RSC	Regional Shopping Centre
SFM	Sustainable Facilities Management
SPSS	Statistical Package for Social Science
Sq. Ft.	Square Footage
TFM	Total Facilities Management
TPS	Toyota Production System

Chapter One
Introduction

1.1 Introduction

This Chapter commences by overviewing the research background and the problem statement of the research. From this, the research aim, objectives, and hypotheses are outlined, followed by the statement of significance and research methodology. This chapter concludes with explaining the structure of the thesis.

1.2 Research Background

Lean philosophy is based around delivering value to the customer, and from the perspective of the customer, it should be evident whether an activity constitutes value-added work (Akdenis, 2015). To document this concept, the term lean was used to describe Toyota's practices and operations in 1990 when researchers, led by James Womack, studied various manufacturing methods in use around the world, and offered the term 'lean manufacture' to describe the Toyota Production System (TPS). Since its inception, the concept of lean has been shared with the world in a book, The Machine that Changed the World, by Roos et al. (1990) outlining the research group's findings. The importance of lean is emphasised further by Fullerton et al. (2014) in a paper exploring lean manufacturing and firm performance, arguing that it is the most important strategy for achieving world-class performance, thus confirming the work by Roos et al. (1990) that it changed the world.

Attempts have been made to elucidate the implementation of the TPS concept. The Toyota toolbox offered by Jones et al. (1997) contains key elements for use, including the levelling of flow order and work, by eliminating all causes of demand distortion or amplification and organising the work so the product flows directly from operation to operation with no interruptions. This scope, and variations of lean, have expanded even further than TPS since its foundation, and have been adopted to minimise process waste in various industries other than production and manufacturing, including service businesses (Manuele, 2007), although successful results are not ubiquitous. The lean concept comprises many different tools and associated aspects, including Kaizen, CI, 5S, and Muda (e.g. McWhorter, 2017; Sweeney, 2017; Sayer & Williams, 2012; Akdeniz, 2015; Shine, 2018). To meet the central aim of this

study, the identification and elimination of excessive production in FM within UK shopping centres, this study focuses on excessive production, a form of Muda, known also as process waste.

Derived from the manufacturing industry, and the Toyota Motor Corporation specifically, process waste elimination/minimisation is a specific tool for lean production (Hussain & Malik, 2015). Aligning with this description, the lean approach is focused on systematically reducing waste in the value stream, with the waste elimination process including not only defective products, but also defective work and activities (Taj & Berro, 2005). To this end, addressing Muda elimination can improve efficiency and lower production costs in manufacturing and production environments (Manuele, 2007). However, this concept has not been examined in facilities management (FM) cleaning operations within UK shopping centres, and therefore the transferability into this environment is unknown.

The activities containing waste add cost and do not cause a product to be transformed into a more complete product in the eyes of the customer; thus, they are non-value-added activities. A value-added activity is one that causes a product to become a more complete product, examples being assembling parts, machine parts and painting, all of which progress the product to a more finished state (Carreira, 2005). Singh and Singh (2013) expand on this customer focused concept further, recognising that very often quality is customer-defined. Considering this, and the definition offered by Piercy and Rich (2008) that value is what the customer is willing to pay for, customer value needs to be defined, which is the first principle of lean (Olesen et al., 2015).

The terminology used to describe waste varies throughout the reviewed literature, however, some consistency is uncovered. Firstly, the name assigned to waste is Muda, and secondly, the seven categories of Muda. The commonly accepted seven categories of Muda are, as supported by Golińska-Dawson et al. (2015), transportation, inventory, motion, waiting, over processing, excessive production, and defects. These align with the Muda categories suggested by Carreira (2005), albeit that they are named slightly differently: overproduction, unnecessary inventory, transport, process, activity resulting from rejected product, waiting, and unnecessary motion. However, the Muda concept has been expanded to include employee contribution through the

addition of non-used employee talent (Sweeney, 2017; Drotz & Pokinska, 2014; Cooney, 2002).

To meet the central aim of this study, the identification and elimination of excessive production in FM cleaning operations within UK shopping centres, the focus of this study is on excessive production. Describing excessive production as the most serious waste, Kiff (2000) explains how it discourages the smooth flow of goods and services, and is an illustration of making too much of something, making something too early, or making something just in case. A definition is mirrored by Carreira (2005), who presents excessive production as producing more than is necessary to produce. This stance is shared by other authors (McWhorter, 2017; Sayer & Williams, 2012; Lee-Mortimer, 2008; Sweeney, 2017), who express that whatever is produced further to what the customer needs is excessive production waste. Furthermore, excessive production waste leads to other wastes including inventory costs, manpower and conveyance to deal with excess product, consumption of raw materials, and installation of excess capacity (Sayer & Williams, 2012; Lee-Mortimer, 2008).

No literature has been uncovered by this study that specifically places excessive production, as a concept in FM cleaning operations within UK shopping centres. However, literature does suggest that it could offer benefit in industries other than production and manufacturing, with researchers simplifying its presence, as occurring anytime more is produced than is required for the next step of a process (Sayer & Williams, 2012; Lee-Mortimer, 2008; McWhorter, 2017). To this end, the focus of the current research aims to contribute to the research gap found in excessive production in an environment other than manufacturing and production, FM cleaning operations within UK shopping centres.

1.3 The Problem Statement of the Research

The relevance of performance measurement in FM has been documented, focusing specifically on critical analysis of FM practices, providing an understanding of performance measurement tools in FM (Amaratunga, 2001). This has also been partially attributed to service efficiency. Amaratunga (2001) found that any improvement in FM is required to firstly provide improvement in quality and time, before progressing towards lower cost and service efficiency. This, whilst further explaining a concept for integrating CI into FM, however, is not specifically

related to process waste, and is not in direct relation to FM cleaning operations, or UK shopping centres.

FM cleaning operations are present in UK shopping centres, in varying forms of service delivery (Atkin & Brooks, 2009). As a property, a shopping centre is a building that contains physical structures, space and facilities that are managed as a single property which needs to be managed and maintained to ensure that its value is increased. This focus in the reviewed literature is, however, not specific to cleaning operations, but rather the delivery of maintenance, grouped as hard services (Pitt & Musa, 2009).

Recognition is, however, given to FM in shopping centres. For example, Hui et al. (2013) finds that the quality of FM service plays an important role in the overall service performance of a shopping mall. The study into facilities management service and customer satisfaction in shopping centre malls by Hui et al. (2013) provides five implications for FM organisations when delivering their services to shopping centres, and specifically maintaining a high level of customer satisfaction, including that FM companies should ensure a clean and comfortable environment in the shopping malls. This demonstrates both the importance and complications of FM service delivery in shopping centres, and provides a platform for service improvement possibilities; a service improvement that could be achieved through enhanced operational efficiency (Narusawa & Shook, 2009; Hasle et al., 2012; McWhorter, 2017; Womack & Jones, 1996).

Lean presents such a service improvement opportunity in the form of Muda, known also as process waste (Akdeniz, 2015), that focuses, specifically on efficiency. The connection between process waste elimination and efficiency improvement is one of interest to this study, especially considering the finding that the literature review uncovered no limitation to the possible transferability of the concept in FM (Chen et al., 2010). The research gap identified is that the implementation, or on-going delivery, of any aspect of lean in FM cleaning operations within UK shopping centres was not found, although the benefits to any industry were clearly identified.

The reviewed literature shows that Muda, and lean, are not simple processes, but are achieved over time and throughout an organisation. It is when lean principles are applied that people

begin to rethink the organisation of the work and the appropriateness of the size of machines, warehouses, and systems to fit the flow (Womack & Jones, 1996). It is at this point that further layers of hidden Muda are uncovered, with perfection becoming the appropriate goal, and not specifically what a competitor is doing. In theory, Muda removal is a continuous process, operating cyclically and without end (Womack & Jones, 1996).

Of the eight categories of Muda, excessive production has been identified as the most serious, with a suggestion that improvement in this area could provide the most benefit of all of the Muda wastes (Kiff, 2000; Sweeney, 2017). Irrespective of this claim, no literature has been uncovered by this study that specifically places excessive production, as a concept, in FM cleaning operations within UK shopping centres. However, literature does suggest that it could offer benefit in industries other than production and manufacturing. Researchers simplify its presence as occurring anytime when more is produced than is required for the next step of the process (Sayer & Williams, 2012; Lee-Mortimer, 2008; McWhorter, 2017).

Therefore, the current study is motivated by the rationale that efficiency improvements are available in operations outside manufacturing and production environments, and that UK shopping centres contain FM cleaning operations in which these efficiency improvements could be possible. Accordingly, the current study aims to undertake the development of a theoretical framework that meets the central aim of the study, the identification and elimination of excessive production in FM cleaning operations within UK shopping centres.

1.4 Research Aim, Objectives, and Hypotheses

This section outlines the research aim, objectives, and hypotheses, for this current study.

1.4.1 Research Aim

The overall aim of the current study is to identify and eliminate excessive production in FM cleaning operations within UK shopping centres. The rationale behind this current study is to contribute to a limited understanding about the utilisation of the Muda concept, and more specifically excessive production, in FM cleaning operations within UK shopping centres, and in the process build a theoretical framework to test relationships between identified independent variables with the chosen dependent variable, excessive production.

1.4.2 Research Objectives

The main research objectives, and how they are achieved is set out below:

1. To explore the lean concept of Muda elimination.

Achieved through a thorough and critical literature review, as documented in Chapter Two of this study, the Literature Review.

2. To identify opportunities for elimination of excessive production in FM cleaning operations within UK shopping centres.

Achieved by confirming and justifying the dependent and independent variables, developed and detailed in Chapter Three of this study, the Theoretical Framework. From this, six hypotheses and four sub-hypotheses are developed to test identified theory.

3. To analyse excessive production from the front-line FM cleaning employee's perspective within UK shopping centres.

Achieved by quantitatively analysing the responses to a survey questionnaire. The questionnaire was surveyed to front-line operatives within UK shopping centres. In total, 12 UK shopping centres were surveyed, with 3 from the neighbourhood scheme, 3 from the local scheme, 3 from the sub-regional scheme, and 3 from the regional scheme (REVO, 2018). The questionnaire presented the volunteer participants with 34 questions and received 107 questionnaires from front-line cleaning operatives for analysis.

4. To establish a conceptual framework that helps to eliminate excessive production in FM cleaning operations within UK shopping centres.

Achieved by utilising the results of the quantitative analysis to test identified theory that contributes to current knowledge, as discussed in Chapter 6, Discussion, and concluded in Chapter 7, Conclusions.

1.4.3 Research Hypotheses

In order to achieve the objectives of the current study, the following hypotheses were proposed:

Hypothesis 1: There will be a significant relationship between facilities management service delivery and the level of excessive production within its front-line operation.

Hypothesis 2: There will not be a significant relationship between in-house/outsource and the level of excessive production within its front-line operation.

Hypothesis 3: There will be a significant relationship between having management presence and the level of excessive production within its front-line operation.

Hypothesis 4: There will be a significant relationship between shopping centre classification and the level of excessive production within its front-line operation.

Sub Hypothesis 4.1: There will be a significant relationship between the regional scheme shopping centre classification and the level of excessive production within its front-line operation.

Sub Hypothesis 4.2: There will be a significant relationship between the sub-regional shopping centre classification and the level of excessive production within its front-line operation.

Sub Hypothesis 4.3: There will be a significant relationship between the local scheme shopping centre classification and the level of excessive production within its front-line operation.

Sub Hypothesis 4.4: There will be a significant relationship between the neighbourhood scheme shopping centre classification and the level of excessive production within its front-line operation.

Hypothesis 5: There will be a significant relationship between continuous improvement and the level of excessive production within its front-line operation.

Hypothesis 6: There will be a significant relationship between performance measurement and the level of excessive production within its front-line operation

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1.5 Statement of Significance

Manufacturing and production environments have realised benefits from a focus on Muda, an associate of lean, to improve efficiency (Kiff, 2000; Sweeney, 2017). Authors (e.g. Jones et al., 1996; Sayer & Williams, 2012) have documented that all of the eight categories of Muda present difficulties over the continuous process that is required for delivery, however, the opportunity for transferability into other industries is found to be possible (Chen et al., 2010). Of the eight Muda categories, one has been chosen for this study, excessive production, as it has been classified as the most serious, and these authors like Sweeney (2017) suggest that improvement in this area could provide the most benefit of all the Muda categories (Kiff, 2000; Sweeney, 2017). However, irrespective of the benefits available and the opportunity for transferability, no efforts have been made outside this study to introduce a specific focus on excessive production into FM, or into FM cleaning operations within UK shopping centres.

FM does present such an environment in which excessive production can be utilised, especially considering that the relevance of performance measurement and continuous improvement, other associates of lean, have been documented within the industry and related to service efficiency (Amaratunga, 2001). This study contributes to the existing knowledge by exploring excessive production within FM cleaning operations in UK shopping centres, a FM environment where the property contains space and facilities (REVO, 2018) which need to be managed and maintained to ensure that its value is increased (Atkin & Brooks, 2009; Pitt & Musa, 2009), and in which FM plays an important role in the overall service performance (Hui et al., 2013).

It is by considering the problem statement of the research that efficiency improvements are available in operations outside manufacturing and production environments, and that UK shopping centres contain FM cleaning operations in which these efficiency improvements could be possible (REVO, 2018), that the significance of this study is realised. From assigning excessive production as the sole dependent variable, any relationships with the independent variables, such as FM service delivery, in-house/outsource, management presence, UK shopping centre classification, CI, and performance measurement, are statistically tested from survey questionnaire responses from front-line UK shopping centre cleaning service operators, to develop the theoretical framework model of excessive production in FM cleaning operations

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within UK shopping centres. This in turn, extends the overall knowledge of Muda and efficiency in FM cleaning operations.

1.6 Research Methodology

This study adopts the positivist paradigm, and develops testable hypotheses based on current theory surrounding FM cleaning operations and waste elimination, and more specifically, excessive production, to achieve the overall aim of the study. Following the positivism paradigm, this study utilises the quantitative research methodology. From this, a deductive research approach is also adopted, testing existing theory surrounding Muda, lean, UK shopping centres, and FM, utilising a quantitative approach to develop a theory that is subjected to a rigorous test. Which concludes in generalisation, based on samples of sufficient numerical size (Saunders et al., 2009).

To achieve this, a questionnaire survey was developed from the secondary data collection phase of the study and utilised as the tool for primary data collection, in order to gather data from a large sample efficiently, whilst not being present at questionnaire survey completion and not influencing the respondent's responses directly. For this purpose, two delivery methods were utilised to distribute the questionnaire, postal delivery, and email.

In order to examine any relationships between the independent variable and the dependent variable, the questionnaire contains twenty-eight questions for the respondents to answer. Twenty-four of these questions were measured using the Likert scale, ranging from strongly disagree to strongly agree, and the remaining four questions are measured using a nominal scale, requiring a yes or no response. Each question, whether measured by Likert scale or nominal scale, is coded for data analysis. In addition, the demographic of the respondents is explored through six separate questions determining age, employment, shift, service, experience, and team.

This study achieves the statistical analysis by utilising SPSS, as it allows the opportunity to generate basic regression information relating to the relationship of two variables (Bryman & Cramer, 2011). To this end, a variety of advanced analytical tests are conducted, from which proof is derived that supports the proposed theoretical framework. Correlation analysis is also

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conducted to test any relationship between the research constructs, from which significant relationships are uncovered. Finally, multiple regression and analysis of variance are conducted to test the proposed theoretical framework, and examine the relationships between the independent variables.

1.7 Structure of the Thesis

This study is divided into the following six chapters:

1.7.1 Chapter One – Introduction

This chapter contains seven sections to present a brief overview of the thesis. The chapter commences by outlining the research background before setting out the research aim, objectives, and hypotheses. The chapter progresses onto justifying the study significance, provides the research context and rationale, explains the research methodology, and lastly summarises the structure of the entire thesis.

1.7.2 Chapter Two – Literature Review

This chapter explores literature pertaining to the subjects and disciplines related to the aim of the study, and guides the thesis with the development of the research hypotheses. The chapter commences with a review of literature related to lean, and its associated elements, before focusing specifically on Muda and choosing excessive production as the area for focus. The subsequent sections of the chapter explore facilities management in general, UK shopping centres, and facilities management cleaning operations. The final section summarises the reviewed literature and leads into the next chapter, Theoretical Framework.

1.7.3 Chapter Three – Theoretical Framework

The Theoretical Framework Chapter discusses the theoretical context of the current study and presents the proposed research hypotheses to examine any relationships between the independent and dependent variables. In addition to this, the initial theoretical framework model of excessive production in FM cleaning operations in UK shopping centres is presented.

1.7.4 Chapter Four – Methodology

This chapter explains the research philosophy of the researcher, and the research methodology applied to the study. The methodological steps implemented in this study to conduct an empirical evaluation of the proposed research hypotheses. The structure of the chapter starts

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with outlining research philosophy, paradigm, and approach, before progressing to explain the data collection method, questionnaire and sample design, and data analysis techniques. This chapter concludes with recognition of reliability and validity of the measures, and ethical considerations taken throughout the course of the study.

1.7.5 Chapter Five – Data Analysis

This chapter presents the data analysis of the findings of the questionnaire survey, whilst explaining all utilised statistical techniques in detail. This chapter commences by addressing how data preparation and screening was performed, before presenting the usage of response rate, missing data, outliers, normality, and linearity. The chapter then examines the reliability and validity of the research constructs, through utilisation of face value and content validity, construct validity, convergent validity, and discriminant validity, before exploring descriptive statistics for the independent and dependent variables. Finally, the chapter details the testing of the research hypotheses using standard regression, and concludes with a summary table of research objectives, analytical methods, and the results of the hypotheses testing, overviewing the research hypotheses that were supported, and those that were not supported.

1.7.6 Chapter Six – Discussion

This chapter presents the interpretation of the findings of this study and gives a comparison against available similar literature. The chapter discusses, specifically in relation to theory and various other studies regarding the central aim of this study, the identification and elimination of excessive production in FM cleaning operations within UK shopping centres. To achieve this, all hypotheses are addressed. This chapter further presents a table of key authors found in the literature with synergy, table 6.1, from which the conclusions are developed in Chapter Seven, Conclusions.

1.7.7 Chapter Seven – Conclusions

This chapter presents the conclusions, and the research implications for theory, research contributions, research limitations, and future research directions.

1.8 Chapter Summary

In this Chapter, the structure of the thesis is explained, along with an outline of the research aim, objectives, and hypotheses of the research. This chapter also explains the research

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methodology that has been utilised, and the statement of significance, which describes the importance of the research.

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Chapter Two
Literature Review

2.1 Introduction

This Chapter explores literature relating to key subjects and themes of this study, as a means to proceed to develop a theoretical framework, in which the research hypotheses are presented. The key subjects and themes explored are process waste elimination, FM, UK shopping centres, and FM cleaning operations, and commence with the concept of lean. This is with the aim to meet the central purpose of this study, which is the identification and elimination of excessive production in FM cleaning operations within UK shopping centres.

2.1.1 Lean

In this section, this study explores the lean concept, and any relevant associated aspects that relate to the research objectives. It is from this section that this study aims to be guided towards literature relating to Muda.

Lean philosophy is based around delivering value to the customer. Akdeniz (2015) argued that it should therefore be from the customer's perspective that it is determined whether an activity constitutes value-added work. The term lean was used to describe Toyota's practices and operations in 1990 when researchers, led by James Womack, studied various manufacturing methods in use around the world and offered the term 'lean manufacture' to describe the Toyota Production System (TPS). Since its inception, the concept has been shared with the world including by a book, *The Machine that Changed the World*, written by Roos et al. (1990) outlining the research group's findings. The importance of lean is emphasised further by Fullerton et al. (2014) in a paper exploring lean manufacturing and firm performance, arguing that it is the most important strategy for achieving world-class performance, thus confirming the work by Roos et al. (1990) that it changed the world.

Womack and Jones (1996) later offered an antidote to waste, lean thinking, which was promoted as a way to specify value, line up value-creating actions in the best sequence, conduct activities without interruption when someone requests them, and perform them more effectively. Aiming to come closer to providing customers exactly what they want, lean thinking was developed from TPS. The goal is to distinguish value-added activities, or steps

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from non-value-added activities, and eliminate process waste so that every step adds value to the process, thus focusing on efficiency. This, whilst aiming also to produce products and services at the lowest cost and as fast as possible (Womack & Jones, 1996; Antony, 2010). The focus on efficiency is one aspect that is expanded on by this study. Eliminating excessive production, a process waste that is explored in later sections of the literature review, and how it will improve efficiency, is aligned with Womack and Jones' (1996) lean thinking, by specifying value, the first step in lean (Olesen, 2015).

Literature (e.g. Narusawa & Shook, 2009; Hasle et al., 2012; McWhorter, 2017; Womack & Jones, 1996) surrounding efficiency documents progression of the concept. This is apparent in the work by Narusawa and Shook (2009) who further break it down into two categories, apparent efficiency, and true efficiency. Apparent efficiency is an increase in production output with no change to the number of operators or equipment, and true efficiency is the production of a set number of parts or products that can be sold, whilst using the minimum number of operators and equipment. Although the examples given by Narusawa and Shook (2009) are clearly centred around a manufacturing and production background, there is no mention that they are not transferrable. Considering this, the opportunity to explore efficiency improvements in facilities management (FM) cleaning operations in UK shopping provides potential opportunity, as the concept could transfer and thus deliver efficiency improvements that have not be achieved previously.

Although the advancements and associated benefits offered by efficiency are apparent in the literature, not all authors are in support. A division between lean supporters and objectors is recognised by Hasle et al. (2012), who find specifically that it is not merely a production method, but a way of thinking that raises efficiency and rejects waste. In support of this idea that lean is far more than a production method, McWhorter (2017) generalises the concept by offering continuous improvement (CI) and elimination of waste, as the two activities that make up the core of lean thinking, as coined previously by Womack and Jones (1996).

This view of requiring only two activities to implement lean is however contested by Sweeney (2017), who suggests that more activities are required for an organisation to implement lean and so maintain a competitive, responsive, and flexible position within the marketplace. Sweeney (2017) puts forward continual elimination of waste, having goals with a broad view,

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simplicity, CI, organisational visibility, and flexibility as six pillars for the lean production method. While elimination of waste focuses on identifying and reducing waste, goals with a broad view deals with the strategy and planning, which allows an organisation to focus on becoming successful over the long term.

In contrast, and utilising a structured approach, five key principles of lean theory is presented by Olesen et al. (2015): value, value stream, flow, pull, and perfection. Focusing on identifying and creating value to the client's objectives as a starting point, and the first principle, as shown in Figure 2.1, the theory by Olesen et al. (2015) leads through to creating services and products that add value to a customer's objectives. Of importance to this study is the second principle, the value stream. At this point the vital steps to facilitate an efficient production are identified, but most importantly the unnecessary steps, process waste, are identified and eliminated to optimise workflow. The theory identifies value to a client's objectives, identifies the vital steps that facilitate efficient production, eliminates steps in the workflow that potentially cause disruption, supplies on demand to ensure no resources are wasted, and strives for perfection by continually removing layers of waste as they are uncovered (Olesen et al., 2015). Considering this theory, it could be assumed that FM cleaning operations without a focus on value could contain process waste, which does not deliver value to the customer.

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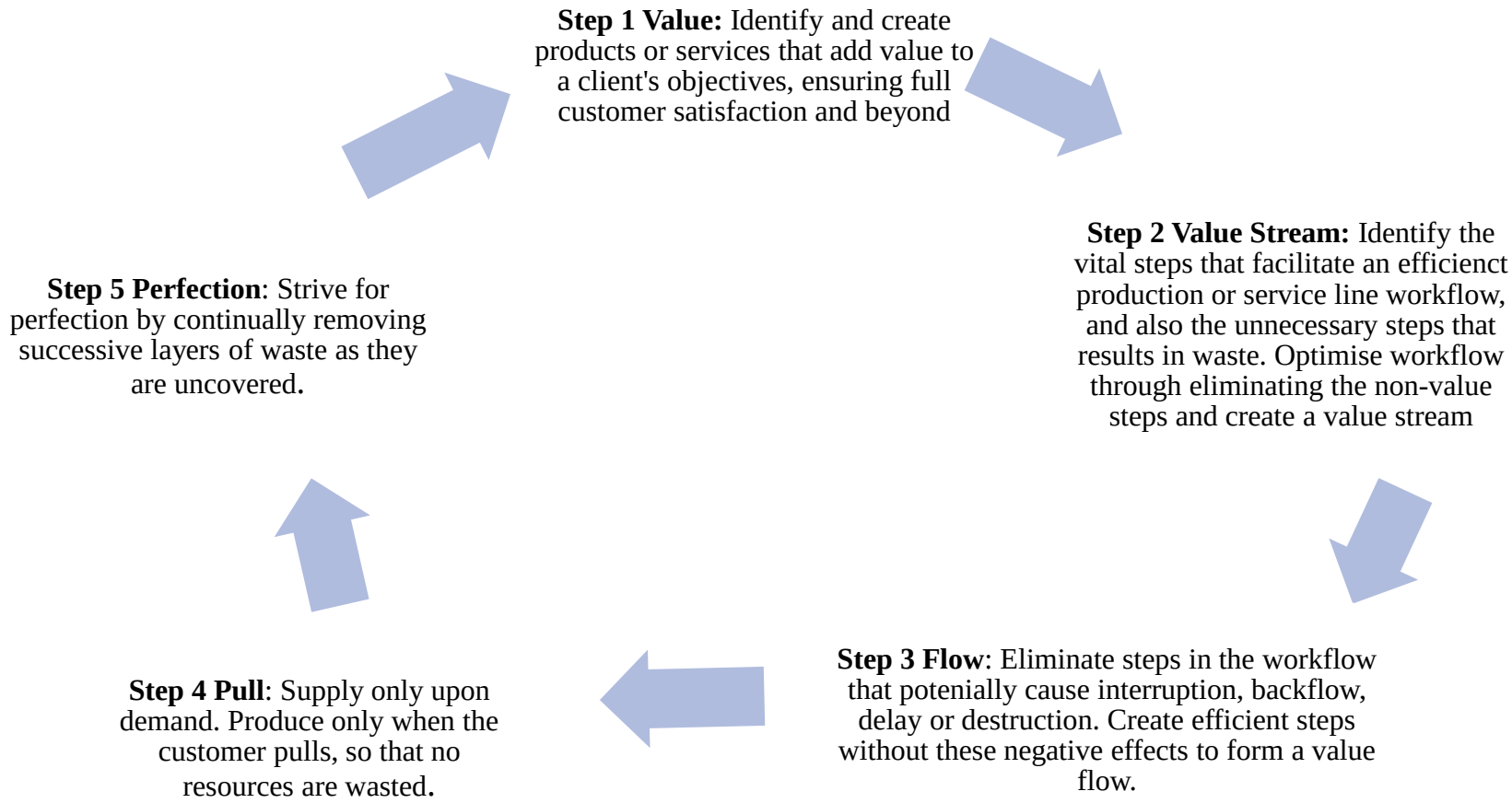
Figure 2.1 - The Five Key Principles of Lean



Source: Olesen et al. (2015)

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Bateman et al. (2013) incorporate five similarly named fundamental principles into their lean thinking for conventional organisations. This theory expands on the five principles set out by Olesen et al. (2015) by utilising application tools and techniques, such as Kaizen, Hoshin Kanri and Kanban, as developing ways of getting closer to the ideal lean position, and. this provides evidence that efforts have been made to progress the knowledge of lean. Piercy and Rich (2008) offer a comparison of improvements to management systems before and after lean implementation, which show improved performance expectations from time standards established per task, with defined routines to meet customer needs effectively and which reduce system failures. As the failure demand reduced, employees were able to concentrate on the management of the process cycle, thus improving productivity. This offers a variant of lean implementation from lean thinking, and documents clear progression of the concept, however not in FM.

The commencement of lean was documented before this. The inception of lean can be found in TPS. Attempts have been made to elucidate the implementation of the TPS concept. The Toyota toolbox offered by Jones et al. (1997) contains key elements for use, including the levelling of flow order and work by eliminating all causes of demand distortion, or amplification, and organising the work so the product flows directly from operation to operation with no interruptions. This scope, and variations of lean, has grown even further since its foundation. The lean concepts have been adopted to minimise process waste in various industries other than manufacturing, including service businesses (Manuele, 2007). This guides this study to hypothesise that lean, and its associated benefits, could be transferrable into FM cleaning in UK shopping centres, which is the focus of this study.

The potential for transferability is also recognised by Sweeney (2017), although not specifically related to FM. Sweeney (2017) specifies that in every industry all businesses can benefit from a rigorous and vigilant approach to waste reduction and efficiency, as provided by lean implementation and operation. This effectiveness, or appropriateness has however been contested by Taj and Berro (2005), who warn that results may not be applicable to other industries. This study recognises again a clear relationship between waste reduction and efficiency.

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Relating to FM, Shine (2018) recognises a relationship between the reliance on innovative, integral, flexible equipment to achieve quality, efficiency, equipment reliability and cost effectiveness to both modern manufacturing processes and aspects of FM. This is with a specific focus on CI implementation, although the work by Shine (2018) focuses on hard FM services, as opposed to the soft FM services focus of this study. Further steps are however required, as simply implementing lean and CI is found to not be the final step. Recognising that nothing sustains itself, Mann (2010) concurs that implementing lean and CI into an operation is not the end of the process. Considering this, the aforementioned requirement for lean experience and knowledge could be required after implementation stage, thus the permanent need for lean and CI personnel within FM cleaning operations within UK shopping centres. As this is relevant to the central aim of the study, the identification and elimination of excessive production within UK shopping centres, both CI and UK shopping centres are explored in this chapter, and developed into hypotheses in Chapter Three, Theoretical Framework.

2.1.2 Kaizen and Continuous Improvement

To understand what possible variations of lean and CI could be found, or subsequently required, in FM cleaning operations within UK shopping centres, this study explores two that feature prominently within the literature, Kaizen, CI and 5S. Firstly, Kaizen and CI are explored as a pair, due the relationship found between them.

The word Kaizen has been extensively used in lean manufacturing. Constructed from two Japanese words it is translated into English as, *kai* – change, to take part, and *zen* – good, for the better (McWhorter, 2017). Built around CI, the Kaizen culture is found to provide significant positive effects on a company, including reacting to changing customer needs, market fluctuations, natural disasters, and threats from competition. With foundations stemming from TPS, Sweeney (2017) found that if companies do not change, they may be left behind. With companies that do adopt change are able to maintain a flexible position within the industry. Reflecting this, this study finds that FM cleaning operations that adopt a Kaizen and CI culture could distinguish themselves from an operation that does not, and maintain a flexible position within the FM sector. In line with McWhorter (2017) and Sweeney (2017), this efficiency advantage is available to FM operations by transferring a proven concept, CI.

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Exactly how this concept is transferred into FM cleaning operations is however not found in the literature reviewed. In relation to the research focus on excessive production, and process waste in general, Sayer and Williams (2012) find that waste is eliminated in the value stream by doing Kaizen, or CI, a concept documented as value stream management. Value stream management was a new strategic and operational approach presented by Hines et al. in 1998 to the data capture, analysis, planning, and implementation of effective change with the aim of achieving a fully lean enterprise in cross-functional and cross-company processes. Relating to waste removal within the supply chain and highlighting its importance, Hines et al. (1998) describe it as perhaps the most important task facing the modern logistician. Initially developed in 1995, value stream mapping has an underlying rationale for the collection of process steps, and use suites and tools to help researchers or practitioners to identify waste in individual value streams. This was to lead to an appropriate route to the removal of waste.

The overall approach in the theory presented by Hines et al. (1998) requires the manager to identify a series of wastes that exist in the supply chain, by rating them as either high correlation and usefulness, medium correlation and usefulness, or low correlation and usefulness. From this rating, the wastes are analysed and prioritised, and, as shown in Figure 2.2, provide a structured approach to waste removal. The wastes with high correlation and usefulness would be addressed before the wastes with low correlation and usefulness, as the high correlated wastes would have a greater negative impact on the operation. Although not specifically related to this study, Figure 2.2 highlights the extent that some organisations, businesses, and industries will go to in order to reduce process waste, thus emphasising its importance. The later sections, 2.3.1, 2.3.2, 2.3.3, 2.3.4, and 2.3.5 of the literature review will explore whether the same importance is placed on process waste in FM.

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Figure 2.2 - Selection Matrix for the Seven Value Stream Mapping Tools

Wastes/Structures	Process Activity Mapping	Supply Chain Response Matrix	Production Variety Funnel	Mapping Tool / Quality Filter Mapping	Demand Amplification Mapping	Decision Point Analysis	Physical Structure
Overproduction	L	M		L	M	M	
Waiting	H	H	L		M	M	
Transport	H						L
Inappropriate Processing	H		M	L		L	
Unnecessary Inventory	M	H	M		H	M	L
Unnecessary Motion	H	L					
Defects	L			H			
Overall Structure	L	L	M	L	H	M	H
Notes: H = High correlation and usefulness, M = Medium correlation and usefulness, L = Low correlation and usefulness							

Source: Hines et al. (1998)

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Efforts have however been made to relate CI and FM. Amaratunga (2001) presents a concept for integrating CI into FM, however, this is not specifically related to process waste. Performance measurement has become a popular topic with both a theoretical and practical focus. Amaratunga (2001) documents how enabling of performance measurement is required in many planning and control tools, including CI, with a direct relationship to FM. The paper, Theory Building in Facilities Management Performance Measurement: Application of Some Core Performance Measurement and Management Principles, focuses on theory building in FM performance measurement, and finds that FM is an emerging force in many organisations. The study of Amaratunga (2001) utilised a qualitative research methodology, and concluded that the theory developed could have possibly been better supported by quantitative evidence.

Even if transferred in FM, the output achieved through Kaizen, or CI, is not specified, and cannot be guaranteed. In fact, scepticism is found in the literature. According to Sayer and Williams (2012), the scope that can be achieved through utilising Kaizen is limited, stating that a common problem in Kaizen implementation is oversized projects, or projects that gradually grow into an unmanageable size. To avoid this, a focus needs to be put on eliminating a single form of waste, rather than multiple forms. Literature by Narusawa and Shook (2009) and Sayer and Williams (2012) promote the idea that the implementation and application of Kaizen in organisations requires thought and planning. Narusawa and Shook (2009) strengthen this stance, explaining that although some classroom study of Kaizen is required, the concept is learned through actual practice. This also relates to the finding in the literature review that permanent personnel could be required for implementation, and on-going operations of lean and CI, which relate to the fundamentals of the concept (Sweeney, 2017). The concept however also contains other fundamental elements, including 5S.

2.1.3 5S

This section investigates the concept of 5S to understand if it could potentially offer benefit to FM cleaning operations within UK shopping centres. Although no specific connection has been found in the literature between 5S and FM cleaning operations within UK shopping centres, studies by Akdeniz (2015), Narusawa and Shook (2009), Shine (2018), Singh and Singh (2013), Sweeney (2017) does however offer reason to conclude that benefit could be derived from its utilisation.

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Within a manufacturing setting, lean maintenance, through engagement with a lean manufacturing programme, can accelerate the development of an organisation's lean capability. In order to allow for the acquisition of tools and parts in the fastest and easiest manner, by clearing out all unnecessary things, lean manufacturing offers 5S (Shine, 2018). This stance on the capability of 5S appears ubiquitous. Akdeniz (2015) similarly found that 5S enables an organisation to maintain an uncluttered and visibly organised workplace, whilst further suggesting that the idea of implementing a comprehensive 5S system should be the first step in any lean transformation. However, the literature reviewed on the 5S principles, sort, set in order, shine, standardise, and sustain (Shine, 2018; Akdeniz, 2015) does not unanimously suggest that 5S must be implemented before other aspects and principles of lean.

5S not only relates to lean, but also to the foundation of Kaizen (Narusawa & Shook, 2009). The purpose of 5S is to clean up a location, or operation, in a simple, practical, and effective way (Sayer & Williams, 2012). The guidance, and translation from the original five Japanese words beginning with S, provided for 5S varies throughout the literature (Shine, 2018; Sweeney, 2017; Singh & Singh, 2013), although all literature aims for outcomes to organise a workspace for efficiency and effectiveness. This is made possible by identifying and storing the items used, maintaining the area and items, and sustaining the new order (Shine, 2018). Later in this chapter, related literature will highlight that all of these items are present in FM cleaning operations in UK shopping centres, and therefore the opportunity is found to be available for 5S utilisation. The utilisation of 5S could potentially enhance the opportunity for lean to be implemented in FM cleaning operations, which is closely aligned to the central aim of the study, which is the identification and elimination of excessive production in FM cleaning operations within UK shopping centres.

2.1.4 Section Summary

This section has provided a critique to demonstrate that lean consists of, and has been derived from, many different aspects, including TPS, Kaizen, CI and 5S. The connection found by this study between process waste elimination and efficiency improvement is one of interest to this study, especially considering the finding that the literature review uncovered no limitation to the possible transferability of the concept to FM. The research gap identified is that the implementation, or on-going delivery, of any aspect of lean in FM cleaning operations in UK shopping centres was not found, although the benefits to any industry were clearly identified.

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It is unknown whether FM cleaning operations in UK shopping centres utilise lean methodology, or if they have the skill set within their respective teams to do so.

As this section has shown a potential for lean transferability into FM cleaning operations, this study will proceed to explore process waste elimination and the Muda concept with the aim of understanding the benefit that could be derived in FM cleaning operations within shopping centres. The next section of this chapter explores the eight wastes separately, and this concludes that excessive production is the sole Muda focus, and is further presented as the dependent variable in Chapter Three, the Theoretical Framework.

2.2.1 Process Waste Elimination

Derived from the manufacturing industry, and the Toyota Motor Corporation specifically, waste elimination is a tool for lean production (Hussain & Malik, 2015). Of a similar nature, the lean approach is focused on systematically reducing waste in the value stream, with the waste elimination process including not only defective products, but also defective work and activities (Taj & Berro, 2005). Chen et al. (2010) elaborated further by explaining the potential benefits of process waste elimination. The correct identification of waste, and successful elimination can lead to reduced manufacturing cost, higher product quality, improved customer satisfaction and increased profits.

Utilising the original Japanese word for any activity that takes place within the production system which does not add value to the final product, Muda, Akdeniz (2015) states that manufacturing plants implement tools and systems to enable them to eliminate process waste, thus continually improving their processes. Muda is also what many organisations traditionally classify as waste. In its most physical form, and derived from the Japanese words for futility or uselessness, Muda has the objective of waste reduction and elimination by clearly separating value-added and non-value-added activities. As with Muda elimination, lean seeks to eliminate activities or processes that consume resources, add cost, or require unproductive time without creating value (Manuele, 2007), and this aligns with the first principle of lean, value (Olesen et al., 2015. This stance is shared by Anthony (2010), who described lean as emphasising speed and waste, efficiency which can be improved within operations, and potentially FM cleaning operations, providing agreement in the literature that in order to be lean, value must be delivered.

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In agreement with this, and the relationship between lean and efficiency found in the previous section of the literature review, addressing Muda elimination can specifically improve efficiency and lower production costs (Manuele, 2007). To achieve Muda elimination, the elements of Muda need to be understood and identified. In addressing this, Jones et al. (1997) advocated Muda identification as a stage within the general approach of the traditional industrial engineering tool, process activity mapping. This general guidance for process waste elimination found in the literature reviewed is however not related to FM cleaning operations in UK shopping centres. Considering this identified gap in knowledge, this study will contribute an insight into whether Muda is present in FM cleaning operations in UK shopping centres, or not.

The reviewed literature (e.g. Manuele, 2007; Jones et al., 1997; Womack & Jones, 2003) shows that Muda elimination, and lean, is not a simple process, but it is achieved over time and throughout an organisation. It is when lean principles are applied that people begin to rethink the organisation, including the work and the appropriateness of the size of machines, warehouses, and systems to fit the flow. It is at this point that further layers of hidden Muda are uncovered, with perfection becoming the appropriate goal, and not specifically what a competitor is doing. In theory, Muda removal is a continuous process, operating cyclically and without end (Womack & Jones, 1996), meaning that any improvement in excessive production in FM cleaning operations within UK shopping centres would need to be achieved over a period of time, and is not a short-term fix. Considering this, the central aim of this study, the identification and elimination of excessive production in FM cleaning operations within UK shopping centres, will provide a current understanding of the excessive production level, and therefore an understanding of whether efforts have already begun to implement lean, albeit in the form of Muda.

Several weaknesses or limitations have however been found in the work continued from Womack and Jones (2003). Searching for opportunities for safety professionals using lean concepts, Manuele (2007) found that the work contained few references to accidents as a waste factor. This omission represents both a problem and an opportunity to make their presence felt, and that progressive safety professionals will react to this shortcoming by educating management on the advantage of including safety considerations as the lean process is applied (Manuele, 2007). Considering this, this study finds a lack of consistency, unevenness, and

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overburden, regarding lean application between industries, and not a positive consensus supporting lean application. From this understanding, lean inconsistency, unevenness, and overburden, could also be expected in FM cleaning operations within UK shopping centres.

Lean however addresses the unevenness and overburden issues. For example, as an activity that consumes resources, but creates no value, Muda separates itself from the other two types of manufacturing variation and waste, Mura and Muri (Sayer & Williams, 2012). This study chooses Muda as the focus for the study, as the literature (Sayer & Williams, 2012) places Mura and Muri more specifically within a manufacturing setting, with no sign of overlap, or transferability, into other industries. Mura is less quantified than the other types of waste and variation and is related to unevenness. The unevenness in workflow can lead to uncertainty as irregular intervals which are difficult to predict, therefore making forecasting difficult. Finally, found in manufacturing processes, Muri is a failure when trying to understand capabilities or the effects of overburden (Sweeney, 2017).

With many variations to the Muda concept, reason to explore waste elimination further is provided in an empirical study by Taj and Berro (2005), which finds that most companies waste 70% to 90% of their available resources, with even the best lean manufacturers wasting 30%. Furthermore, Taj and Berro (2005) advise that every company has to find its own way to implement the lean method, as there is no universal way that applies to all, and despite the wide knowledge and resources available, many companies are struggling to stay lean.

Considering this clearly documented challenge to achieve the benefits that lean offers (Taj & Berro, 2005), and to understand in which areas companies should focus their efforts to become or stay, lean, this study explores non-value-added activities, and variations thereof. Non-value-added activities are those that contain the waste (Sweeney, 2017), a concept that was addressed earlier by Antony (2010), suggesting that lean strategies play an important role in eliminating non-value-adding activities across an organisation. This is relevant to this study, as previously confirmed in this chapter lean must deliver value (Olesen et al., 2015).

2.2.2 Value-Added, Non-Value-Added and Required Non-Value-Added Activities

Everything observed within manufacturing either generates revenue or adds cost. The activities containing waste add cost and do not cause a product to be transformed into a more complete

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product in the eyes of the customer, thus they are non-value-added activities. A value-added activity is one that causes a product to become a more complete product, examples being assembling parts, machining parts and painting, all of which progress the product to a more finished state (Carreira, 2005). Singh and Singh (2013) expand on this customer related concept further, recognising that very often quality is customer-defined. Considering this, and the definition offered by Piercy and Rich (2008) that value is what the customer is willing to pay for, value needs to be defined. This study aims to define value in FM cleaning operations in shopping centres in later sections of the literature review, as they differ from those in a manufacturing and production environments. Only by elucidating what value is to FM cleaning operations in UK shopping centres can the central aim of this study be realised, the identification and elimination of excessive production in FM cleaning operations within UK shopping centres.

A further third category is offered as required, or necessary, and this is non-value-added activities. McWhorter (2017) offers an example for this type of activity as being quality checks. The customer ultimately wants quality, but is not necessarily willing to pay for the quality checks required to ensure that the product, or service, meets the expected criterion. In addition, McWhorter (2017) relates the required, or necessary, non-value-added activity to a restaurant scenario, from the customer perspective. For example, whilst understanding that many costs are associated with running a restaurant, such as electricity, building maintenance and refrigeration storage, a customer would not welcome seeing these related costs on their food receipt. The customer would however expect food, food preparation and service delivery to the table to be shown on the receipt, the items that they envisage as part of the overall service. This relates to this study as it is predicted that there will be significant costs incurred with FM cleaning operations, which is inevitably not what the customers wish to experience.

2.2.3 The Muda Concept

Through an understanding of value and an overview of waste elimination, this study will proceed to explore waste in greater detail to elucidate which elements are relevant to industries outside of those to which it was originally intended. To achieve this, this study will focus initially on Muda as a concept.

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The terminology used to describe waste varies throughout the existing literature, however, some consistency is found. Firstly, the name assigned to waste being Muda, and secondly, the seven categories of Muda. The commonly accepted seven categories of Muda are, as supported by Golińska-Dawson et al. (2015), transportation, inventory, motion, waiting, over processing, excessive production, and defects. This aligns with the Muda categories suggested by Carreira (2005).

Muda can be broken down into two further categories: waste that adds no value but is necessary, and waste that adds no value and is avoidable. Non-value-added activities appear to be prominent. From when the customer places an order to when they receive the product or service and pay for it, it is documented that 95% of all lead time is made up of non-value-added activities (McWhorter, 2017). Although this finding of McWhorter (2017) is not specific to the FM industry, considering the high percentage of all activities that are non-value-added, 95%, in production and manufacturing environment, the possibility of non-value-added activities in FM cleaning operations in UK shopping centres is real. As this cannot be confirmed in FM cleaning operations within UK shopping centres, this study will contribute to this gap in knowledge by exploring the level of excessive production. If excessive production is present in FM cleaning operations within UK shopping centres, and therefore creates more than the customer needs (Carreira, 2005), then it can be confirmed that non-value-added activities are being delivered.

Irrespective of the category, Chen et al. (2010) found that products or features that customers do not want are considered Muda, as they do not generate revenue but add cost. Singh and Singh (2013) also relate this to cost, stating that cost is usually looked at from the manufacturer's perspective, as the overall cost of producing and selling the product. This is of interest to this study, as if Muda could be identified and eliminated in FM cleaning operations it could not only improve efficiency, but also potentially have a positive financial impact.

There are however some alternatives to the Muda categories. Although offering comparable examples for the agreed seven wastes, Taj and Berro (2005) offer an eighth waste, knowledge, when people doing the work are not confident about the best way to perform tasks, thus promoting a new concept. An eighth waste, although different from that set out by Taj and Berro (2005), was however suggested long before. Lean Master, Shigeo Shingo defined an

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eighth form of waste, the underutilisation of people. Through not engaging the people, or employees, the process does not allow them to fully contribute their talents, ideas, and energy to the work environment. Sayer and Williams (2012) contribute to this idea also, stating that organisations would miss out on a lot of opportunities for improvement and satisfaction when harbouring the suggested eighth waste, suggesting that the eighth waste is a valuable addition to the original seven.

The literature review of Muda as a concept has not found a consensus on agreed benefits that can be derived from implementation, or the number of wastes that should exist. Rather, this study finds that the different aspects of Muda could possibly present varying outcomes, and it is unclear whether the industry in which it is implemented has an impact on the success. This study contributes towards the knowledge gap by exploring the level of excessive production, an element of Muda, in FM cleaning operations within UK shopping centres. To achieve this, excessive production is utilised as the sole dependent variable, as is explored in the proceeding sections of this Chapter, and furthermore in Chapter Three, the Theoretical Framework.

2.2.4 The Eight Process Wastes

This section critiques and provides a critical insight into the literature pertaining to the identified eight wastes, and explores any possibility of transferability, considering the limited research uncovered regarding lean and its associated concepts, within the FM industry. This, whilst continuing to proceed in concluding on which aspect, or aspects, of Muda to proceed with to develop the dependent variable, or variables.

This section reviews the eight wastes as opposed to the seven, as they provide an additional area for focus, possible variation, and opportunity for operational improvement in FM cleaning operations in UK shopping centres. The eight wastes, as presented by Sweeney (2017), are reviewed following the acronym DOWNTIME (defective production, over-processing, waiting, non-used employee talent, transportation, inventory, motion, and excessive production). It should be noted that the order of the acronym is not based on priority.

2.2.4.1 Defective Production

Being a cost that cannot be passed onto the customer, Sweeney (2017) argues that defective production is not only a non-value-added activity, but also holds potential for doubling the cost

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of producing an individual part if defects are found. To illustrate this, Hussain and Malik (2015) provide examples of defects when relating the original seven wastes in private and public hospitals in the UAE. The specific examples offered are readmission because of failed discharge, and repeating tests because correct information was not provided. Hussain and Malik (2015) proceed to attribute defects to three sub criteria in relation to lean management framework in the healthcare system. The three sub criteria offered are accompanied by examples from NHS111 (2007). Repeating tests because correct information was not provided is assigned as sub criteria 'clarity of information', readmission because of failed discharge is assigned as sub criteria 'readmission due to errors', and diagnostic test sample is identified electronically by a barcode and is assigned as sub criteria 'equipment errors'. This all contributes to understanding that defective production occurs in many forms and has potential to utilise effort and resources that produce no value to the customer.

2.2.4.2 Over Processing

Any time or effort on processing a product receives, other than that specifically required by the customer, is considered over processing. Although processing to a customer's needs is considered a value-added activity, customers will not pay for unnecessary work. Furthermore, additional processing presents the opportunity of further waste creation, such as wasteful motion, unnecessary waiting, inventory, and transportation costs, along with an increased risk of defective production (Sweeney, 2017). Ultimately, over processing represents all non-value-added processing, and any further efforts made that add no value to the product or service from the customer point of view (McWhorter, 2017). This view is supported by Sayer and Williams (2012), who found that over processing waste adds no value to the product, and can be the result of inadequate technology, sensitive materials, or quality prevention. In agreement with its importance, Hussain and Malik (2015) rank over-processing as the highest importance in a paper prioritising lean management practices in public and private hospitals, which demonstrates its value to the Muda concept.

2.2.4.3 Waiting

Waiting waste is considered to be goods which are not being processed, consumed or in transport. Although waiting waste can be assigned a specific status within a production process, assigning the status does not negate that waiting is a non-value-added condition, and the elimination of waiting-related waste events is largely based on changes to operations and logistics protocols (Sweeney, 2017). Sayer and Williams (2012) also recognised this earlier,

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finding that waiting waste is any time an employee's hands are idle, whether due to shortages, unbalanced workloads, need for instructions, or by design. Moreover, Sayer and Williams (2012) found that waiting waste is present in all forms of waste. This confirms waiting waste as relevant to the Muda concept, as it is related to other waste forms and presents inefficiency.

2.2.4.4 Non-Used Employee Talent

As opposed to the other seven wastes that have causes, outcomes and consequences, non-used employee talent is more difficult to quantify (Sweeney, 2017). The literature does however not suggest that this is a limitation to its implementation, but such implementation appears to be inconsistent. Practical implications from a research paper into lean in healthcare from employees' perspectives by Drotz and Poksinska (2014) recognise the employee contribution. Recognising that flow orientation is weak in healthcare, the study found that lean contributed to improvement through employees. Drotz and Poksinska (2014) uncovered that flow orientation and teamwork has increased the understanding of the work of other professional groups, leading to greater utilisation of knowledge. In contrast, a study by Cooney (2002) exploring whether lean is a universal production system within batch production in the automotive industry focusing specifically on employee involvement concluded that employee involvement was not in operation within the studied specialist component firms.

2.2.4.5 Transportation

Hussain and Malik (2015) find transportation as the second highest priority of waste in private hospitals in the UAE. Hussain and Malik (2015) uncover that due to the central location of the medical imaging facilities and centralised stores for supplies of medicines/instruments there is unnecessary staff, equipment and supplies movement, and transportation. Recognising the cellular facility layout, as a means to minimise transportation waste, Hussain and Malik (2015) suggest that senior managers should make greater effort to see that the facility layouts have been designed to minimise or eliminate unnecessary movements, and that basic equipment is provided at departmental level. Similarly, Jagdish et al. (2013) find that by highlighting the importance of facility and modernisation of plant and equipment, lean can provide the solution. Interestingly, lean is not the only suggestion, but the reliability and efficiency of the machines are also presented. From the literature already reviewed, this study recognises the relationship between lean and efficiency, however, in this case the machine requires efficiency before the lean implementation, which is different from efficiency being the output from a successful lean delivery.

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2.2.4.6 Inventory

Described as inventory that is not needed, unnecessary inventory consists of items that are sitting idle anywhere in the facility without somebody, or something, working on them. Only two ways to accumulate unnecessary inventory have been documented: either bought or made (Carreira, 2005). Significant progress has been made in an attempt to minimise inventory waste. In reaction to observed inventory relating to batch sizing and sequencing, Bicheno et al. (2001) present a model that aims to minimise inventory levels under constrained total capacity, whilst considering individual product changeover times. The application of the algorithm resulted in inventory savings greater than 10%, and without change-over time reduction, but with claims that the potential for even greater inventory savings exist. The study comprised of four different press shops and documents savings between 4% and 35%, with an average potential savings above 10% in each of the surveyed companies (Bicheno et al., 2001). Guidance is offered by Harrison (1992) on how to achieve reduced inventory waste, suggesting that a focus on setup will reduce inventory levels required, which would be relevant in cleaning FM operations, as inventory is required for service cleaning (Lucke, 2013).

2.2.4.7 Motion

Including walking, bending, lifting, twisting, and reaching, any movement of a person's body that does not add value to the process is motion waste. In addition, any adjustments or alignments required before the product can be transformed is also considered motion waste (Sayer & Williams, 2012). With regards to machines that produce value-added activity, motion waste, or non-value-added motion, is considered as any wear and tear other than what is necessary for production (Sweeney, 2017). This finding is mirrored by McWhorter's (2017) explanation that motion waste is any movement from machines or people that does not add value.

Motion waste has been explored in relation to an environment outside production and manufacturing, with clear and concise negative outcomes of not addressing the waste. Soriano-Meier et al. (2011) explain that in a time coined austerity Britain, the discussions around public service costs is considered a controversial issue. The study by Soriano-Meier et al. (2011) into the role of the physical layout in the implementation of lean management initiatives confirms that the physical layout of a hospital has an impact on the quality of care, and the cost effectiveness of the staff deployed in that facility. In addition to this motion waste, if the layout is not conducive to the natural patterns of collaboration between dependent clinical units and

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service providers, the results can have further negative impact. This will, according to Soriano-Meier et al. (2011), result in negative staff perception and lower quality care. This is a view that is shared by Wong et al. (2009), explaining that with flexible layouts that reduce movements of both materials and people, minimised handling losses and avoidance of inventories between stations, several different issues can be negated.

2.2.4.8 Excessive Production

Describing excessive production as the most serious waste, Kiff (2000) explains how it discourages the smooth flow of goods and services, and is an illustration of making too much of something, making something too early, or making something just in case. A definition that is mirrored by Carreira (2005) presents excessive production as that which produces more than is needed. Relating to a lean car dealership's vision for the future, Kiff (2000) provides two separate examples to define excessive production waste. Firstly, the acquisition example describes how customers can be persuaded to receive a different car specification to that ordered, or wanted, because the one ordered or wanted was not ready in time. The excessive production waste is shown to be the re-preparation of cars awaiting handover due to inaccuracy of delivery timing, and something that the customer does not want. The second example, a maintenance example, is more time specific. The customer enters the car dealership at 08:30am with a car for service or repair which is completed by 10:00am, and the car collected at 17:00pm. The excessive production is that the customer was provided a car, or the car valeted, when not actually required by the customer. No value was added, and it did not add value to the customer, which is the first principle of lean (Olesen et al, 2015), and thus is not efficient.

2.2.4.9 The Eight Process Wastes Summary

This section has explored all eight documented process wastes, known traditionally as Muda. The exploration of all eight aspects is key to this study, to understand what the constituent elements of each process waste are, and their respective usage in the manufacturing and production environment in which they were originally intended (Sweeney, 2017). Whether the benefits within a manufacturing and production environment from a process waste focus, as found in the literature (e.g. Sweeney, 2017; Hussain & Malik, 2015; NHS111, 2007; McWhorter, 2017; Sayer & Williams, 2012; Drotz & Poksinska, 2014; Cooney, 2002; Jagdish et al., 2013; Carreira, 2005; Bicheno et al., 2001; Harrison, 1992; Lucke, 2013; Soriano-Meier et al., 2011; Wong et al., 2009; Kiff, 2000; Olesen et al., 2015) are available in other industries will now be investigated. Only if the concept can be utilised in other industries can this study

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achieve the central aim, which is the identification and elimination of excessive production in FM cleaning operations within UK shopping centres.

2.2.5 Transferability

This section reviews the literature pertaining to the possible transferability of Muda into industries other than manufacturing and production, and is therefore relevant to the focus of this study. Transferability is important as the study focuses on FM cleaning operations in UK shopping centres, which is not a production and manufacturing environment.

Demonstrating transferability of the Muda concept into other industries other than manufacturing and production, Olesen et al. (2015) present a framework for lean terminalisation. The aim of the paper by Olesen et al. (2015), using lean principles to drive operational improvements in intermodal container facilities, is to investigate the application of lean practices to improve material flow within intermodal terminals, and to develop an overarching framework for lean terminalisation. Olesen et al. (2015) found that although central to the framework, some of the wastes within the concept of waste elimination do not translate as well as others into terminalisation. Examples include transportation due to the fact that it is the very reason for terminals, and inventory, as the transport operator is often paid to hold inventory making it a value-adding activity rather than a waste. Different from concentrating on the seven types of Muda, the findings presented that Mura, inconsistency and unevenness in operations, and Muri, unreasonableness and overburdening of people and/or resources, are perhaps more applicable to intermodal operations. This study does not however focus on Mura and Muri, proving this specific positive transferability finding irrelevant.

Lean, and its associated aspects, have been adopted in a wide range of industries beyond its origins in the motor industry, and this has been achieved through a considerable extension of the lean concept outside high-volume repetitive manufacture. Bateman et al. (2013) find that lean can be successfully applied in a public sector context, with only modest modifications required to its core principles. Furthermore, before adopting a review of the context in which it will be used, the lean principles themselves need to be reviewed. Hussain and Malik (2015) agree, stating that waste minimisation is no longer limited to automotive or manufacturing companies, and finding that services such as healthcare are considering lean methodology as an improvement programme. This presents another industry in which lean is being considered.

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Agreement with this is however not found in the literature. Taj and Berro (2005) contend that their lean research findings from an automotive assembly plant in a mass production industry may not be applicable in other types of industry. In contrast, Manuele (2007) argues that although early literature describes the application of lean concepts in manufacturing, the concepts have been adopted to minimise waste in a wide range of enterprises and activities including depot operations, service businesses and healthcare facilities. Hasle et al. (2012) concur, expressing that the use of lean in sectors other than automotive and other manufacturing industries, are still little explored. Furthermore, Hasle et al. (2012) specify the service sector, the sector into which FM operates (Atkin and Brooks, 2009), is an area for lean exploration. This is a positive finding for this study in understanding any transferability possibility of lean into the FM industry. This study proceeds to focus on specific lean delivery models, and their respective achievements.

The public healthcare lean impact provided direct savings of £3.1 million, a reduction in waiting time and lead times (19-24%), fewer safety incidents, savings of £237,500 in transportation costs with lean layouts, reduced transportation time, the average length of stay reduced, reduced turnaround times, reduced appointment waiting waste from an average of 23 days to 12 days, and a reduction of patient flow time by 48%. With similar positive lean impact, the private healthcare study provided productivity gains resulting in improved financial performance of £27 million in savings, enhanced patient safety, a reduction in patients and nurses waiting time. Furthermore, the 'waiting waste' for front-line workers was reduced enabling a faster turnaround of pathology reports from five to two days, a change to procedure for intravenous line insertion delivered a 90% drop in infections after just 90 days in North America – saving almost $500,000 a year in intensive-care-unit costs. Furthermore, lean measures created a capacity of 10 additional chemotherapy and antibiotic infusion patients per day reducing the waiting time of patients from 123 to 53 minutes in the urgent care clinic, and laboratory reporting times improved, a reduction in emergency department stays was realised and overall medical error decreased by 50% (Hussain & Malik, 2015).

The literature (Hussain & Malik, 2015; Olesen et al., 2015; Bateman et al., 2013; Taj & Berro, 2005; Manuele, 2007; Hasle et al., 2012; Atkin & Brooks, 2009) indicates an inconsistent understanding of the potential transferability of lean, and its associated aspects, to industries other than production and manufacturing. Moreover, the majority of the literature reviewed

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pertained to production and manufacturing, and through not adding significant value to this study, have been omitted. A common theme found within the literature reviewed is the use of lean and its associated aspects within healthcare. Although no reason was found as to why healthcare has adopted lean, Hussain and Malik (2015) provide quantifiable positive outcomes, including £27 million improved financial savings, of which similar could be achieved within FM cleaning operations in UK shopping centres. Importantly, no literature suggests that this could not be achieved.

2.2.6 The Chosen Waste

Having investigated literature pertaining to all eight process wastes, and the transferability possibilities or limitations, this section proceeds to outline the justification for choice of process waste as the dependent variable for the study. In brief, this study will utilise excessive production as the dependent variable.

Through conducting an extensive review, no literature was found by this study that specifically places excessive production, as a concept, into FM cleaning operations in UK shopping centres. However, literature does suggest that it could offer benefit in industries other than production and manufacturing. Although this is similar to some of the other seven identified wastes, excessive production appears to be ubiquitous in operations, as explained by McWhorter (2017) that excessive production occurs anytime when more is produced than is required for the next process.

This perspective of McWhorter (2017) is shared by other authors (Sayer & Williams, 2012; Lee-Mortimer, 2008), who express that whatever is produced further to the customer needs is excessive production waste. Furthermore, excessive production waste leads to other wastes including inventory costs, manpower and conveyance, in order to deal with excess product, consumption of raw materials, and installation of excess capacity (Sayer & Williams, 2012; Lee-Mortimer, 2008). Examining the introduction of Kanban production control at a UK based electronic product manufacturing operation, excessive production waste is presented, and benefits predicted from reducing it. Referring to previous literature related to lean, and its associated aspects, such as efficiency, the reduction of excessive production ensures resources are used more efficiently and obsolescence is reduced (Lee-Mortimer, 2008).

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A relationship has been found between large circumstances of waste, or numerous waste events, and excessive production. This means that businesses need to become increasingly flexible to meet changing customer and market needs (Sayer & Williams, 2012; Lee-Mortimer, 2008). For this reason, and because excessive production also impacts other waste forms, Sweeney (2017) documents excessive production as the most serious form of waste, a statement made earlier by Kiff (2000).

Comparisons between excessive production in manufacturing and other working environments are documented (Carreira, 2005), albeit without clear quantifiable results, which aligns with the theme found in the literature. Direct comparison is made between how an oyster sandwich shop works and how a manufacturing operation works. If no demand exists in oyster sandwiches, the staff do not continue to make the sandwiches, as this would be excessive production, thus producing more that the customer needs. It is at this point that the staff engage in non-value-added activities such as, cleaning, organising condiments and discussing ways to improve the menu selection and customer satisfaction; the use of employee contribution, and these activities do not add value to the customer. The example in full by Carreira (2005) documents the steps required for both an oyster sandwich shop and a manufacturing operation, and the activities that can be carried out to eliminate excessive production. The only variations between the processes are being specific to the intended product, the purchase or lease of tools and equipment, and the purchase of raw materials. Other than these, the process steps for both are identical, highlighting transferability between industries and services. This finding further indicates to this study that the transferability of a focus on excessive production waste in FM cleaning operations in UK shopping centres is possible, strengthening the justification of excessive production as the dependent variable.

The theme found by this study in the literature is that benefit is achievable when focusing on eliminating excessive production within industries outside manufacturing and production, with key authors claiming it to be the most serious of all the process wastes (Kiff, 2000; Sweeney, 2017). No consensus is concluded in the literature regarding specific introduction of an excessive production waste focus in FM cleaning operations in UK shopping centres. However, the literature highlights that transferability is possible.

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This study recognises that the specific nature of excessive production is a probable reason for the limited literature uncovered, and subsequent restricted opportunity for comparison and analysis. This however presents the research gap to which this study will contribute.

2.2.7 Section Summary

Process waste elimination is derived from the manufacturing industry, with the overall aim of systematically reducing waste in the value stream, and therefore value to the customer (Olesen et al, 2015). The literature reviewed suggests that with correct identification of waste, and successful elimination of those found, it can lead to reduced manufacturing cost, higher product quality, improved customer satisfaction and increased profits (Chen et al., 2010).

No clear agreement has been found regarding the number of waste categories, with some authors preferring seven and some authors preferring eight. The literature does however indicate an agreement on the original seven categories: defects, over processing, waiting, transportation, inventory, motion, and excessive production. Based on literature presenting excessive production as ubiquitous in operations, and that it leads to other wastes, its reduction ensures resources are used more efficiently. Considering this, and that it is suggested as the most serious form of waste (Kiff, 2000; Sweeney, 2017), this study has chosen excessive production as the sole dependent variable.

Although addressing waste, including excessive production, is found to specifically improve efficiency, a common theme found within this literature review, the general guidance for process waste elimination found in the literature reviewed is not related directly to FM, forms a research gap that this study will contribute towards. Achievement of the central aim of this study, the identification and elimination of excessive production within UK shopping centres, will contribute to this gap by relating process waste elimination specifically to FM.

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2.3.1 Facilities Management

This section proceeds to investigate the essence of FM, before exploring its delivery models and nuances. A further understanding of possible process waste elimination, focusing specifically on FM, is provided.

Highlighting a realisation that the discipline of FM encompasses much more than costs alone, Wauters (2005) suggests that facilities managers need to add value to the organisational value chain. As endeavours to eliminate activities or processes that consume resources add cost, or require unproductive time without creating value, applying lean concepts have become popular among senior-level management (Manuele, 2007). To this end, a description of FM is offered by the International Facility Management Association (IFMA) (2019): "facilities management is the practice of coordinating the physical workplace with the people and the work process of the organisation; integrating the principles of business administration, architecture, and the behavioural and engineering sciences". This demonstrates a complex and wide range of services.

FM is a comparably new concept, with little in the way of academic studies published before the late 1960s, and these were in the area of building maintenance, servicing, and cleaning. There were few common FM operating procedures in circulation leading to innovative organisations, and these were mainly in banking, telecommunications, and media sectors, to find ways to effectively manage their growing portfolios. Since its inception, FM has emerged as its own service sector, establishing a new professional discipline operating with its own codes, standards, and technical vocabulary (Atkin & Brooks, 2009). This operating standard is however not ubiquitous in the literature reviewed. It is documented that the development of FM is not found to have been consistent throughout the world, and the UK was not the forerunner. In contrast to the UK, Finch (1992) earlier documented that FM is well established in the US, and is becoming increasingly recognised in Europe, in which the focus of this study presides, UK shopping centres.

Derived from a need to support and enable organisations to reduce costs, FM was founded during a time of recession in the 1980s. Interestingly to this current study is a further claim that FM aims to increase productivity (Ee, 2015), an aim of lean implementation (Piercy & Rich,

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2008). Considering this, this study finds a similar aim for both FM and lean implementation in aiming to increase productivity.

Terminology varies in the FM industry. The term ‘facility management’ is considered similar to property management. However, it is different in that it is often applied to larger and more commercial properties, where typically the management and operation is more complex (Yiu, 2008). Finch (1992) argues that due to property managers no longer being able to assume that properties in the right location will sustain their value, a growing awareness that a permanent management structure for coping with change in the built environment was needed, and FM was coined. Moreover, Finch (1992) argues that FM is an indispensable part of property management. Atkin and Brooks (2009) document potential confusion regarding terminology, explaining that the word ‘facility’ is used in some parts of the world instead of ‘facilities’, recognising it as the same and the use of either word as a matter of individual preference.

Although differing terms exist for the FM industry (Yiu, 2008; Finch, 1992; Atkin & Brooks, 2009), the progress of FM continues. Nardelli et al. (2014) predicted the future of FM and the areas in which it could develop. One area put forward is that of innovation. Nardelli et al. (2014) state that the field of FM services is increasingly recognised as a professional service sector and a scientific discipline. Furthermore, it has been argued that to further develop FM as a discipline, it may be critical for a research focus on innovation. Earlier, Alexander (2003) recognised FM as a rapidly developing and growing discipline, vocation, and business service, finding that early developments have been made. Based on a strong practical discipline, but similar to Nardelli et al. (2014), the focus is directed towards research in FM, which this study aims to contribute towards by providing academic contributions relating to the central aim, which is the identification and elimination of excessive production in FM cleaning operations within UK shopping centres.

To deliver FM, a facilities manager can be utilised, a role that must be flexible and willing to change (Tuveson, 1998). Further requirements of a facilities manager have been documented earlier. A facilities manager looks after many stakeholders and shareholders, of which Finch (1992) acknowledges four: shareholders, employees, customers, and community. The facilities manager looks after the stakeholders and shareholders by maintaining the value of the corporate estate, the employees by enhancing the working environment, the customers by maintaining

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and reinforcing the corporate image, and the community by ensuring that a company's impact on the environment and the community is favourable to all. Having a facilities manager in place is however not the only consideration, Ee (2015) stresses that in order to manage its organisation's non-core business operations, the FM objectives must be aligned with the organisation's mission and goals.

The role of the facilities manager in delivering FM is found to be both important and also complicated. Recognising a continuous process of service provision within FM to support a company's core business, the challenges facing facilities managers comprise the need to optimise the performance of assets to ensure business continuity, extending equipment lifestyles without unacceptable loss of equipment performance and developing strategies to reduce operating costs, and generally contribute to the company's revenue flow (Shine, 2018). In addition to facilities managers achieving this, it is suggested that they should also be self-critical. Hodges and Sekula (2013) offer questions that facility managers could ask themselves to better understand if they are a high performing FM organisation. The questions range from asking whether there are established written and publicised operation and maintenance practices and procedures to how the maintenance and cleaning needs of the building's permanent interior elements are managed to ensure longevity of the asset, and comfort of the occupants. Interestingly, all the questions relate to the operations of FM organisations, including FM cleaning operations, and not to building intelligence, cost effectiveness and quality. This suggests that facilities managers have direct impact on the output of the FM cleaning operation, and as the literature does not identify if facilities managers are present at all UK shopping centres, this study identifies this as a potential independent variable.

The focus of FM services is not always focused on core activities, and does contribute to services in a non-core way. Atkin and Brooks (2000) describe that in aim of establishing a thorough understanding of the present state of the organisation's real estate, strategic analysis of facilities requirements is required, demonstrating a broad vision of FM services. O'Mara (1999) shares this view by suggesting several strategies for managing corporate real estate and facilities for competitive advantage, including incrementalism, standarsisation, and value-based strategy. All of which do not relate specifically FM core activities and duties, such as cleaning, maintenance, and security (Ee, 2015). The value-based approach suggested by O'Mara (1999) promotes communication between line employees and senior management,

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which shares a company vision throughout an organisation. This approach does not address core activities, but aligns with the non-core strategy of the real estate, which demonstrates the broad scope that the role of a facilities manager covers.

As a profession, the role of a facilities manager has developed and requires personal and organisational investment. Successful FM requires a skilled facilities manager, for which many qualifications are available to help. The skilled facilities manager identifies processes that allow an organisation to sustain a quality operating environment and services to meet strategic needs, and at best cost (Alexander, 2003). Hui et al. (2013) state similarly that the quality of FM service plays an important role, relating it specifically to the overall service performance of shopping malls, an area that this study explores in greater detail in later sections of the paper, and that relate specifically to the central aim of this study.

Considering the proposition by Hui et al. (2013), and Tucker and Pitt's (2009) suggestion that customers attach greater importance and quality to services that are predominantly in the front-line, FM service delivery teams in UK shopping centres provide a suitable population for data collection for this study. This rationale is strengthened by Noor and Pitt (2009), explaining that at the lowest level of FM operations there is a day-to-day support of operations that are required to keep the business functioning, where most front-line employees operate, and where the research survey population resides.

In general, FM has different meanings for an organisation for which the FM is provided, and the FM organisation providing the service. Alexander (2003) separates the two by providing examples for each. The organisation for which the FM is provided recognises the value that facilities add to business, gives authority to the FM business unit to improve service quality and develops the facilities to meet business objectives. On the other hand, the FM service provider formulates and communicates a facilities policy, plans, and designs for CI of service quality, identifies business needs and user requirements, and systematically services appraisal of quality, value, and risk.

Interestingly, literature in FM recognises improvement opportunities and innovation, and although little mention was given to the industry as recently as the 1960's, the literature suggests that it is a progressing industry. This is no clearer than through the development of

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the facilities management profession. Through being challenged to meet strategic needs, for both for core and non-core activities (O'Mara, 1999), and at best cost (Alexander, 2003), the facilities manager can contribute to achieving set targets by improving efficiency by eliminating excessive production. Considering this, onsite management presence is considered as an independent variable in Chapter Three of this study, Theoretical Framework.

2.3.2 Facilities Management Service Delivery

As the literature suggests, FM is multi-faceted and operates in many different locations and environments. FM can be operationally delivered in many guises, with the approach determined by the processes required to meet the business demands (Then, 2005). However, the literature reviewed does not provide a definitive solution to all FM operational needs. To this end, varying FM service delivery models have been developed to meet the differing requirements. This study has therefore explored the literature pertaining to this variable.

The five key stages of the FM process theory underpin this study by highlighting opportunity for service improvement in FM, as illustrated in Figure 2.3. The theory begins, as this study does, by recognising a business need for improvement within FM delivery by the service providers. Of the five stages, stages one to three formulate the strategy, analyse requirements, and develop solutions. The final two stages, implementing the solutions and monitoring the service provision, form the benefits available for any organisation that acts on the recommendations of this study (Atkin & Björk, 2007). Interestingly, the theory uses best value as a measure for the success of the process, which is similar to the first principle of lean, value identification (Olesen et al., 2015).

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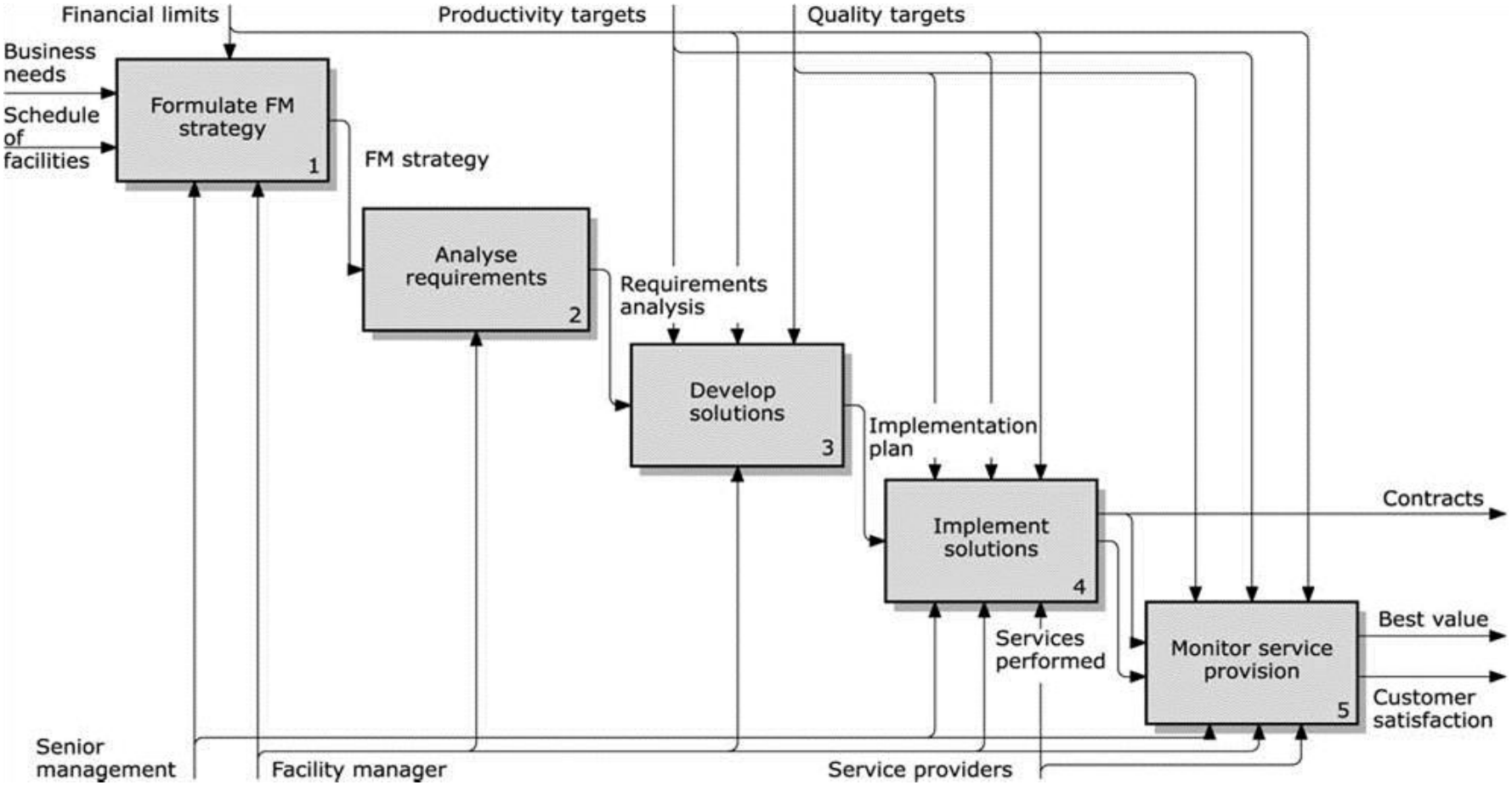
Figure 2.3 - Five key stages in the FM process



Source: Atkin and Björk (2007)

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As a discipline, FM spans both public and private sectors. Nardelli et al. (2014) concur, suggesting that FM units have the ability to actively contribute to the innovation strategies of the public and private entities, achieved by mediating and managing relationships among public and private stakeholders. FM is further broken down into various scopes, with differing opinions into which categories the scopes should be. Existing FM literature (e.g. Ee, 2015) suggests there are four categories, building, operations management, project management and support services. The building scope includes mechanical and electrical, and internal and external building works, the operations management scope includes maintaining the building structures and systems, and the project management scope includes enhancing business performance. The final category, and most relevant to this paper, support services, contains security, health and safety, and most pertinently, cleaning (Ee, 2015).

In addition to the categories suggested by Ee (2015), further refinement has been made to the FM operational categories. Shine (2018) breaks down the delivery of FM services into two categories: hard FM services and soft FM services. Consisting of reactive and preventative maintenance, the hard FM services are further divided into specific offerings including heating systems, painting and decorating, and mechanical and electrical, none of which are the focus of this study. The second category, soft services, contains cleaning, along with waste, security, and catering, and is of interest. Of additional interest to this study is a claim that all businesses require a range of services, in order to operate smoothly, with efficient soft services of FM being vital to achieve this (Shine, 2018). Considering this, this study recognises a further relationship between FM and efficiency, and as documented previously in the literature review, elimination of excessive production will improve efficiency. However, it does not provide the means by which efficiency can be achieved, thereby offering a gap to which this study can contribute.

Furthermore, to a FM service providing either hard services or soft services only, it is proposed that an FM service can be provided through total facilities management (TFM). TFM is where a single entity takes responsibility for all facets of FM. This is however with the possibility to outsource or subcontract specialist elements of the FM delivery (Atkin & Brooks, 2000). As TFM covers all services, it covers all inputs and outputs of FM service delivery. Brown's (1996) Performance Process Framework looks to elucidate the journey from inputs to outcomes, and is evaluated by Moss et al. (2007) in terms of FM viability. Brown's (1996)

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model commences with input measures and progresses through process measures and output measures before concluding with outcome measures. The framework, as explained by Moss et al. (2007), shows the importance of balanced performance measures, which should cover all aspects of inputs, process, outputs, and outcomes, all of which are present in FM, a platform to which an efficiency improvement that this study could contribute towards.

Central to FM is understanding that the role of performance measurement is an essential tool, to which Amaratunga (2001) firstly provided improvement in quality and time, before progressing towards lower cost and service efficiency. Addressing some core performance measurement principles, including FM customer base, FM internal processes, FM learning and growth, and FM financial status, Amaratunga (2001) has developed new theory relating to FM performance measurement, and further presents suggestions for further research. However, none of the suggestions are related to lean, efficiency, or process waste, making no reference to how performance measurement could assist in these areas. Interestingly however, the paper does recognise that performance models in FM lack empirical support, and that descriptive guidelines on performance measurement in FM has failed to generate useful guidelines for facilities managers. This demonstrates, in line with the findings of this study, that research and successful implementation of new concepts in FM appear to be absent. This presents a platform for improvement in an industry, FM, that has been addressed, albeit not in the industry specifically (Amaratunga, 2001; Moss et al, 2007).

Based on the critique of the literature review in this section, it is possible to deduce that the development of the survey required for this study will address support services and soft services, which may contain the cleaning operations response required. This study recognises that the variance of service delivery model, hard service alone, soft services alone, TFM, could have a positive or negative impact on the level of excessive production and potential performance measurements, although the literature does not suggest either way. Furthermore, and in line with a common theme within the literature, an opportunity for a focus on efficiency has been identified, which meets the central aim of this study, which is the identification and elimination of excessive production in FM cleaning operations within UK shopping centres.

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2.3.3 In-House – Outsource

FM is not solely delivered by outsourced service providers. The literature (e.g. Atkin & Brooks, 2009; Ikediashi et al., 2012; Finch, 1992; Ee, 2015) suggests that FM services can be delivered in-house. This chapter proceeds to explore this potential variable.

Common service delivery approaches in FM exist, regardless of the size and location of buildings, however, this may not always result in common solutions to problems (Atkin & Brooks, 2009). Outsourcing of services is an option for delivering FM services. This approach of outsourcing is expressed as a way of contracting the services, as opposed to in-house service delivery, and can be achieved in various ways and with varying results. Where the decision for FM service delivery has been reached by an organisation based on demonstrating better value for money, it has been described as FM working effectively (Atkin & Brooks, 2009). In contrast, it has also been documented that effectiveness is not always guaranteed, with risk present in outsourcing of FM services and tasks. A study by Ikediashi et al. (2012) administered 146 questionnaires to registered members of the IFMA at three levels of management: top level manager, middle level manager and low-level manager. Of the 41.8% response rate, the findings ranked the 39 risk factors associated with facilities management outsourcing. Poor quality of service presented the highest risk, and natural disasters were found to present the lowest risk. This demonstrates that the FM service delivery method is a complex decision.

Irrespective of the suggested risk, Finch (1992) documents that the adoption of outsourcing was growing at a rate of 20% per annum in the UK in the 1990's, and already well established in the US. The reasoning given for outsourcing is that it allows organisations to focus on core business activities, whilst procuring and buying FM from a third party. This is echoed by Ee (2015), who states that the key value of FM in providing support services is enabling the core functions to focus on the business operations. This is further generalised through the use of FM outsourcing across the industry, suggesting that a service will be a target for outsourcing if it can be easily accomplished by an outside service provider at a comparable or lower cost (Mara, 1999).

This intermediate degree figure is however in stark contrast to only 5% cleaning found to be outsourced in hotels in a study conducted by Jones (2002). Based on these findings, the decision to choose outsourcing may seem appropriate, however caution is recognised and expressed by

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Johnson (1997). In acknowledgement that many have regretted signing an outsourcing agreement, Johnson (1997) states that no such agreement should be signed before consideration is given to the longer-term implications. Considering this, the literature suggests that no increased performance is guaranteed through outsourcing, and therefore either in-house or outsource has no preference.

A specification is however documented for choosing an in-house or outsource FM service delivery method. Atkin and Björk's (2007) model for 'implementation solutions to FM needs', depicted in Figure 2.3, shows that irrespective of in-house or outsourced services, there is a need for service needs specifications and service level agreements. The involvement of the preparation of documentation is likely to consist of some sort of tender competition for the supply of services. Considering this, in-house and outsourced service delivery could compete for FM contracts. The 'implementation solutions to FM needs' model starts by identifying the services required, taken potentially from the existing service provision, and by involving the facilities manager and potential service providers, leads to the performance of the services. In contrast, Yiu (2008) does not document performance as the end product, but rather as a service that can itself be sourced.

In summary, this section has found that both in-house and outsourced FM service delivery offer benefit and risk. The literature does not however identify any specific performance difference between the two sourcing options. Although it is found that both sourcing options can compete for FM service contracts, the literature does not indicate in which working environments each would be best suited. Considering the omission of information regarding reasons to choose either sourcing option, utilising in-house/outsource as an independent variable would offer guidance as to the efficiency performance levels regarding excessive production in FM cleaning operations within UK shopping centres. This would contribute to this current gap in knowledge by ascertaining if either sourcing option has an advantage over the other regarding efficiency, and whether differing levels of excessive production should be expected. This would inform property management when choosing either sourcing option.

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2.3.4 Review of Previous Studies into FM

The literature illustrates a significant lack of research specific to, or relating to, the introduction of lean, and its associated aspects, within FM in general. To this end, this section proceeds to understand which areas FM research has reached, and whether this offers any guidance for this study.

Amaratunga et al. (2002) recognise that process evaluation in FM is an important issue, noting that process analysis tools are needed for business improvement in FM, and that its application in business processes has not been discussed to a great extent. Furthermore, and highlighting a clear research gap, Amaratunga et al. (2002, p.318) recognise that even though FM has achieved a certain level of maturity as a discipline, it remains in its infancy in FM process research, with little research having been carried out to date. An alternative is to continue with current FM deliverables, however Barrett (2000) stresses that operating in a reactive technical mode will not necessarily provide a viable future for FM. Evidence that this continues to exist is the collapse of Carillion in 2018, an organisation that held many FM contracts in the UK. Mabbett (2018) explains that since the adoption of austerity policies in 2010, an outsourcing increase has been observed that is driven by a direction to cut costs, not by aspirations for service improvements.

Specific areas put forward by McRae (2004) for a new FM alignment are discussed by Tobi et al. (2013). The areas were brought to service providers, senior facility professionals, property clients and academics to debate on the alternative future of four defined subject areas. The debate looked to identify and progress the areas of common purpose, to begin to establish a new coherence for the management of infrastructure facilities and support services across all sectors, and to clarify and demonstrate the real relevancy and critical value of property and FM on the demand side of business clients. Finally, the debate looked to lay the foundation for a multi professional and cross disciplinary alliance to align the interface between the supply and the demand for business infrastructure, facilities, and services. Although this could suggest progress has been documented in FM, such progress is not ubiquitous. In support of this perspective, Atkin and Björk (2007) connect the lack of awareness, misconception and immaturity to the limited progress that has been made to understand the interrelationships and dynamics of FM processes, in particular the scope for continual improvement in practices, as promoted by this study.

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In conclusion, the professional discipline of FM has progressed from being a narrowly-defined set of functional tasks, delivered in a mechanical manner to meet a specific requirement, to an integrated management approach which perceives its role as being a significant determinant of corporate goal achievement (Pathirage et al., 2006). Although Fleming (2004) concludes that the concept of measuring facilities, in terms of their contribution to core business in the form of increased productivity, had begun development, it is at an early stage. Jones (2002) offers possible benefits of continuing advancing facilities, concluding that efficient FM holds the potential for increasing profitability, improving reputation, safety, cleanliness, comfort, and the working environment, aligning with the common theme found in the literature review, the potential relationship of efficiency and FM operations.

2.3.5 Section Summary

FM covers a variety of activities and services, providing either in-house or outsourced, although the level of development within the industry differs throughout the world. The activities and services are predominantly broken down into hard and soft services, to which the service can be delivered separately, or together as TFM. The literature suggests that although FM is progressing as an industry, especially considering performance measurement (Amaratunga, 2001), there is still scope for further progress. This section has found that FM related academic studies are limited, especially relating to lean, and its associated aspects. This is surprising, considering that a focus has been found on reducing costs, and assigned specifically to an established profession- that of a facilities manager. In response to this finding, this study aims to guide FM, and facilities managers, to identify and eliminate excessive production in FM cleaning operations, thus reducing cost of activities that do not add value to the customer. This will assist in meeting the central aim of this study, the identification and elimination of excessive production in FM cleaning operations within UK shopping centres, by elucidating whether facilities managers currently enhance operational efficiency, thus having lower excessive production, or not.

2.4. Shopping Centre History

This study will proceed to explore UK shopping centres, with a further focus on FM service delivery of them. This section of the literature review aims to justify the choice of UK shopping centres as a suitable platform for the surveying of front-line employees to achieve the central aim of the study: the identification and elimination of excessive production in FM cleaning operations within UK shopping centres.

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A shopping centre is, as explained by Pitt and Musa (2009), a building that contains many units of shops, however, it is managed as a single property. The complexities of shopping centres in terms of their size have led, according to Pitt and Musa (2009), to confusion to shopping centre identities. Amid this confusion, some consistency is found in that shopping centres are retail properties with special qualities compared to other property investments. This is especially important considering the pull of attractive shops and a wide variety of people, in providing a place where people spend their weekends to shop and relax (Ibrahim et al., 2018).

Focusing on shopping centres in the UK, a paper researching two UK shopping centres described the shopping areas as being at the historic core of cities and towns, and the centrepiece of an urban landscape (Banham, 2006). These shopping areas represent a major economic function for an urban area and present a continuing planning design challenge. The challenge is to adapt to a built environment inheritance to meet any present commercial requirements of retailers, maximise any potential of the physical environment, and finally address any social amenities that are expected from a city or town centre public realm (Jones et al., 2016). In addition, the strength of the UK shopping centre market, and the availability of shopping floorspace has been documented previously. Banham (2006) states that the UK shopping market is one of the most mature in Europe. The UK had 240m² floorspace per 1000 population, which is greater than that in France, Germany, and Spain.

This strength of UK shopping centres is found in other literature reviewed. The strength of UK shopping centres was found in a study by Robertson and Fennell (2007) into the economic effects of Regional Shopping Centre's (RSC), outlining how attractive that they can be to day visitors, with a significant number coming from outside of the region in which they are situated. Of the annual visitors to three specific RSC's, Metro Centre (25 million), Braehead (20 million) and Lakeside (24 million), Robertson and Fennell (2007) document that between one quarter and one third of the visitors originate from outside of the local sub-region, and therefore travel long distances to visit the shopping centre. Irrespective of the number of visitors, the UK has found a need for bigger shopping centres. For example, when opened in 2008, Westfield shopping centre, London, became Europe's largest urban shopping centre (Kajalo & Lindblom, 2009).

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The literature (e.g. Robertson & Fennell, 2007; Kajalo & Lindblom, 2009) suggests that UK shopping centres are key destinations for the UK population, with travel distance not being a limiting factor for visiting. Along with being prominent visitor destinations, UK shopping centres are documented to be significantly developed, in comparison to Europe and further afield. The annual visitor numbers to Metro Centre, Braehead and Lakeside shopping centres published by Robertson and Fennell (2007) give reason to ensure that cleaning operations within the shopping centres are suitable and sufficient. Losing only 10% of these visitors due to cleaning standards would have a significant negative impact on sales. Considering this, the FM cleaning operation service provider must ensure that cleaning standards are maintained, whilst also aiming to achieve best cost (Alexander, 2003), as documented in the previous section of the literature review. An improvement in operational efficiency, as this study aims to achieve, could assist in achieving this.

2.4.1 Sizes and Classifications Overview

This section explores the literature pertaining to UK shopping centres with regards to sizes and classifications. Based on the complexities of shopping centres in terms of their size, as found by Pitt and Musa (2009), this study aims to understand what categories certain sizes and classifications of UK shopping centres are given, if any, and whether they present a viable independent variable for analysis.

Classifications of shopping centre differ from country to country with many to choose from. Of the vast number of categories available, Ibrahim et al. (2018) present twenty-one different categories worldwide including super regional, shopping arcade and sub regional. Research by Ronse et al. (2015) approach this variable differently, not only addressing the issue of shopping centre classification, but also offering the variable as a way to better understand the results and increase the transparency of the statistical analysis. Different from the twenty-one categories of shopping centre offered by Ibrahim (2018), Ronse et al. (2015) propose only two factors by which the shopping centres are categorised. These are the size of the city, and the location of the shopping centre relative to the city centre. The study by Ronse et al. (2015) into shopping centre siting and model choice in Belgium chose the two variables, as the data showed that visitors to shopping centres in smaller cities exhibit more car dependent travel patterns, and a large share of potential customers live outside the urban area.

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Considering these varying classifications, and to compare various researchers for example Ibrahim (2018), Ronse et al. (2015), institutions and countries, shopping centre criteria is provided. The criteria consist of size, anchor tenants, types of product, location, leisure/entertainment, concept, configuration/presentation/design, structure, customer facilities, physical presentation, communications, building centre security, infrastructure/facilities and maintenance. All the criteria contain sub-criteria, or questions pertaining to the shopping centre being assessed, including the maintenance criteria. Interesting for this study is the fact that cleaning in a shopping centre is recognised, based on the criteria and sub-criteria (Ibrahim, 2018). Further criteria and classifications are also presented. Robertson and Fennell (2007) explain that the difference between RSC and other centres is not only size. The key characteristics provided include the range, style and selection of goods and services, and the location and type of accessibility. Along with also being defined by the transport and high levels of car parking required to allow an RSC to function, Robertson and Fennell (2007) suggest that most RSC's include, or are co-located with, major leisure and catering facilities, and possibly a cinema, ten-pin bowling and a range of cafés and restaurants.

Writers including Ibrahim (2018), Robertson and Fennell (2007), and Ronse et al. (2015), provide varying suggestions on which sizes and classifications should be attributed to shopping centres, with various criteria, and sub-criteria, offered to categorise. Considering the discrepancy in the literature, this study contends that there is no consensus made regarding sizes and classifications of shopping centres. This study has further explored literature regarding shopping centre sizes and classifications with the of confirming set categories to utilise as an independent variable for the study.

2.4.2 Sizes and Classifications by Leading Bodies

2.4.2.1 The International Council of Shopping Centres (ICSC)

An offering of shopping centre classifications is documented by ICSC (2019). ICSC is the premier global trade association of the shopping industry. Founded in 1957, with over 63,000 members and spanning over 100 countries, it includes owners of shopping centres, marketing specialists, investors, managers, developers, academics, and public officials as well as retailers and brokers. In 2019 ICSC presented its own classification and characteristics pertaining to grouped shopping centres based on location: United States, Canada, Asia-Pacific, and of most

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relevance to this study, Europe. The UK is not individually separated, with no guidance given on which European countries are included (ICSC, 2019).

The classifications and characteristics for European shopping centres are placed into two categories: traditional shopping centres and speciality shopping centres, and criteria utilised to determine the correct allocation for a shopping centre. Irrespective of the category, of the eight criteria offered five are stated as non-applicable throughout. This leaves only three criteria by which shopping centres are allocated: concept, typical gross leasable area (GLA), range (sq. M.), and typical type of anchors. Some shopping centres contain anchor stores, known in USA as major space units (MSU's). An anchor store is determined by size and occupied by department stores such as John Lewis, Debenhams, and House of Fraser, which by their appeal attract more visitors to the respective shopping centre. The standard size of a store in a shopping centre in 2006 was 300m², whereas an anchor store can cover 1,000-2,500 m² (Banham, 2006). All of these variants present different FM cleaning requirements (Djellal, 2002), and therefore differing opportunities to achieve value for the customer through lean implementation (Olesen et al., 2015).

2.4.2.2 REVO (Retail Evolution)

A standardised classification for retail assets has been developed by REVO (2018) to support the goal of creating a common, objective, fairer and more positive vernacular for retail assets in the UK, as shown in Figure 2.4. As it represents the current UK classification for retail assets (REVO, 2018), this study has utilised the REVO classifications as an independent variable. The document made available by REVO in 2018 outlines new classifications based on an understanding that the previous classifications in the UK market described locations that were either 'prime' or 'secondary', and were considered too broad. Furthermore, and strengthening a need for revised UK classifications, REVO (2018) recognised how the retail environment was fast-changing, with increasingly selective and purpose led customer shopping trips. It was hereby proposed by REVO (2018) that new classifications would allow investors, owners, valuers, and advisors to utilise a widely accepted lexicon to describe UK retail assets.

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Figure 2.4 - UK Classification for Retail Assets, REVO

Variables	Neighbourhood Scheme	Local Scheme	Sub-Regional Scheme	Regional Scheme
Typical Size (sq ft)	50,000 - 200,000 (in addition to anchor store)	150,000 - 500,000	400,000 - 1,000,000	750000+
Typical Number of Anchors	The scheme typically includes or is adjacent ot a food store.	1 or no anchor, probably a variety store and/or food store, or service cluster.	1 or 2 anchors; could include for example, department store, cinema or mixed leisure.	3 or more anchors; likely to include for example, full line department store, flagship fashion store, cinema, experience-led entertainment destination and/or food and drink.
Definition/Concept	A convenience-oriented scheme for the immediate catchment's everyday use.	The principal retail destination for the immediate catchment.	Principal retail offer in large urban area with strong retail and leisure offer, serving a large catchment area.	A destination characterised by extensive retail, leisure and significant mix of other uses, serving an extensive catchment area.
Characteristics	Easily accesible, serving the daily needs of the direct local catchment. Convenience occupiers. Highly likely to be underpinned by food store, and used throughout the week.	A strong representation from convenince occupiers, with a more limited comparison offer. Likely to be the commercial focus and foremost retailing pitch in the town, or value based offer in larger towns/cities. Used for weekly trips.	Typically, 1 or 2 anchors and strong supporting fashion and well-used leisure offer. Mix of comparison and convenience. Used for monthly/weekly trips.	Typically, 3 or more anchors, containing a range of flagship stores. Long dwell times, high footfall, often used for experiential visits and a high degree of discretionary spend. Used for quarterly/monthly trips.
Typical Catchment Area/Travel Time	Typically less than 15 minutes travel time.	Typically less than 30 minutes travel time.	Up to 45 minutes travel time.	45+ minutes travel time.
Specialised - Purpose				
Outlet Scheme	Specialist scheme that comproses manufacturers' and retailers' outlet store, typically with planning restrictions for discounted good, let on flexible/turnover leases, offering brand-name goods at discounted pricing.			
Leisure Scheme	Almost exclusively leisure/entertainment destination, often complemented with a F&B offer.			
Transport Hub	Retail, F&B and service offer in public transport networks; airports, railway stations, tube stations.			

Source: REVO (2018)

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However, the REVO (2018) document claims that ongoing consultation involving key stakeholders across the industry aims to provide a 'final' classification for publication by the end of 2018, but will remain under regular review. This means that the classifications are under constant review and could be influenced by the findings of this study. Through several communications between the researcher and senior members of REVO in August 2019, it is confirmed that a further set of classification was not published by the end of 2018, or even in 2019. Considering this, this study has utilised the classifications proposed by REVO, as an independent variable with the aim of satisfying the research objectives.

The four classifications offered are broken down into two sub-categories: destinations and lifestyle, and community. The destinations and lifestyle sub-category contain regional scheme and sub regional scheme retail assets, and community sub-category contains local scheme and neighbourhood scheme retail assets. The classification list contains three further descriptions under the category specialised-purpose: retail assets, outlet scheme, leisure scheme and transport. This study does not recognise these as independent variables, as the classification of these are not determined by any set of criteria, and therefore any allocation will involve interpretation, which is not in line with the researcher's positivist philosophy. Differently, the destination and lifestyle, and community categories have clear, concise, and quantifiable criteria (REVO, 2018).

The literature (e.g. ICSC, 2019; REVO, 2018) indicates that there is no agreed classification of shopping centres, but rather different leading bodies provide their own. The criteria provided in each of the two leading bodies explored contains a mixture of quantifiable and non-quantifiable criteria, leaving the categorisation open to interpretation. To eliminate interpretation, and align with the researcher's positivist research philosophy, the quantifiable criteria offered by REVO for regional scheme, sub-regional scheme, local scheme, and neighbourhood scheme has been utilised as an independent variable.

2.4.3 Review of Previous Studies into UK Shopping Centres

This study aims to review previous studies surrounding shopping centres, particularly UK shopping centres, and to understand any documented relationship with FM cleaning operations.

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Research by Teller and Alexander (2014) focuses specifically on UK shopping centres, offering more relevance to this study than that of Ibrahim (2018), and Kajolo and Lindblom (2009). The paper by Teller and Alexander (2014) into store managers on the seismographs in shopping centres utilises a quantitative approach, which is also adopted by this study. The study by Teller and Alexander (2014) researched a population of 570 store managers, producing a 38% response rate (217 usable questionnaires) achieved through web-based survey, concluding a direct link between the atmosphere construct indicator and the attractiveness of a shopping centre to the customers. Interestingly however, the attention of the empirical investigation was placed upon two types of shopping centre: regional shopping malls, consisting of between 17 and 47 stores, and supra-regional malls of between 72 and 134 stores, stating that these two types are the most commonly found mall types. Although the paper is published before 2018, when REVO proposed the new classifications (REVO, 2018), the paper does not confirm whether any other set or sizes or classifications were considered.

An atmosphere element is considered also by Kupke (2002) when evaluating the perception of customers, however, this makes no direct connection to cleaning in any way. The study into identifying the dimensions of retail centre image in Australia reviews the application of Multidimensional Scaling (MDS) to retail market research, and how MDS could help map the impressions of the retail centre image held by customers. The categories offered, range from shops, prices, parking, fast food, opening hours, service, and atmosphere, are broad and not accompanied by any further explanation. Although found by Teller and Alexander (2014) that cleaning can impact on the customer perception, it is unclear where it fits into the aggregated perception map presented by Kupke (2002).

Although a relationship was found between shopping centres and attractiveness by Teller and Alexander (2014), there is no clear acknowledgement of cleaning indicated. This study finds, in line with a common theme of the literature review, few academic advances in studies to both UK shopping centres, FM cleaning, or a combination of the two. Reflecting this, any relationship between FM cleaning and shopping centres requires further focus, which presents the research gap to which this study contributes.

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2.4.4 FM in Shopping Centres

As a property, a shopping centre is a building that contains physical structures, space and facilities that are managed as a single property, which needs to be managed and maintained to ensure that its value is increased. To achieve this, it is argued by Pitt and Musa (2009) that the management effort should be directed to the maintenance. Although demonstrating a significant focus on FM hard services, not the soft services focus of this study (Pitt & Musa, 2009), a model for the establishment of management system in shopping centres is presented in Figure 2.5. This categorisation of cleaning is however in contrast to a conceptual framework by Ibrahim (2018), categorising cleaning under maintenance.

In Pitt and Musa's (2009) model in Figure 2.5, facilities sit directly under the centre management teams, alongside property and tenant mix. This is irrespective of whether in-house or outsourced FM service delivery. Interestingly, although facilities are responsible to the centre management teams, at the top of the management structure are the owners: developers, investors, and local authority. It is the owners that have the success or failure outcomes (Evans, 2019). The model presented by Pitt and Musa (2009) confirms that facilities have direct impact on these success and failure outcomes, even if not responsible to the owners directly. Therefore, the actions of facilities manager and their respective teams of service operators affect the success and failure outcomes. As a result, it can be deduced that the efficiency of the FM cleaning operation will reflect the success and failure outcomes of the top line of management, owners, developers, investors, and local authority, as presented by Pitt and Musa (2009), and must therefore be considered important to the success of a UK shopping centre.

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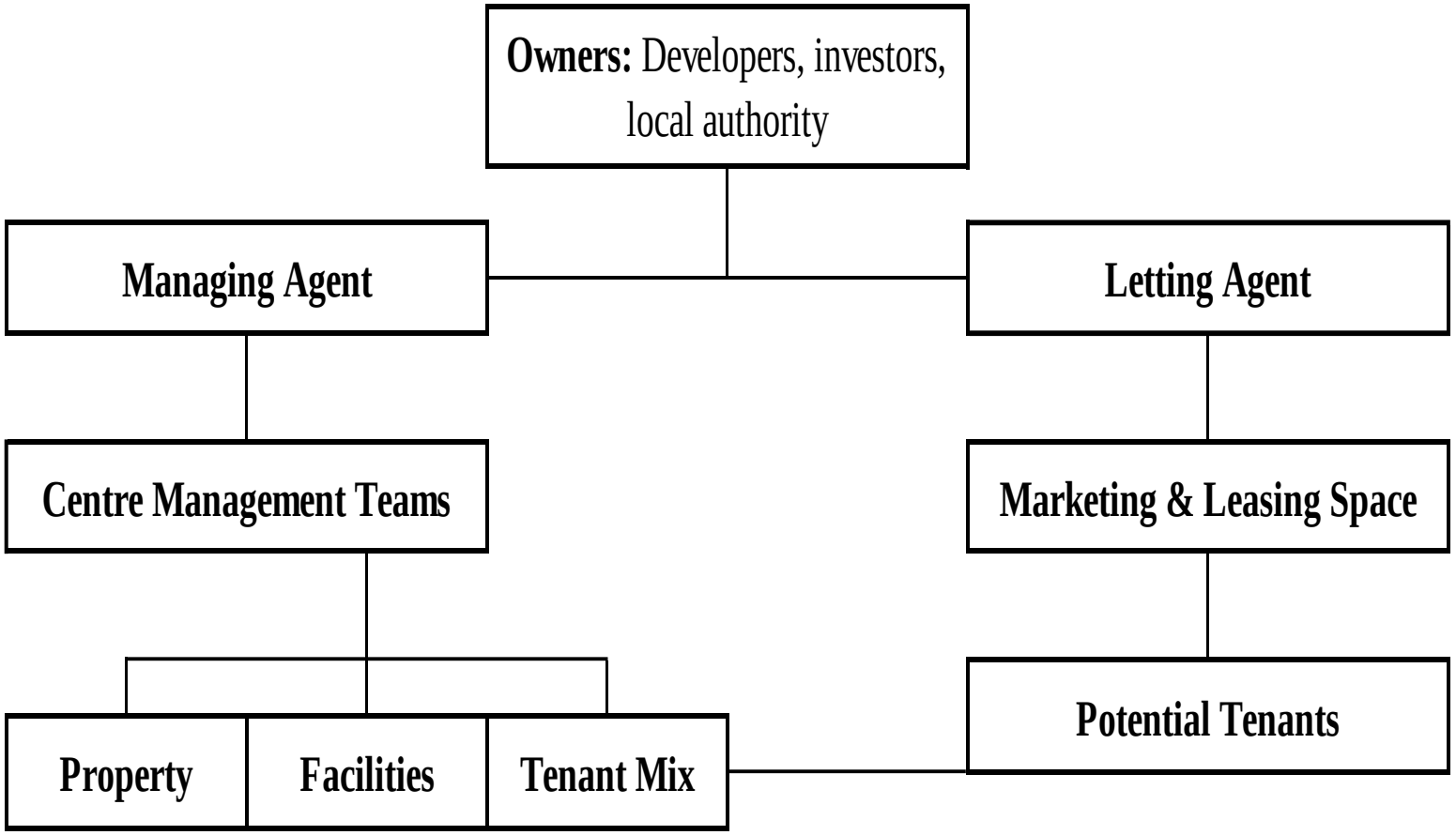
Figure 2.5 - Establishment of Management System in Shopping Centres



Source: Pitt and Musa (2009)

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Ibrahim et al. (2018) recognise FM in detail in their conceptual framework classification of shopping centres for grading shopping centres. Shopping centres are graded on a five scale system: excellent, above average, average, below average, and poor. This helps the owners rank portfolio holdings and potentially sell low-scoring properties. Categories are utilised for grading and are broken down into further criteria and sub criteria as validated by expert opinion (Ibrahim, 2018). The conceptual framework clearly identifies the importance of FM to the grading of shopping centres by contributing to five of the eleven classification criteria: customer facilities, physical presentation, maintenance, building centre security, and infrastructure/facilities. Considering this, this study recognises that the heavy involvement of FM in the criteria and sub criteria of the grading of shopping centres demonstrates the importance of FM to shopping centres, a stance supported by Hui et al. (2013).

Hui et al. (2013) found that the quality of FM service plays an important role in the overall service performance of shopping mall. The study into facilities management service and customer satisfaction in shopping centre malls provides five implications for FM organisations when delivering their services to shopping centres. These include maintaining a high level of customer satisfaction, such as that FM firms should ensure a clean and comfortable environment in the shopping malls. These implications could help guide FM service delivery, whether in-house or outsourced, but also demonstrate both the importance and complications of FM service delivery in shopping centres.

This section of the literature review has highlighted a relationship between shopping centre management and the FM service provider, either in-house or outsourced. The importance of FM service delivery in shopping centres is demonstrated by Pitt and Musa (2009), who contend that even if the FM service delivery does not report directly to the owners of the shopping centre, their performance does have a direct impact on the shopping centre outcomes. Furthermore, it is stated that FM service plays an important role in the overall service performance of shopping malls (Hui et al., 2013).

2.4.5 Section Summary

The literature suggests that UK shopping centres are a key destination for the UK population, with travel distance not being a limiting factor for visiting. The documented visiting figures strengthen this stance, as shown by the annual visitors figures of Metro Centre, Braehead and

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Lakeside shopping centres (Robertson & Fennel, 2007). This indicates the importance that cleaning operations within the shopping centres are suitable and sufficient, as losing only 10% of these visitors due to cleaning standards would have a significant negative impact on sales.

Authors such as Ibrahim (2018), Robertson and Fennell (2007), REVO (2018), Ronse et al. (2015) provide varying suggestions for what sizes and classifications should be attributed to shopping centres, with various criteria, and sub-criteria offered to categorise. Considering the discrepancy in the literature, this study finds that no consensus is made regarding sizes and classifications of shopping centres. To counter this, leading bodies, ICSC and REVO provide their own. However, the criteria provided in each of the two leading bodies explored contains a mixture if quantifiable and non-quantifiable criteria, leaving the categorisation open to interpretation, and not aligning succinctly with the researcher's positivist research philosophy.

The importance of FM service delivery in shopping centres is demonstrated by Pitt and Musa (2009), who explained that even if the FM service delivery does not report directly to the owners of the shopping centre, their performance does have a direct impact on the shopping centre outcomes. Recognising the importance of FM to shopping centres found in the literature, this study explores FM cleaning operations in greater detail, with the aim of achieving the central aim of this study, which is the identification and elimination of excessive production in FM cleaning operations within UK shopping centres.

This chapter proceeds to explore literature pertaining to FM cleaning operations, with the aim of finding relationships with UK shopping centres.

2.5.1 The Cleaning Industry

The definition, as presented by Djellal (2002, p.122), describes cleaning as "a service industry whose final outcome is the removal of dirt and grime from the medium in which the service is being delivered." Djellal (2002) recognised however that this definition is restrictive and does not cover all services provided by cleaning companies. The cleaning industry operates in many different guises, and for varying purposes. Bob Lamberts of Graymills (Creighton, 2007) explains that the cleaning industry is busy, and as a mature industry has made evolutionary changes through adopting technology to carry out its tasks. Djellal also (2002) documented this earlier, finding that the cleaning industry as a service industry, is undergoing major changes to

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scope and has an increasing use of information technologies, and was initially not computerised. However, due to an increase in services offered, with regards to both scope and complexity, the cleaning industry has undergone profound changes. This highlights that the cleaning industry has witnessed progression and development over time, and could therefore welcome an improvement in efficiency that this study aims to contribute towards.

In review of a panel discussion covering best cleaning practices, Lucke (2013) questioned why line personnel should not both be trained, and educated on the processes that they are monitoring and facilitating. The panel recognised cleaning as a broad subject and further questioned whether there is even need to clean, and whether there is such a thing as too much cleaning. However, Lucke (2013) does not offer any answers, or even discussion points, to these questions related to best cleaning practices. For example, and in line with Carreira (2005), that overcleaning represents excessive production Muda. To counter this, a connection has been found between cleaning and customer satisfaction. For example, in a study focusing on contracting cleaning services in a European public underground transportation company, Jiménez et al. (2006) found that cleaning is part of a major service provided to underground transportation users. Jiménez et al. (2006) continue to empathise that cleanliness is directly tied to customer satisfaction and performance quality levels for the public transportation services, recognising that when done well, cleaning is often taken for granted. However, as noted by Jiménez et al. (2006), when done poorly it is immediately noticed. This is of interest to this study as due to the large volume of shoppers visiting UK shopping centres, one poor cleaning incident would be noticed by many people, potentially culminating in them not visiting the shopping centre again, perhaps because another shopping centre is cleaner.

In addition to the documented connection between cleaning and customer satisfaction, the cleaning industry has significant financial worth, and provides many opportunities for organisations to generate profit. An article by Markets and Markets (Focus on Surfactants, 2016) quotes the industrial cleaning market being worth $50.24 billion by 2020. This is a significant rise of $11 billion from $39.24 billion in 2014, at a compound annual growth (CAGR) of 4.2%. As a result of this, the industrial cleaning sector is growing, evolving, and innovating. As an example, one such innovation, IceStorm90, could revolutionise industrial cleaning, according to Walter (2018). However, the concept it represents, dry ice cleaning, was discussed previously, in 2017 (Marlowe), demonstrating that when an innovative concept is

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found in the cleaning industry, others try to replicate, possibly due to the profit available. In contrast, this study found no similar concepts to that of the central aim of the study during the literature review, and therefore the implementation of an excessive production focus in FM cleaning operations within UK shopping centres is uniquely innovative.

The cleaning industry has undertaken changes in both aiming to progress and develop the industry, and offers significant profit for cleaning companies to compete for. Irrespective of this, the industry relies on vast numbers of employees with contracts requiring a manager to control, similar to the role of facilities manager previously discussed in the literature review. This study recognises a similarity with the requirement of a manager and that of a facilities manager, leading to question whether more or less excessive production would be present with or without a manager at a cleaning site. This is discussed further in the theoretical framework chapter when explaining the independent variables, and subsequent research hypotheses, with the understanding that management presence could affect the level of excessive production in FM cleaning operations within UK shopping centres.

2.5.2 In-House / Outsource

This section explores the service delivery options available to cleaning contracts of UK shopping centres, focusing on the similarities with FM of in-house and outsourced service delivery.

The choice of cleaning service provider and recruitment of staff is complicated. Jiménez et al. (2006) discuss the choice of cleaning service provided in relation to underground facilities, and argue that the selection of supplier is a complex decision-making problem with several conflicting criteria. The criteria offered include prices, delivery conditions and human resources, technical merit and resources, and quality control procedures. These complications have led to other forms of recruitment. Knotter (2017) explains that outsourcing of cleaning has allowed for recruitment of people outside the regulated labour markets, finding that immigrants are overrepresented in the cleaning workforce, with specific attention paid to women with part-time, irregular jobs. However, no mention is given to efficiency as a deciding factor.

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This is similar to other services (Knotter, 2017). Cleaning can operate in both public and private sectors, with literature suggesting that employees differ in this variable. In relation to cleaning in government, public sector, it is considered by Sambrowski (2016) that many in-house staff are excellent workers. Sambrowski (2016) recognises an alternative view from facility managers. Some facility managers have changed from hiring employees from in-house service delivery to outsourcing the service delivery to private cleaning companies. Interestingly, although Sambrowski (2016) proposes that with the switch from in-house to outsource comes overall cleaning improvement, when considering the pros and cons of each approach it is found that no consensus is held, suggesting that there are likely to be as many government managers that prefer working with in-house cleaning workers, as there are those that prefer outsourcing.

Outsourcing offers benefits as it can offer cost-avoidance opportunities. Wheatley (2010) describes how this was achieved at Nissan's car assembly plant in Sunderland. The company providing the cleaning service, Initial Industrial Services, reduced its waste emissions by building a dedicated waste sortation and picking line. The new process realised an increase of 30% of recovery of recyclable materials, reducing waste disposal costs up to £70,000. Furthermore, additional revenue has been generated from the sale of the separated scrap, and further waste stream possibilities have been identified that may come to fruition in future. To strengthen this stance, BuyingTeam, a procurement specialist in outsourcing of indirect services, claims that direct cost savings 8%-10% are readily available, even before considering any account improvements in service delivery (Wheatley, 2010).

This variance of in-house or outsource is not solely generalised across FM service delivery, or associated support activities. A study by Bröchner et al. (2002) into outsourcing FM in the process industry, whilst comparing Swedish and UK patterns, identified that individual activities can be categorised by either a high degree, intermediate degree, or low degree of outsourcing. In the comparison of three Swedish companies and three UK companies, cleaning was found to be outsourced to an intermediate degree (26%-75%). Jones (2002) however shows a further variance between industries. Different from the process industry findings by Bröchner et al. (2002), Jones (2002) presents a significantly lower outsourced cleaning figure in medium-sized UK hotels, with only 5%, showing a variance in findings. Interestingly, there is no mention given to which service delivery method would provide better efficiency, if any variance exists. This means that although a variance of outsourcing in different industries is

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found in the literature, there does not appear to be any specific correlation to the level of excessive production delivered. This is considered in Chapter Three, Theoretical Framework, when contemplating in-house/outsource as an independent variable.

However, considering the above, the overall consensus in choice of in-house or outsourced cleaning service provider is not found in the reviewed literature. A study by Toffolutti et al. (2016) into outsourcing cleaning services in UK hospitals found that there is a long-standing debate about the impact of outsourcing of hospital cleaning services to private sector contractors. Although found to have an economic cost per bed when outsourced, it has been documented that outsourcing cleaning services provided significantly higher methicillin-resistant staphylococcus aureus (MRSA) incidence. This was combined with reports that handwashing materials were not always readily available, and led to perceptions of patients that bathrooms, rooms, and wards were less clean. Irrespective of which service provider, the determining factor could be the technology available. This is justified by the conclusion of Nugent et al. (2013) that the indictors tested in the study are suitable for providing improved process control for automated cleaning processes in hospitals.

The studies of Bröchner et al. (2002) and Jones (2002) suggest that irrespective of the requirement of employees to deliver a cleaning service, the deciding factors of in-house or outsourced service delivery are not defined. Different from in-house service delivery, literature (e.g. Wheatley, 2010) was found to document positive outsourced service delivery outcomes. This would suggest that outsourcing is the consensus, however, a figure of 26%-75% was documented, with no explanation as to why the remaining percentage choose in-house service delivery (Bröchner et al., 2002). This study challenges this percentage claim offered by Bröchner et al. (2002) through generating in-house/outsource as an independent variable, and therefore providing the actual in-house/outsource ratio of FM cleaning operations within UK shopping centres.

2.5.3 Cleaning Improvements

This study explores improvements within the cleaning industry and cleaning operations to ascertain if any potential improvements derived from this study would be accepted.

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Different to services delivered through the agency of information, including banking, insurance, administrative services, and large-scale retailing, the cleaning industry has been previously deemed unworthy for attention. Described as the last refuge of the unskilled worker, it has been recognised that this stance needs to change. To this end, the cleaning industry is experiencing a radical transformation, as highlighted by the introduction of various types of technological innovation and also the provision of new services containing an increase in complexity Djellal (2002). This transformation has been recognised in other areas of cleaning, showing that improvements in cleaning can be niche in different cleaning disciplines. A study by Benito-López et al. (2011) focusing on the determinants of efficiency in the provision of municipal street-cleaning and refuse collection services found the existence of a significant relation between efficiency and all the variables analysed: per capita income, urban population density, the comparative index in the importance of tourism, and that of the whole economic activity. This is of interest to this study as it continues a common theme, efficiency, and relates it to cleaning improvements, an area on which this study focuses.

An unrelated study by Kim et al. (2016) also considers the significance of efficiency. In contrast to the study by Benito-López et al. (2011), Kim et al. (2011) focused on efficiency of the cleaning products only. Although neither study relates any efficiency reference to lean, or Muda specifically, the mention of efficiency regarding cleaning is of interest to this study. This study recognises also that progress is required, and in some circumstances is being made, in other areas related to cleaning. Daniels (1994) documents a survey conducted on cleaning alternatives at a national conference finding that over 40% of attendees were cleaning with ozone-depleting chemicals. From these findings, Daniels (1994) highlights that further progress is required in the area of cleaning improvements.

Specific practical examples of cleaning improvement are found within the literature. Hermes (2013) presents an improvement in the cleaning industry assigned to efficiency, recognising that many facilities implement programmes to reduce energy, water, and fuel usage, and regularly utilise sub-contractors to achieve outcomes. Hermes (2013) suggests that the cleaners working daily on the facilities are often overlooked. With the aim of reducing operating costs and improving efficiencies, a colour-coding system is proposed. Addressing that an increasing number of cleaners in the USA do not speak English as a first language, the colour-coding system helps to identify items in certain situations. However, in some circumstances where

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reducing costs and efficiency are not the sole beneficiaries, health and safety benefits can be, as they can warn or direct an employee as appropriate.

Not all decisions in the cleaning industry are to progress and develop, some are made for company survival. Cleaning companies are not always successful and must sometimes reorganise, and even change company direction, on occasion. Srinivasan (2017) illustrates this by recalling a case study of an on-demand cleaning services start-up company in Mumbai, India, who suspended its regular cleaning services and solely concentrated on business to business (B2B) commercial cleaning services, and business to consumer (B2C) deep cleaning. This decision was taken as the company could not generate sufficient hyper-local demand, which would have lowered logistics time and cost for regular cleaning. This change resulted in reducing the workforce by over 50% to under 100 personnel. This was necessary as the logistics cost formed 40% of the order revenue for the regular cleaning service, but accrued only between 5%-10% margins. It is unclear from the literature what reductions could have been prevented had the efficiency of the cleaning been improved through identification and elimination of excessive production. However, any benefit that had quantifiable results based on the figures could have been utilised by this study to demonstrate the reductions.

Specific cleaning standards are not exempt from the apparent search for improvement in the cleaning industry found in the literature. Green Seal's GS-42 (2015) standard for commercial and institutional cleaning services was revised and refined to reduce the need for interpretation. The criteria were consolidated into purchasing, use, maintenance, training, and communication categories. Cleaning standards are not unique to commercial cleaning and can have many varying characteristics. Lang (2017) presents ISO 16232 and VDA 19.1 as familiar industry standards for technical cleanliness. These standards are portrayed by Lang (2017) as generic by design, but suitable to lay out the framework for developing cleanliness specifications for particulate contamination of components and systems. The control on this standard is not specified in the literature.

The literature (Djellal, 2002; Hermes, 2013) suggests a search for improvement in various areas of the cleaning industry, and in general recognises a transformation. Efficiency is also documented as an area of focus, which aligns with the central aim of this study, which is the identification and elimination of excessive production in FM cleaning operations within UK

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shopping centres. The literature does not convey that the efficiency focus is directly attributable to cleaning operations, but rather to cleaning products, rates per capita income, urban population density, the comparative index in the importance of tourism, and the whole economic activity. This is however of interest to this study as it presents a gap in the efficiency focus, one that this study will contribute towards by progressing the cleaning industry to understand what level of excessive production exists, and thus guiding cleaning operations to become more efficient. This will be achieved through the dependent variable, excessive production, as presented in Chapter Three, Theoretical Framework, by exploring its relationship with the chosen independent variables, again, set out in Chapter Three, Theoretical Framework.

2.5.4 Cleaning in FM

In order to understand cleaning specifically in FM, as opposed to other cleaning deliveries discussed, this section explores literature pertaining directly to FM.

Bridging a gap of limited research looking into the benefits of FM help desks, a study carried out by May (2010) utilised four case studies spanning two different FM delivery platforms, commercial and estates, and the national health service (NHS). The study summarised further variations in characteristics of FM service delivery. Interestingly, variations were found also within the two FM delivery platforms themselves. The commercial and estates platform recognised both commercial facilities with a number of different clients, and commercial facilities with only one principal client, demonstrating varying aspects of the service provided. Different aspects have also been documented in other areas of cleaning, highlighting that cleaning in FM is similar to that in other cleaning disciplines.

Although not found to be prominent in the literature reviewed, the cleaning industry does publish some quantitative data. Cleaning benchmarking surveys are conducted annually in the UK by the Association of Public Service Excellence (APSE). Reviewing previous surveys in 2008/2009, Klungseth (2014) commented that 89% / 87% maintain an internal cleaning service organisation, and the responsibility is for building cleaning only at 42% / 37%. This does not highlight a significant change between the two years reviewed, but shows a trend for cleaning services. Klungseth and Blakstad (2015) further this, generalising that cleaning represents 38%-55% of FM organisations workforce illustrating that a significant proportion of the

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workforce provides benefit for finding efficiency. This is a view strengthened by Human Resource Management International Digest (2017), adding further interest to this study by exploring the idea that FM is a potential area to cut costs and create efficiencies to benefit financially.

There was limited research, e.g. Klungseth and Blakstad (2015), May (2010) related to FM cleaning, particularly that focusing on the UK. The key author found to relate the two aspects is May (2010) who focused on FM helpdesks, finding variations from each case study. This is of interest to this study as it also surveys different locations utilising FM cleaning operations, and could therefore possibly predict varying outcomes. Of further interest within this section of the literature review is the similarity of cleaning in FM to that in other cleaning disciplines, which potentially expands the opportunity for implementation of any focus on excessive production, and therefore possibly generalising the concept.

2.5.5 Cleaning Service Delivery

The literature reviewed up to this point suggests that the cleaning industry is varied, covering a multitude of disciplines. If found in the research findings of this study, excessive production will be present in elements of the cleaning processes and tasks (Taj & Berro, 2005). For this reason, this study proceeds to explore cleaning processes and tasks.

Literature leads to early reference surrounding specification of cleaning in relation to conditions and terms of contract. Wilson (1989) considers that irrespective of whether providing in-house or outsourced service delivery, corporate occupiers make decisions about their cleaning services regarding the standard and frequency of cleaning. Considering the concept that the risk for both client and contractor is reduced through more specific and detailed specification for cleaning services, Wilson (1989) adds further requirements including legal requirements, and details of the premises to be cleaned, including floor areas, finishes, fittings and types of accommodation and schedule of tasks. A cleaning schedule is also documented as a means to not waste time and energy and to ensure that no uncompleted tasks are left. To achieve this, Walkiden (1994) generalises a cleaning schedule divided by sections into daily tasks, such as office cleaning, toilets, canteen cleaning, and weekly or monthly tasks. The cleaning schedule is filled out by ticking boxes to confirm that tasks have been completed. The

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scheduling of cleaning work is related directly to an element of Muda, transportation, by Lynn (2003), as travel time between cleaning jobs can be reduced by scheduling.

To place scheduling into context, Lynn (2003) offers a breakdown and overview of tasks for a typical day of a cleaner. The day begins with a check of equipment to ensure the team have everything required for the day, including enough cleaning solution and paperwork for the day's tasks. The team completes a checklist routine for the day to serve as a reminder for the tasks to be completed, and initials are added by the cleaner to show accountability should any complaints arise. Before returning paperwork, the supplies for the following day are replenished and the supervisor is advised of any issues that have occurred during the day. Lynn (2003) suggests that teams should be allowed flexibility, but advises that when allowing flexibility, the teams should remain cleaning in an efficient and logical way. However, no guidance is provided regarding how to achieve an efficient and logical way, and no specific or general description is given for efficient cleaning. In contrast, and in relation to the focus on efficiency, it is suggested that having the right tool for the job cuts down on time and increases productivity (Delane, 2018). In line with the common theme of the literature review, this suggests that efficiency improvement is possible within cleaning operations, an efficiency improvement that a focus on excessive production could provide.

Checklists can be utilised to assist in detection and elimination of specific cleaning items, and also in monitoring to help ensure satisfactory completion of basic and specialised services (Fenix, 2002), a view shared by other authors (e.g. Delane, 2018; Lynn ,2003). Delane (2018) progresses the checklist by inputting an approximate time required to complete each task. Although intended for a house cleaning business and not a shopping centre, the progressed checklist concept offered by Delane (2018) provides information on how long a certain area takes to clean, guiding the employees on task completion and assisting in charging the client correctly. This method for calculating costs for cleaning is however not ubiquitous, with some companies documented to charge solely by sq. ft. to be cleaned (Amador, 2017). Following this method would allow the service provider to benefit from any efficiencies found within larger operations, as the time taken to clean is not calculated and efficiencies found at a larger scale could be greater. Considering this, an efficiency improvement found from a focus on excessive production could be directly implemented, thus saving the service provider time, and

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in turn allowing them to clean more square footage per hour using the same level of resource, thus making more profit per hour.

In contrast to this profit related efficiency improvement, but also offering benefit, Fenix (2002) states that through consistent and efficient execution of services, profit margins can be maintained. Consistency and efficiency are further presented as essential components of good cleaning practices that, combined with specific knowledge of cleaning materials and equipment, will prevent companies from losing contracts. Moreover, this is achieved through management and supervision, which are suggested by Fenix (2002), in order to require a wide range of knowledge and skills. The suggested knowledge to be held by the supervisor, or manager, includes the types of standards and services required in specific situations, an understanding of the types of services which can be provided, and the application of the methods of work planning (Allen, 1989). Relevant to this study is that the level of knowledge required by the front-line workers, who represent the sample that are surveyed for this study, is not stated. This lack of understanding appears to be a gap in the literature. This study understands from the lean and process waste elimination sections of this literature review that certain skills are required to achieve lean, and its associated aspects. It is unclear which skills a front-line cleaner would possess, and whether they would be capable of eliminating excessive production in their respective operations.

Irrespective of efficiency improvements or profit generation, certain cleaning standards need to be achieved. Justification for a cleaning operation achieving a set standard is offered by the British Institute of Cleaning Science (BICSc) (BICSc, 2019, p.4), which states that the “best value and value for money continue to be an important requirement for customers involved in the management or procurement of cleaning services.” This is contrary to the standard of clean which is defined (Fenix, 2002). BICSc (2019) state that it is possible to define the term ‘clean’, and that cleanliness can be measured within a given set of clear criteria. Moreover, BICSc (2019) describe cleaning as scientific, and although usually judged subjectively by a given expectation, cleaning is an industry in which innovation is possible. In search of innovation, productivity has been addressed, but without providing specific, or general, guidance for improved service delivery.

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The Human Resource Management International Digest's (2017) paper into understanding increased productivity through facilities management aimed to view the output of facilities as more than just cleaning offices. It is with this, and suggestion that the most popular management focus has been to find marginal gains with the single-minded pursuit of finding efficiencies to gain competitive advantage over the opposition in recent times that the paper is written. Further acknowledgement is given that fewer marginal gains are available to enable an organisation to stay ahead of the competition. This was found by Human Resource Management International Digest (2017), stating that all classic forms of advantage, including high performance culture in teams, continuous improvement, agile approaches, and six sigma-based management, are available in human resource management. And further confirm that they have been studied, resulting in a level playing field amongst competitors. It is with a focus on excessive production in FM cleaning operations within UK shopping centres that organisations can gain a competitive edge.

Whether delivered in-house or outsourced, the literature suggests that cleaning strategy is necessary, and can be achieved through cleaning scheduling. Although scheduling of cleaning offers many benefits to cleaning operations including profit generation and contract obtainment, the literature of most interest to this study is that relating to efficiency. As found at several stages of the literature review, efficiency improvement is recognised as positive, available, and achievable. This study will test this agreement by exploring efficiency improvement through a focus on excessive production in FM cleaning operations within UK shopping centres.

2.5.6 Section Summary

Apart from aligning with FM by offering both in-house and outsourced service delivery, the cleaning industry also operates in both the private and public sectors. In addition to the documented complicated choice of in-house or outsourced service delivery, the literature suggests difficulty in recruitment of cleaning employees, leading to recruitment outside the regular markets. Similar again to FM, the cleaning industry recognises a requirement for an onsite manager, coined as facilities manager in FM, although no criteria are provided for when it is required, or whether greater efficiency is achieved with or without.

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Although the cleaning industry has made evolutionary changes through adopting technology to undertake tasks, and has witnessed progression and development over time and a radical transformation, the literature suggests that efficiency is not a specific area of improvement. The need and reason for improvement is also documented, finding that the cleaning industry has significant financial worth, providing many organisations opportunity to generate significant profit. In addition, although certain cleaning standards need to be achieved, cleaning scheduling, and a subsequent breakdown of cleaning tasks, is documented as a means to not waste time and energy, and ensure that no uncompleted tasks are left (Wilson, 1989). This presents ideas in which operational efficiency can be delivered, thus addressing the central aim of this study, the identification and elimination of excessive production in FM cleaning operations within UK shopping centres.

2.6. Literature Review Summary

There is a significant gap in the literature as to lean and its importance to the FM sector, particularly when considering Muda is an important tool used to improve efficiency. The literature reviewed does however have a common theme throughout FM, and FM cleaning operations, which is that efficiency is not only possible, but also required to meet key objectives such as lowering operating costs. Multiple key authors recognise this in various guises (Alexander, 2003; Shine, 2018; Jones, 2002; Djellal, 2002; Benito-López et al., 2011; Kim et al., 2016; Hermes, 2013; Srinivasan, 2017; Klungseth & Blakstad, 2015; Delane, 2018; Fenix, 2002; Amaratunga, 2001). However, solutions to the issue are not presented, providing a research gap that this study aims to contribute towards. This chapter has uncovered positive quantitative results from lean implementation, mostly within a hospital environment, but has not found a specific approach that is suggested to be applicable in UK shopping centres. This research gap is present due to the limited research that has been conducted into efficiency in FM operations, with none found to be specific to UK shopping centres. However, key authors have been identified and their respective studies explored within this literature review, as set out in Table 2.6.

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Table 2.6 – Key Authors Found in the Literature Review

Year	Author/s	Study Title	Key Findings
1989	Allen	Accommodation and Cleaning Services: Volume 1: Operations	The types of standards and services, relating to the cleaning industry, required in specific situations, providing an understanding of the types of services which can be provided, and the application of the methods of work planning.
1989	Wilson	Specifying Cleaning Services	Certain cleaning standards need to be achieved, cleaning scheduling, and a subsequent breakdown of cleaning tasks, is documented as a means to not waste time and energy, but ensure that no uncompleted tasks are left. Further requirements include legal requirements, and details of the premises to be cleaned, including floor areas, finishes, fittings and types of accommodation and schedule of tasks.
1992	Finch	Facilities Management at the Crossroads	A facilities manager looks after four different stakeholders and shareholders, the shareholders, the employees, the customers, and the community. Argues that due to property managers no longer being able to assume that properties with the right location will sustain their value, a growing awareness that a permanent management structure for coping with change in the built environment is needed, which was coined FM.
1993	Robson	Cleaning Services: Making a Clean Sweep	Multi-service contracts require an on-site manager in each respective building, being responsible for services including cleaning.
1994	Walkiden	Contract Cleaning: Starting and Running Your Own Business	Generalises a cleaning schedule divided by sections into daily tasks (offices), daily tasks (toilets), daily tasks (canteen), weekly tasks (general) and monthly tasks.
1996	Brown	Keeping Score: Using the Right Metrics to Drive World Class Performance	Presents a performance process framework that looks to elucidate the journey from inputs to outcomes. The model commences with input measures and progresses through process measures and output measures before concluding with outcome measures.

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Year	Author/s	Study Title	Key Findings
1996	Womack and Jones	Lean Thinking: Banish Waste and Create Wealth in Your Corporation	Offers an antidote to waste, lean thinking, which was promoted as a way to specify value, line up value-creating actions in the best sequence, conduct activities without interruption when someone requests them, and perform them more effectively. For example, waiting in a check-in, waiting in a customs line, and receiving the tickets by mail. It is documented that studied holiday journey took 13 hours and consisted of a total of 23 processing steps, many of which are incumbent, as many firms are involved, and usually contributing to only one step in the process.
1997	Johnson	Outsourcing: In Brief	Presents that no outsourcing agreement should be signed before consideration is given to the longer-term implications.
1998	Hines et al.	Value Stream Management	Describes waste removal from the supply chain as perhaps the most important task facing the modern logistician. The overall approach requires the manager to identify a series of wastes that exist within the supply chain and to choose, apply and analyse the output from a series from chosen appropriate contingent tools.
2000	Atkin and Brooks	Total Facilities Management. (3rd Ed.)	Presents the possibility to outsource, or subcontract, specialist elements of FM delivery, and that since its inception, FM has emerged as its own service sector, establishing a new professional discipline operating with its own codes, standards, and technical vocabulary.
2000	Kiff	The Lean Dealership: A Vision for the Future: From Hunting to Farming	Describes excessive production as the most serious waste, whilst providing two separate examples to define excessive production waste.

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Year	Author/s	Study Title	Key Findings
2001	Amaratunga	Theory Building in Facilities Management Performance Measurement: Application of Some Core Performance Measurement and Management Principles	Explains that performance measurement has become a popular topic with both a theoretical and practical focus, documenting how enabling of performance measurement is required in many planning and control tools, including CI, with a direct relationship to FM.
2002	Bröchner et al.	Outsourcing Facilities Management in the Process Industry: A Comparison of Swedish and UK Patterns	The cleaning service in particular was found to be outsourced on 26%-75% of occasions and considered as intermediate degree, as opposed to low degree (0%-25%) or high degree (76%-100%).
2002	Djellal	Innovation Trajectories and Employment in the Cleaning Industry	The cleaning industry, as a service industry, is undergoing major changes to scope and increasing use of information technologies, and was initially not computerised. Describes cleaning as "a service industry whose final outcome is the removal of dirt and grime from the medium in which the service is being delivered."
2002	Fenix	Commercial and Residential Cleaning Services: A Resource Guide to Developing and Maintaining Your Own Janitorial or Home Cleaning Business	Management and supervision require a wide range of knowledge and skills. states that through consistent and efficient execution of services profit margins can be maintained. Consistency and efficiency are further presented as essential components of good cleaning practices that combined with specific knowledge of cleaning materials and equipment will prevent companies from losing contracts. This is achieved also through management and supervision, which are suggested to require a wide range of knowledge and skills.

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Year	Author/s	Study Title	Key Findings
2002	Jones	Facilities Management in Medium-Sized UK Hotels	5% outsourcing of cleaning in UK medium-sized hotels, offering possible benefits of continuing advancing facilities, concluding that efficient FM holds the potential for increasing profitability, improving reputation, safety, cleanliness, comfort, and the working environment.
2003	Alexander	A Strategy for Facilities Management	FM is a rapidly developing and growing discipline, vocation, and business service, finding that early developments have been made. The skilled facilities manager identifies processes that allow an organisation to sustain a quality operating environment and services to meet strategic needs, and at best cost, to which the facilities manager could contribute to achieving set targets by improving efficiency by eliminating excessive production.
2003	Lynn	Start Your Own Cleaning Service: Your Step-by-Step Guide to Success	In addition to using cleaning scheduling, cleaning teams should be allowed flexibility and clean in an efficient and logical way, and travel time between cleaning jobs can be reduced by scheduling. Suggests that teams should be allowed flexibility, however, advises that when allowing flexibility, the teams should remain cleaning in an efficient and logical way.
2005	Carreira	Lean Manufacturing That Works: Powerful Tools for Dramatically Reducing Waste and Maximising Profits	Excessive production is producing more than you need to produce. Documents the steps required for both an oyster sandwich shop and a manufacturing operation, and the activities that can be carried out to eliminate excessive production. The only variations between the processes are specific to the intended product, the purchase or lease of tools and equipment, and the purchase of raw materials. Other than these, the process steps for both are identical, highlighting transferability between industries and services.

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Year	Author/s	Study Title	Key Findings
2005	Taj and Berro	Application of Constrained Management and Lean Manufacturing in Developing Best Practices for Productivity Improvement in an Auto-Assembly Plant	The lean approach is focused on systematically reducing waste in the value stream, with the waste elimination process including not only defective products but also defective work and activities, warning that results may not be applicable to other industries.
2005	Then	A Proactive Property Management Model that Integrates Real Estate Provision and Facilities Services Management	FM is multi-faceted and operates in many different locations and environments. FM can be operationally delivered in many guises, with the approach determined by the processes required to meet the business demands.
2005	Wauters	The Added Value of Facilities Management: Benchmarking Work Processes	Facilities managers need to add value to the organisational value chain, highlighting a realisation that the discipline of FM encompasses much more than costs alone.
2006	Jiménez et al.	Contracting Cleaning Services in a European Public Underground Transportation Company with the Aid of a DSS	Cleanliness is directly tied to customer satisfaction and performance quality levels for the public transportation services, recognising that when done well, cleaning is often taken for granted, and when done poorly, it is immediately noticed.

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Year	Author/s	Study Title	Key Findings
2007	Atkin and Björk	Understanding the Context for Best Practice Facilities Management from the Client's Perspective	Present a model for 'implementation solutions to FM needs' which shows that irrespective of in-house or outsourced services, there is a need for service needs specifications and service level agreements. Connect the lack of awareness, misconception and immaturity to the limited progress that has been made to understand the interrelationships and dynamics of FM processes.
2007	Creighton	Snapshot of the Cleaning Industry	The cleaning industry is busy, and as a mature industry, the cleaning industry has made evolutionary changes through adopting technology to its tasks.
2007	Manuele	Lean Concepts: Opportunities for Safety Professionals	Connects the lack of awareness, misconception and immaturity to the limited progress that has been made to understand the interrelationships and dynamics of FM processes. Found that the work contained few references to accidents as a waste factor. This omission represents both a problem and an opportunity to make their presence felt, and that progressive safety professionals will react to this shortcoming by educating management on the advantage of including safety considerations as the lean process is applied.
2007	Moss et el.	Performance Measurement Action Research	Presents a framework that shows the importance of balanced performance measures, which should cover all aspects of inputs, process, outputs, and outcomes, all of which are present in FM.
2008	Piercy and Rich	Lean Transformation in the Pure Service Environment: The Case of the Call Service Centre	Offer comparisons of improvements to management systems before and after lean implementation. Performance expectations improved from time standards established per task with defined routines to meeting customer needs effectively and reducing system failures. Also explains that as failure demand reduces, employees were able to concentrate on the management of the process cycle, improving productivity.

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Year	Author/s	Study Title	Key Findings
2009	Atkin and Brooks	Total Facilities Management. (3rd Ed.)	FM has emerged as its own service sector, establishing a new professional discipline operating with its own codes, standards, and technical vocabulary. Documents potential confusion regarding terminology, explaining that the word 'facility' is used in some parts of the world instead of 'facilities', recognising it as the same and the use of either word as a matter of individual preference.
2009	Narusawa and Shook	Kaizen Express: Fundamentals for Your Lean Journey	Breaks down efficiency into two categories, apparent efficiency, and true efficiency. Apparent efficiency being an increase in production output with no change to number of operators or equipment, and true efficiency being the production of a set number of parts or products that can be sold, whilst using the minimum number of operators and equipment. Although the examples given are clearly centred around a manufacturing and production background, there is no mention that they are not transferrable.
2009	Pitt and Musa	Towards Defining Shopping Centres and Their Management Systems	Explains a shopping centre as a building that contains many units of shops, however, is managed as a single property. The complexities of shopping centres in terms of their size have led to confusion as to shopping centre identities.
2010	Chen et al.	Lean Automated Manufacturing: Avoiding the Pitfalls to Embrace the Opportunities. Assembly Automation	Irrespective of industry, with correct identification of waste, and successful elimination of those found, it can lead to reduced manufacturing cost, higher product quality, improved customer satisfaction and increased profits. Found that products or features that customers do not want are considered Muda, as they do not generate revenue, but add cost.
2010	Wheatley	Outright Decision. Site Operations and Services	Outsourcing can offer cost-avoidance opportunities, claiming that direct cost savings 8%-10% are readily available, even before considering any account improvements in service delivery.

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Year	Author/s	Study Title	Key Findings
2012	Hasle et al.	Lean and the Working Environment: A Review of the Literature	A division between lean supporters and objectors exists, with supporters arguing that it is not merely a production method, but a way of thinking that raises efficiency and rejects waste. Specifying that the service sector is an area for lean exploration.
2012	Ikedashi et al.	Analysis of Risks Associated with Facilities Management Outsourcing: A Multivariate Approach	Administered 146 questionnaires to registered members of the International Facilities Management Association (IFMA) at three levels of management, top level manager, middle level manager and low-level manager. Of the 41.8% response rate, the findings ranked the 39 risk factors associated with facilities management outsourcing. Poor quality of service presented the highest risk, and natural disasters were found to present the lowest risk.
2012	Sayer and Williams	Lean for Dummies. (2nd Ed)	Waste is eliminated in the value stream by doing Kaizen, or CI. However, finds that the scope that can be achieved through utilising Kaizen is limited, stating that a common problem in Kaizen implementation is oversized projects, or projects that gradually grow into an unmanageable size.
2013	Bateman et al.	Wider Applications for Lean: An Examination of the Fundamental Principles Within Public Sector Organisations	Lean can be successfully applied in a public sector context, with only modest modifications required to its core principles.
2013	Hodges and Sekula	Sustainable Facility Management: The Facility Manager's Guide to Optimizing Building Performance	Offers questions that facility managers could ask themselves to better understand if they are a high performing FM organisation. The questions range from asking whether there are established written and publicised operation and maintenance practices and procedures to how the maintenance and cleaning needs of the building's permanent interior elements are managed to ensure longevity of the asset, and comfort of the occupants.

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Year	Author/s	Study Title	Key Findings
2013	Hui et al.	Facilities Management Service and Customer Satisfaction in Shopping Mall Sector	The quality of FM service plays an important role in the overall service performance of a shopping mall.
2015	Klungseth and Blakstad	Organising in-House Cleaning Services in Public FM	Generalise that cleaning represents 38%-55% of FM organisations workforce.
2015	Ee	Value-Based Facilities Management: How Facilities Practitioners Can Deliver Competitive Advantage to Organisations	The soft services delivery category contains support services, security, health and safety, and cleaning. FM aims to increase productivity.
2015	Olesen et al.	Using Lean Principles to Drive Operational Improvements in Intermodal Container Facilities: A Conceptual Framework	Presents the 5 key principles of lean theory that leads through to creating services and products that add value to a client's objectives, leading through to creating services and products that add value to a client's objectives. The theory identifies value to a client's objectives, identifies the vital steps that facilitate efficient production, eliminates steps in the workflow that potentially cause disruption, supplies on demand to ensure no resources are wasted and strives for perfection by continually removing layers of waste as they are uncovered.
2015	Ronse et al.	Shopping Centre Siting and Modal Choice in Belgium: A Destination-Based Analysis	Proposes two factors by which the shopping centres are categorised, the size of the city, and the location of the shopping centre relative to the city centre. Addresses the issue of shopping centre classification, but also offers the variable as a way to better understand the results and increase the transparency of the statistical analysis.

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Year	Author/s	Study Title	Key Findings
2016	Sambrowski	In-House Cleaning Employees, Outstanding Cleaning Services Present Different Advantages	In relation to cleaning in government, public sector, it is considered that many in-house staff are excellent workers, proposing that with the switch from in-house to outsource comes overall cleaning improvement.
2017	Amador	Real Stories, Lessons and Tips from Someone Who Started a Cleaning Company and Grew Revenues to Over $1m in 6 Years	Some companies charge solely by square footage to be cleaned, and use this to calculate the cost of cleaning.
2017	Knotter	Justice for Janitors Goes Dutch. Precarious Labour and Trade Union Response in the Cleaning Industry (1988-2012): A Transnational History	Explains that outsourcing of cleaning has allowed for recruitment of people outside of regulated labour markets, finding that immigrants are overrepresented in the cleaning workforce, with specific attention paid to women with part-time, irregular jobs.
2017	McWhorter	Introduction to Lean Manufacturing: The Road to Continuous Improvement	Offers CI and elimination of waste as the two activities that make up the core of lean thinking. The word Kaizen has been extensively used in lean manufacturing. Constructed from two Japanese words it is translated into English as, kai – change, to take part, and zen – good, for the better. Offers an example for necessary, non-value-added activities being quality checks. The customer ultimately wants quality, but is not willing to pay for the quality checks required to ensure that the product, or service, meets the expected criteria.

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Year	Author/s	Study Title	Key Findings
2017	Sweeney	Lean Quick Start Guide: The Simplified Beginner's Guide to Lean. (2nd Ed)	More activities are required for an organisation to implement lean, and maintain a competitive, responsive, and flexible position within the marketplace. Continual elimination of waste, goals with a broad view, simplicity, CI, organisational visibility, and flexibility are presented as six pillars for the lean production method.
2018	Delane	Clean Up Cleaning Up: Learn the Secrets to Starting, Running and Growing Your Own Professional Cleaning Business	Having the right tool for the job cuts down on time and increases productivity. Although intended for a house cleaning business not a shopping centre, the progressed checklist concept offered provides information on how long a certain area takes to clean, guiding the employees on task completion and assisting in charging the client correctly.
2018	Ibrahim et al.	Shopping Centre Classification Scheme: A Comparison of International Case Studies	Offers twenty-one different categories over the world for shopping centres including super regional, shopping arcade and sub regional. Recognise FM in detail in their conceptual framework classification of shopping centre for grading of shopping centres. Shopping centres are graded on a five scale system, excellent, above average, average, below average, and poor, to help the owners rank portfolio holdings and potentially sell low-scoring properties. Categories are utilised for grading and are broken down into further criteria and sub criteria as validated by expert opinion.
2018	REVO	UK Classification for Retail Assets	Offers four different shopping centre classifications, regional scheme, sub-regional scheme, local scheme, and neighbourhood scheme, all of which contain varying characteristics. Recognised how the retail environment was fast-changing, with increasingly selective and purpose led customer shopping trips. It was proposed that new classifications would allow investors, owners, valuers, and advisors to utilise a widely accepted lexicon to describe UK retail assets.

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Year	Author/s	Study Title	Key Findings
2018	Shine	The Essential Guide to Maintenance and Facilities Management. (2nd Ed.)	Recognises a relationship between the reliance of innovative, integral, flexible equipment to achieve quality, efficiency, equipment reliability and cost effectiveness to both modern manufacturing processes and aspects of FM., in order to allow for the acquisition of tools and parts in the fastest and easiest manner, by clearing out all unnecessary things, lean manufacturing offers 5S.
2019	BICSc	Best Value Standards Specifications and Productivity Rates	States that the "best value and value for money continue to be an important requirement for customers involved in the management or procurement of cleaning services." Describes cleaning as scientific, and although usually judged subjectively by a given expectation, cleaning is an industry in which innovation is possible.
2019	Evans	Scottish Shopping Centre Goes on Sale for £1	Facilities managers are responsible to the centre management teams of shopping centres. At the top of the management structure are the owners: developers, investors, and local authority. It is the owners that have the success or failure outcomes.
2019	ICSC	Europe Shopping Centre Classification and Typical Characteristics	ICSC presented its own classification and characteristics pertaining to grouped shopping centres based on location.

Source – Created by the author

A connection found in this study between process waste elimination and efficiency improvement is a key theme of interest, particularly when considering that the literature review uncovered no limitation to the possible transferability of the concept into FM. Any such implementation into FM would be a different environment from where process waste elimination was derived, the production and manufacturing industries. Irrespective of industry, the literature reviewed suggests that with correct identification of waste, and successful elimination of that found, it can lead to reduced manufacturing cost, higher product quality, improved customer satisfaction and increased profits (Chen et al., 2010). To achieve this, categories of waste are provided.

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There is no clear agreement found (e.g. Sayer & Williams, 2012; Taj & Berro, 2005) regarding the number of waste categories, with some authors preferring seven and some authors preferring eight. The literature does however indicate an agreement on the original seven categories of defects, over processing, waiting, transportation, inventory, motion, and excessive production (e.g. McWhorter, 2017; Sweeney, 2017). Based on literature documenting excessive production as ubiquitous in operations, and that it is the most serious waste, and its reduction ensures resources are used more efficiently, this study has chosen excessive production as the sole dependent variable.

Regarding FM in general, the literature reviewed suggests that FM covers a variety of activities and services, provided either in-house or outsourced activities and services are broken down into hard and soft services, to which the service can be delivered separately, or together as TFM. The literature suggests that FM is progressing as an industry, especially regarding performance measurement (Amaratunga, 2001). This critical review of existing literature indicates there is notably limited literature in the area of FM, particularly around lean, and its associated aspects. This is surprising, considering that a focus was found on reducing costs, and assigned specifically to an established profession - that of the facilities manager. In response to this finding, this study aims to guide FM, and facilities managers, to identify and eliminate excessive production in soft FM cleaning operations, thus reducing the cost of activities that do not add value to the customer.

Although the literature around FM in shopping centres was not found to be extensive, especially related to the central aim of this study, the importance of FM service delivery in shopping centres is documented. Pitt and Musa (2009) explain that even if the FM service delivery does not report directly to the owners of the shopping centre, their performance does have a direct impact on the shopping centre outcomes. The literature suggests that UK shopping centres are a key destination for the UK population, with travel distance not being a limiting factor for visiting. The documented visiting figures strengthen this stance, showing annual visitors figures of Metro Centre, Braehead and Lakeside shopping centres (Robertson & Fennell, 2007). This provides strong evidence to suggest that cleaning operations within the shopping centres are suitable and sufficient, as losing only 10% of these visitors due to cleaning standards would have a significant negative impact on sales.

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There is a significant gap in the current literature related to lean being implemented in the cleaning industry, and its possible benefits. The literature reviewed does however relate the cleaning industry to FM. As well as aligning with FM by offering both in-house and outsourced service delivery, the cleaning industry operates in both the private and public sectors. Offering further similarity to FM, the cleaning industry recognises a requirement for an onsite manager, known as a facilities manager (Alexander, 2003), although no criteria is provided for when it is required. The cleaning industry literature suggests opportunity for organisations to generate tangible profit within an industry that has significant financial worth, and provides need and reason for cleaning operations to find efficiency improvements, a gap in understanding that this study aims to contribute towards.

Considering the literature reviewed, this study will proceed to confirm and justify the dependent and independent variables in the following chapter, the Theoretical Framework. This is with the aim of meeting the research objectives: to identify opportunities for elimination of excessive production in FM cleaning operations within UK shopping centres, to analyse excessive production from the front-line FM cleaning employee's perspective within UK shopping centres, and to establish a conceptual framework that helps to eliminate excessive production in FM cleaning operations within UK shopping centres.

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Chapter Three
Theoretical Framework

3.1 Theoretical Framework Introduction

The Theoretical Framework chapter justifies, utilising the literature review, the research theoretical framework and the proposed hypotheses. The role of the theoretical framework is to guide the research, providing hypothesised interaction and relationships between the independent variables and the dependent variable. Furthermore, the theoretical framework presents theories underlying the hypothesised interactions and relationships, providing clear rational for any predictions. The Theoretical Framework Chapter commences with an overview of the process utilised by this study for hypothesis development, before justifying and confirming the dependent and independent variables, firstly outlining the justification for choice of dependent variable before continuing to justify choice of independent variables.

3.2 Development of Hypotheses

Previous studies reviewed in the literature review have revealed limited direct relationship between Muda, or excessive production specifically, and FM cleaning operations within UK shopping centres. This study aims to contribute to this identified research gap by elucidating what, if any, excessive production is present in FM cleaning operations within UK shopping centres, and how the findings are affected by identified independent variables. The findings from the literature review have guided this study in choosing the variables for this study, all of which pertain directly to either FM, FM cleaning operations, UK shopping centres, or a combination thereof.

Considering the limited direct relationship between Muda, or excessive production specifically, and FM cleaning operations within UK shopping centres, the variables have been chosen based on three criteria. Firstly, the variables are associated with at least one of the theoretical aspects of the research objectives: to explore the lean concept of Muda elimination, to identify opportunities for elimination of excessive production in FM cleaning operations within UK shopping centres, to analyse excessive production from the front-line FM cleaning employee's perspective within UK shopping centres, and to establish a conceptual framework that helps to eliminate excessive production in FM cleaning operations within UK shopping centres. Secondly, the variables will provide measurable findings for statistical analysis. Thirdly, the findings required are available through survey questionnaire.

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This study will proceed to justify and confirm the dependent and independent variables by considering the aforementioned three criteria. The dependent variable, excessive production, will be discussed first.

3.3 Dependent Variable – Excessive Production

In line with the relationship between lean and efficiency found in the literature review, addressing Muda elimination can improve efficiency and lower production costs (Manuele, 2007). In addition, the reviewed literature further shows that Muda elimination, and lean, is not a simple process, but it is achieved over time and throughout an organisation. It is when lean principles are applied that people begin to rethink the organisation of the work and the appropriateness of the size of machines, warehouses, and systems to fit the flow (Jones et al. 1996). Theory suggests that there are seven commonly accepted categories of Muda, as supported by Golińska-Dawson et al. (2015). These are transportation, inventory, motion, waiting, over processing, excessive production, and defects, which align with the Muda categories suggested by Carreira (2005), albeit named slightly differently. However, in contrast, some literature suggests a further category of Muda, that of non-used employee talent, or a variation thereof (Sayer and Williams, 2012). Different to the other seven, excessive production has been identified as the most serious of process wastes (Kiff, 2000; Sweeney, 2017), suggesting that improvement in this area could provide the most benefit of all of the Muda wastes, if producing more than the customer needs can be identified and eliminated.

This view by Kiff (2000) and Sweeney (2017) is shared by other authors such as Sayer and Williams (2012), Lee-Mortimer (2008), expressing that whatever is produced further to what the customer needs is excessive production waste. In addition to this, excessive production waste leads to other wastes including inventory costs, manpower and conveyance to deal with excess product, consumption of raw materials, and installation of excess capacity (Sayer & Williams, 2012; Lee-Mortimer, 2008), albeit documented from a production and manufacturing perspective. Referring to previous literature regarding lean and its associated aspects, efficiency and the reduction of excessive production ensures resources are used more efficiently and obsolescence is reduced (Lee-Mortimer, 2008).

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This study recognises that utilising all eight categories of Muda as separate dependent variables would present a questionnaire with a respondent completion time that would be difficult to justify to UK shopping centre FM cleaning operations, and would also not provide findings that meet the objectives of this study: to analyse excessive production from the front-line FM cleaning employee's perspective within UK shopping centres, and to establish a conceptual framework that helps to eliminate excessive production in FM cleaning operations within UK shopping centres. Considering this, this study has chosen excessive production as the sole dependent variable.

Again, there was little to no literature found by this study that specifically places excessive production, as a concept, into FM cleaning operations in UK shopping centres. However, literature does suggest that it could offer benefit in industries other than production and manufacturing, with researchers simplifying its presence as occurring anytime more is produced than is required for the next step of the process (Sayer & Williams, 2012; Lee-Mortimer, 2008; McWhorter, 2017). In light of this, theories surrounding cleaning processes have been uncovered during the literature review that could contain excessive production, scheduling, and checklists (Wilson, 1989; Walkiden, 1994; Lynn, 2003; Fenix, 2002; Delane, 2018), and are a focus for identifying and eliminating excessive production.

This study recognises that the specific nature of excessive production is a probable reason for the limited literature uncovered, and subsequent restricted opportunity for comparison and analysis, presenting the research gap to which this study will contribute. To achieve this, the variances of the presence of excessive production in FM cleaning operations within UK shopping centres has been examined through the use of independent variables, and which this study will proceed to justify and confirm.

3.4 Independent Variables

This section justifies and confirms the independent variables that have been utilised to achieve the research objective: to analyse excessive production from the front-line FM cleaning employee's perspective within UK shopping centres, and leads towards addressing the fourth and final objective of this study, which is to establish a conceptual framework that helps to eliminate excessive production in FM cleaning operations within UK shopping centres.

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3.4.1 Facilities Management Service Delivery

As the literature demonstrates, FM covers a variety of activities and services, although the level of development within the industry differs throughput the world (Atkin & Brooks, 2000; Brown, 1996; Moss et al., 2007). The activities and services are predominantly broken down into hard and soft services, to which the service can be delivered separately, or together as TFM. The literature suggests that although FM is progressing as an industry, there is scope to progress further. This study finds that FM related academic studies are limited, especially relating to lean, and its associated aspects, whether as soft, hard or TFM service delivery.

TFM is where a single entity takes responsibility for all facets of FM. This is however with the possibility to outsource, or subcontract specialist elements of the FM delivery (Atkin & Brooks, 2000). As TFM covers all services, it covers all inputs and outputs of FM service delivery. Brown's (1996) performance process framework looks to elucidate the journey from inputs to outcomes, and is evaluated by Moss et al. (2007) in terms of FM viability. Brown's (1996) model commences with input measures and progresses through process measures and output measures before concluding with outcome measures. The framework, as explained by Moss et al. (2007), shows the importance of balanced performance measures, which should cover all aspects of inputs, process, outputs, and outcomes, all of which are present in FM.

As a discipline, FM spans multiple sectors, and covers both public and private sectors. Nardelli et al. (2014) suggest that FM units have the ability to actively contribute to the innovation strategies of the public and private entities, achieved by mediating and managing relationships among public and private stakeholders, and this shows the diversity of the FM industry. FM is further broken down into various scopes, with differing opinions into which service categories the scopes should be, and how these service categories should be delivered. Existing FM literature suggests there are four categories: building, operations management, project management, and support services (Ee, 2015). The building scope includes mechanical and electrical and internal and external building works, the operations management scope includes maintaining the building structures and systems and the project management scope includes enhancing business performance. The final category, and most relevant to the paper, is support services containing security, health and safety, and most pertinently, cleaning (Ee, 2015). This study focuses on the cleaning aspect of the service delivery options to meet the central aim, which is the identification and elimination of excessive production in FM cleaning operations within UK shopping centres.

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This study recognises that the variance of the service delivery model, such as hard services alone, soft services alone, or TFM, could possibly have a positive or negative impact on the level of excessive production, although the literature does not suggest either way. A focus on multiple aspects of service delivery, as is the nature of TFM, could distract from driving efficiencies in one single operational aspect, for instance cleaning. It could therefore be probable that possible efficiencies, such as a focus on excessive production, could be overlooked.

In contrast to focusing on TFM service delivery, FM can also be delivered as soft services only, incorporating the cleaning operation. Expanding on the previous explanation of soft, hard and TFM service delivery methods, FM is broken down into various scopes, with differing opinions into which categories the scopes should be. Literature suggests four categories: building, operations management, project management and support services. The building scope includes mechanical and electrical and internal and external building works; the operations management scope includes maintaining the building structures and systems; and the project management scope includes enhancing business performance. The final category, and most relevant to the paper is support services, which contains security, health and safety, and most pertinently, cleaning (Ee, 2015), and relates directly to the soft services delivery model as documented by multiple authors (Shine, 2018; Atkin & Brooks, 2000; Moss et al., 2007; Brown, 1996).

In addition to the categories suggested by Ee (2015), further refinement has been made of the FM operational categories. Shine (2018) breaks down the delivery of FM services into two categories, hard FM services and soft FM services. Consisting of reactive and preventative maintenance, the hard FM services are further divided into specific offerings including heating systems, painting, and decorating, and mechanical and electrical, none of which are the focus of this study. The second category, soft services, contains cleaning, along with waste, security, and catering, and is of interest. Of further significant interest to this study is a claim that all businesses require a range of services in order to operate smoothly, with efficient soft services FM being vital to achieving this (Shine, 2018). Considering this, this study recognises a further relationship between FM and efficiency, and as documented in the literature review, elimination of excessive production will improve efficiency. In response to this finding, this study aims to guide FM, and facilities managers, to identify and eliminate excessive production

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in soft FM cleaning operations, thus reducing the cost of activities that do not add value to the customer.

Although no literature suggests that soft services delivery alone will impact any level of excessive production, either positively or negatively, a soft services alone delivery could have an enhanced operational efficiency focus through it not being necessary to also deliver hard services, thereby utilising specific cleaning operational concepts, such as scheduling and checklists, to drive efficiency. Considering the previous discussion, and the varying benefits offered by each service delivery method, facilities management service delivery is considered in this study as an independent variable, in order to examine its effect on the level of excessive production found within FM cleaning operations within UK shopping centres.

Based on this, the first hypothesis is as follows:

Hypothesis 1: There will be a significant relationship between facilities management service delivery and the level of excessive production within its front-line operation.

3.4.2 In-House / Outsource

FM is not solely delivered by outsourced service providers. The literature suggests that FM services can be delivered in-house, differing from outsourcing through contracted services (Atkin & Brooks, 2009). Although the option for service delivery means that both in-house and outsourced options can compete for FM cleaning contracts, this study finds from the literature that both in-house and outsourced FM service delivery offer both benefit and risk. The literature however does not identify any specific performance difference between the two sourcing options.

Recognising a study regarding outsourcing by Ikediashi et al. (2012), which was conducted within the FM industry, 146 questionnaires were administered to registered members of the IFMA at three levels of management: top level manager, middle level manager and low-level manager. The study concluded that risk has been documented previously surrounding the outsourcing of FM services, however any effect on the level of excessive production is unknown. Of the 41.8% response rate, the findings ranked the 39 risk factors associated with facilities management outsourcing. However, excessive production, into which this study researches, in order to meet the central aim of this study, which is the identification and

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elimination of excessive production in FM cleaning operations within UK shopping centres, is not presented as a risk factor. Poor quality of service presented the highest risk, and natural disasters were found to present the lowest risk.

Irrespective of the suggested risks, Finch (1992) documents that the choice of outsourcing was augmenting at a rate of 20% per year in the UK, and was already well established in the US. The reasoning given by Finch (1992) is that outsourcing allows organisations to focus on core business activities. This, whilst procuring and buying FM from a third party. As this is echoed by Ee (2015), stating that the key value of FM in providing support services enables the business to focus on the core functions, this study recognises outsourcing as a viable option for FM services, and that they are not restricted to a specific FM sector. This stance is further strengthened by generalising that through the use of FM outsourcing across the industry, a service will be a target for outsourcing if it can be easily accomplished by an outside service provider at a comparable or lower cost (Mara, 1999).

The variance of in-house or outsource is not solely generalised across FM service delivery, or associated support activities. A study by Bröchner et al. (2002) into outsourcing FM in the process industry, whilst comparing Swedish and UK patterns, identifies that individual activities can be categorised by either a high degree, intermediate degree, or low degree of outsourcing. In the comparison of three Swedish companies and three UK companies, cleaning was found to be outsourced to an intermediate degree (26%-75%). Literature however shows a further variance between industries. Different from the process industry findings by Bröchner et al. (2002), Jones (2002) presents a significantly lower outsourced cleaning figure in medium-sized UK hotels, with only 5%, showing a variance in the findings.

To provide a deeper knowledge on cleaning services by investigating how the work is managed and organised, Klungseth and Blakstad (2015) find from two descriptive case studies, one in Norway and one in the UK, that in-house cleaning services can be structured and managed in different ways, with literature not found to define otherwise.

Similar to many services, cleaning can operate in both public and private sectors, with literature suggesting that employees also differ in this variable. In relation to cleaning in government, and the public sector, it is considered by Sambrowski (2016) that many in-house staff are

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excellent workers, however no quantitative measure is provided. Irrespective of the requirement for employees to deliver a cleaning service, the deciding factors of in-house or outsourced service delivery are not defined, and an overall consensus in choice of in-house or outsourced cleaning service provider is not found in the reviewed literature. To this end, this study has found no evidence that either in-house or outsource will provide a variation to the findings, especially considering excessive production, as no such literature was uncovered. The decision between in-house or outsource has however been discussed.

In acknowledgement that many have regretted signing an outsourcing agreement, Johnson (1997) states that no such agreement should be signed before consideration is given to the longer-term implications, especially considering that it is the owners of shopping centres that have the success or failure outcomes (Evans, 2019). The facilities service delivery is however documented to have direct impact on this success or failure, and this is illustrated in a model presented by Pitt and Musa (2009), confirming that facilities have direct impact on these outcomes, even if not responsible to the owners directly. A stance strengthened by Hui et al. (2013), states that FM service plays an important role in the overall service performance of shopping malls.

Atkin and Björk's (2007) model for 'implementation solutions to FM needs' shows that irrespective of in-house or outsourced services, there is a need for service needs specifications and service level agreements. The involvement of the preparation of documentation is likely to consist of some sort of tender competition for the supply of services. Considering this, in-house and outsourced service delivery could compete for FM contracts. The 'implementation solutions to FM needs' model starts by identifying the services required, taken potentially from the existing service provision, and by involving the facilities manager and potential service providers, leads to the performance of the services. In contrast, Yiu (2008) does not document performance as the end product, but rather as a service that can itself be sourced, thus not providing quantifiable reasons for choosing either FM cleaning service delivery method.

Considering the previous discussion, especially the omission of information regarding definitive reasons to choose either sourcing option, in-house/outsource is considered in this study as an independent variable, in order to examine its effect on the level of excessive production found within FM cleaning operations within UK shopping centres.

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Based on this, the second hypothesis is as follows:

Hypothesis 2: There will not be a significant relationship between in-house/outsource and the level of excessive production within its front-line operation.

3.4.3 Management Presence

Highlighting a realisation that the discipline of FM encompasses much more than costs alone, Wauters (2005) suggests that facilities managers need to add value to the organisational value chain. In relation to lean, seeking value, and as an endeavour to eliminate activities or processes that consume resources, add cost, or require unproductive time without creating value, applying lean concepts have become popular among senior-level management (Manuele, 2007). Hodges and Sekula (2013) explain further that the common driver of most facilities managers is cost, but recognise that it is not understood by upper level management. Rather, the money for operations and maintenance and capital investments, all associated with FM, is allocated using two separate funding mechanisms annually. These two budgets in turn form the basis of the annual FM budget, dictating the day-to-day operations.

To deliver FM, a facilities manager can be utilised, a role that must be flexible and willing to change (Tuveson, 1998). Further requirements of a facilities manager have been recognised and documented earlier. A facilities manager looks after many stakeholders and shareholders of which Finch (1992) acknowledges four: shareholders, employees, customers, and community. The facilities manager looks after the stakeholders and shareholders by maintaining the value of the corporate estate; the employees by enhancing the working environment; the customers by maintaining and reinforcing the corporate image; and the community by ensuring that a company's impact on the environment and the community is favourable to all. Having a facilities manager in place is however not the only consideration. Ee (2015) stresses that, in order to manage its organisation's non-core business operations, the FM objectives must be aligned with the organisation's mission and goals. It can be the facilities manager that delivers the set objectives.

The role of the facilities manager in delivering FM is found to be both important and complicated. Recognising a continuous process of service provision within FM to support a company's core business, the challenges facing facilities managers comprise the need to

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optimise the performance of assets to ensure business continuity, extending equipment lifestyles without unacceptable loss of equipment performance, and developing strategies to reduce operating costs and generally, contribute to the company's revenue flow (Shine, 2018). This has direct impact on the output of the FM cleaning operation, thus positioning them well to improve operational efficiencies, such as a focus on excessive production, and meets strategic needs at best cost (Alexander, 2003).

In direct relation to cleaning operations, Robson (1993) documents that multi-service contracts require an on-site manager responsible for services including cleaning in each respective building. The cleaning industry has undertaken changes, both at aiming to progress and develop the industry, and offers significant profit for cleaning companies to compete for. Irrespective of this, the industry relies on vast numbers of employees, with contracts requiring a manager to oversee, similar to the role of the facilities manager previously discussed in the literature review. This study recognises a similarity with the requirement of a manager and that of a facilities manager, leading to question whether more or less excessive production would be present with or without a manager at a cleaning site. However, this study recognises that an onsite facilities manager could be set specific operational objectives that could encompass minimising excessive production through aiming for best cost service delivery, even if not known by the facilities manager.

FM can however de delivered without the presence of an onsite facilities manager, with some sites not large enough to financially warrant it. This study recognises a similarity with the requirement of a manager and that of a facilities manager, leading to question whether more or less excessive production would be present with or without a manager at a cleaning site.

Based on this, the third hypothesis is as follows:

Hypothesis 3: There will be a significant relationship between having management presence and the level of excessive production within its front-line operation.

3.4.4 Shopping Centre Classification

Classifications, or category, and sq. ft. of shopping centre differ from country to country with many to choose from. Of the vast number of categories available, Ibrahim et al. (2018) present twenty-one different categories over the world including super regional, shopping arcade and

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sub regional. Research by Ronse et al. (2015) approached this variable differently, not only addressing the issue of shopping centre classification, but also offering the variable as a way to better understand the results and increase the transparency of the statistical analysis. Highlighting differing opinions, twenty-one categories of shopping centre are offered by Ibrahim (2018), whereas only two are considered by Ronse et al. (2015): the size of the city, and the location of the shopping centre relative to the city centre. This presented an issue during the literature review stage of this study, as no consensus was available on which to focus the research. In support of this, different authors provide varying suggestions for what sizes and classifications should be attributed to shopping centres, with various criteria, and sub-criteria being offered to categorise (ICSC, 2019; Banham, 2006; REVO, 2018; Ibrahim et al., 2018).

The four classifications offered are broken down into two sub-categories: destinations and lifestyle, and community. The destinations and lifestyle sub-category contain regional scheme and sub regional scheme retail assets, and the community sub-category contains local scheme and neighbourhood scheme retail assets, with further classifications containing three additional descriptions under the category of specialised-purpose, which includes retail assets, outlet scheme, leisure scheme and transport. Considering the documented four independent shopping centre classifications, each will be represented in this study as separate sub-hypotheses, in addition to an overall UK shopping centres hypothesis.

The criteria for each of the four within the destination and lifestyle, and community, categories provide clear sq. ft. guidance for categorising a shopping centre. Furthermore, considering the justification for a cleaning operation to achieve a set standard, as set by BICSc (2019), the sq. ft. of a building could present a variation in the standard achieved, or more specific to this study, the level of excessive production produced. This could also be attributable to a possible increased level of service delivery required by a larger shopping centre, measured by sq. ft.

Irrespective of the sq. ft. required for cleaning, the relevance of cleaning quality in shopping centres is found in the literature reviewed. Hui et al. (2013) document that the quality of FM service plays an important role in the overall service performance of a shopping mall. The study into facilities management service and customer satisfaction in shopping centre malls provides five implications for FM organisations when delivering their services to shopping centres. These are specifically maintaining a high level of customer satisfaction, including that FM

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firms should ensure a clean and comfortable environment in the shopping malls. These implications not only guide FM service delivery on what quality is to a shopping centre, either for in-house or outsourced, but also demonstrate both the importance and complications of FM service delivery in shopping centres. Considering REVO's (2018) UK shopping centre classifications, and their respective variances in size and attributes between the different schemes, regional, sub-regional, local, and neighbourhood, complications in shopping centres appear to change, thus providing varying challenges, including cleaning by sq. ft. (BICSc, 2019).

Sq. ft. is however not the only determining factor when considering complications in cleaning, and the potential variance in excessive production in the cleaning operation within UK shopping centres. As a property, a shopping centre is a building that contains physical structures, space and facilities that are managed as a single property, which needs to be managed and maintained to ensure that its value is increased. To achieve this, Pitt and Musa (2009) suggest that the management effort should be directed to the maintenance. Although demonstrating a significant focus on FM hard services, not the soft services focus of this study (Pitt & Musa, 2009), a model for the establishment of management system in shopping centres is presented in Figure 2.5. This categorisation of cleaning is however in contrast to a conceptual framework by Ibrahim (2018), categorising cleaning under maintenance. With this focus on maintenance as well as cleaning, covered by soft services, the level of excessive production could be increased, as the cleaning operation is not the sole focus, and more could be produced than is required for the next process (McWhorter, 2017), as the service operators are unclear of the value to the customer (Olesen et al., 2015).

Reflecting on the previous discussion, shopping centre classification and sq. ft. has been considered in this study as an independent variable to examine its effect on the level of excessive production found within FM cleaning operations within UK shopping centres.

Based on this, the fourth hypothesis is as follows:

Hypothesis 4: There will be a significant relationship between shopping centre classification and the level of excessive production within its front-line operation.

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Sub Hypothesis 4.1: There will be a significant relationship between the regional scheme shopping centre classification and the level of excessive production within its front-line operation.

Sub Hypothesis 4.2: There will be a significant relationship between the sub-regional shopping centre classification and the level of excessive production within its front-line operation.

Sub Hypothesis 4.3: There will be a significant relationship between the local scheme shopping centre classification and the level of excessive production within its front-line operation.

Sub Hypothesis 4.4: There will be a significant relationship between the neighbourhood scheme shopping centre classification and the level of excessive production within its front-line operation.

3.4.5 Continuous Improvement

Although the advancements, and associated benefits offered by efficiency can seem clear in the literature, it appears that not all are in support. A division between lean supporters and objectors is recognised by Hasle et al. (2012), finding specifically that supporters argue that it is not merely a production method, but a way of thinking that raises efficiency and rejects waste. In support of this idea that lean is far more than a production method, McWhorter (2017) generalises the concept by offering CI and elimination of waste as the two activities that make up the core of lean thinking, as coined by Womack and Jones (1996).

More than two activities are suggested for an organisation to implement lean, and maintain a competitive, responsive, and flexible position within the marketplace. Sweeney (2017) puts forward continual elimination of waste, goals with a broad view, simplicity, CI, organisational visibility, and flexibility as six pillars for the lean production method. While elimination of waste focuses on identifying and reducing waste, goals with a broad view deals with the strategy and planning, allowing an organisation to focus on becoming successful over the long term. In contrast, and utilising a structured approach, five key principles of lean theory is presented by Olesen et al. (2015), as shown in Figure 2.1. Bateman et al. (2013) incorporate

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five similarly named fundamental principles into their lean thinking for conventional organisations. This theory expands on the five principles set out by Olesen et al. in 2015 by utilising application tools and techniques, Kaizen, Hoshin, Kanri, and Kanban, as developing ways of getting closer to ideal.

In relation to CI, the word Kaizen has been extensively used in lean manufacturing. Built around CI, the Kaizen culture, is found to provide significant positive effects on a company. Improvements from Kaizen can come from changing customer needs, market fluctuations, natural disasters, and threats from competition, while improving efficiency. With foundations stemming from TPS, Sweeney (2017) finds that if companies do not change they are left behind, with companies that adopt change are able to maintain a flexible position within the industry. Considering this, this study finds that FM cleaning operations that adopt a Kaizen and CI culture could distinguish themselves from an operation that does not, and maintain a flexible position within the FM sector, with a focus on efficiency. Moreover, a FM cleaning operation that currently utilises CI should be more flexible and efficient than one that does not, with excessive production levels being a possible measure of that.

In relation to the research focus on excessive production, and process waste in general, Sayer and Williams (2012) find that waste is eliminated in the value stream by doing Kaizen, or CI, a concept named as value stream management. Value stream management was a new strategic and operational approach presented by Hines et al. in 1998 to the data capture, analysis, planning, and implementation of effective change with the aim of achieving a fully lean enterprise in cross-functional and cross-company processes. Relating specifically to waste removal within the supply chain and highlighting its importance, Hines et al. (1998) describe it as perhaps the most important task facing the modern logistician, an importance that could also be relevant to FM cleaning operations within UK shopping centres.

Since its inception in 1995, value stream mapping has an underlying rationale for the collection, and utilisation of suites and tools to assist researchers or practitioners to identify waste in individual value streams. This was to lead to an appropriate route to the waste removal. The overall approach requires the manager to identify a series of wastes that exist within the supply chain and to choose, apply and analyse the output from a series from chosen appropriate contingent tools (Hines et al., 1998), as shown in Figure 2.2. Although not specifically related

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to this study, Figure 2.2 highlights the extent that some organisations, businesses, and industries go to reduce process waste, thus emphasising its importance and associated focus for reduction. This study aims to understand the importance of excessive production and achieve the central aim, the identification and elimination of excessive production in FM cleaning operations within UK shopping centres.

The output achievable through Kaizen, or CI, is however not specified, and cannot be guaranteed. In fact, scepticism is found in the literature. According to Sayer and Williams (2012), the scope that can be achieved through utilising Kaizen, or CI, is limited, stating that a common problem in implementation is oversized projects, or projects that gradually grow into an unmanageable size. Considering this, and the significant challenges that are encountered when cleaning UK shopping centres due to sq. ft. and the varied array of amenities (REVO, 2018; BICSc, 2019), the implementation, and utilisation, of CI may increase excessive production in FM cleaning operations within UK shopping centres as they are oversized projects (Sayer & Williams, 2012). However, literature (Narusawa & Shook, 2009; Sayer & Williams, 2012) promotes the idea that the implementation and application of Kaizen, or CI, in organisations requires thought and planning, and that although some classroom study is required, the concept is learned through practice. Because of the size of operation due to higher sq. ft. of cleaning and more complex venues, regional scheme shopping centres offer greater practice cleaning opportunity (Narusawa & Shook, 2009; Sayer & Williams, 2012) in which to enhance the utilisation of CI, thus positively impacting the level of excessive production. Considering the previous discussion, continuous improvement will be considered in this study as an independent variable to examine its effect on the level of excessive production found within FM cleaning operations within UK shopping centres.

Based on this, the fifth hypothesis is as follows:

Hypothesis 5: There will be a significant relationship between continuous improvement and the level of excessive production within its front-line operation.

3.4.6 Performance Measurement

The relevance of performance measurement in FM has been documented, focusing specifically on critical analysis of FM practices, providing an understanding of performance measurement tools in FM. This has also been partially attributed to service efficiency. Amaratunga (2001)

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found that any improvement in FM is required to firstly provide improvement in quality and time, before progressing towards lower cost and service efficiency.

This improvement in efficiency has however not been realised. Addressing some core performance measurement principles, such as FM customer base, FM internal processes, FM learning and growth, and FM financial status, Amaratunga (2001) develops new theory relating to FM performance measurement, and further presents suggestions for further research. Amaratunga (2001) further explains a concept for integrating CI into FM, however, not specifically related to process waste. Performance measurement has become a popular topic with both an academic and management focus. Amaratunga (2001) documents how the enabling of performance measurement is required in many planning and control tools, including CI, with a direct relationship to FM. The paper, focusing on theory building in FM performance measurement, found that FM is an emerging force in many organisations.

Considering the previous discussion, performance measurement will be considered in this study as an independent variable to examine its effect on the level of excessive production found within FM cleaning operations within UK shopping centres.

Based on this, the sixth hypothesis is as follows:

Hypothesis 6: There will be a significant relationship between performance measurement and the level of excessive production within its front-line operation.

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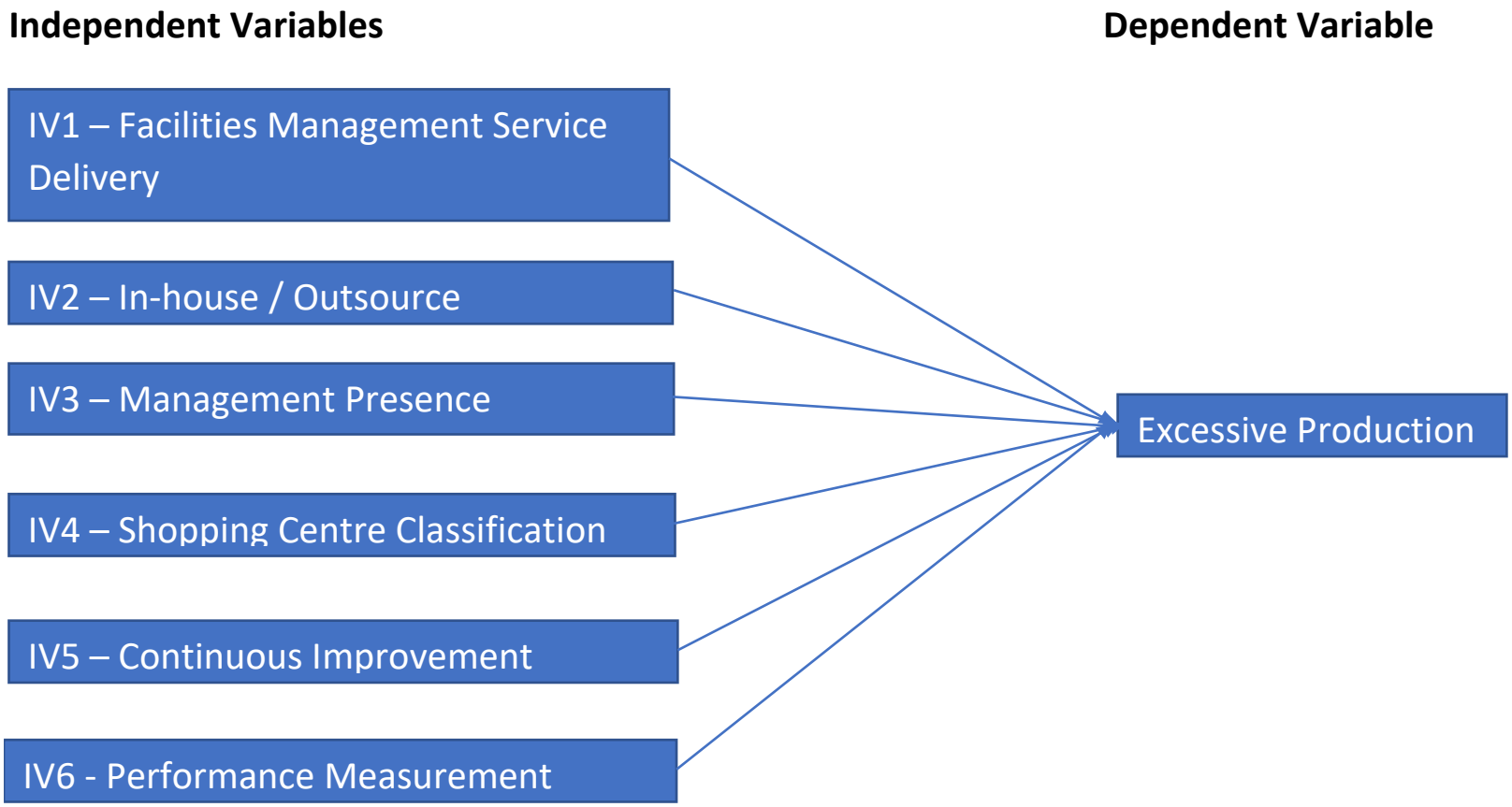
3.5 Theoretical Framework Model of Excessive Production in FM Cleaning Operations in UK Shopping Centres

Figure 3.1 – Theoretical Framework Model of Excessive Production in FM Cleaning Operations in UK Shopping Centres



Source – Created by the author

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3.6 List of Research Hypotheses

Figure 3.2 – List of Research Hypotheses

Research Variable	Research Hypothesis
Facilities Management Service Delivery	**Hypothesis 1**: There will be a significant relationship between facilities management service delivery and the level of excessive production within its front-line operation.
In-house/Outsource	**Hypothesis 2**: There will not be a significant relationship between in-house/outsource and the level of excessive production within its front-line operation.
Management Presence	**Hypothesis 3**: There will be a significant relationship between having management presence and the level of excessive production within its front-line operation.
Shopping Centre Classification	**Hypothesis 4**: There will be a significant relationship between shopping centre classification and the level of excessive production within its front-line operation.

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	Sub Hypothesis 4.1: There will be a significant relationship between the regional scheme shopping centre classification and the level of excessive production within its front-line operation. **Sub Hypothesis 4.2:** There will be a significant relationship between the sub-regional shopping centre classification and the level of excessive production within its front-line operation. **Sub Hypothesis 4.3:** There will be a significant relationship between the local scheme shopping centre classification and the level of excessive production within its front-line operation. **Sub Hypothesis 4.4:** There will be a significant relationship between the neighbourhood scheme shopping centre classification and the level of excessive production within its front-line operation.
Continuous Improvement	**Hypothesis 5**: There will be a significant relationship between continuous improvement and the level of excessive production within its front-line operation.

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Performance Measurement	**Hypothesis 6**: There will be a significant relationship between performance measurement and the level of excessive production within its front-line operation.

Source: Developed by the author

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3.7 Chapter Summary

This Chapter has outlined the theoretical framework and hypothesis development to address the research objective: to analyse excessive production from the front-line FM cleaning employee's perspective within UK shopping centres, and lead towards addressing the fourth and final objective of this study: to establish a conceptual framework that helps to eliminate excessive production in FM cleaning operations within UK shopping centres.

Six research hypotheses were presented in this chapter, all of which address aspects found within the literature review that could affect the level of excessive production found within FM cleaning operations within UK shopping centres. The first hypothesis, FM service delivery, focuses on the FM cleaning services delivery by either soft services only or as TFM. The second hypothesis, in-house/outsource, explores the impact on excessive production of whether the FM cleaning operation is managed by the shopping centre itself, in-house, or managed by a contracted service provider, outsourced. The third hypothesis, management presence, looks at whether having an onsite manager that constantly overlooks the operation achieves greater efficiency than a manager that operates remotely. The fourth hypothesis, shopping centre classification, aims to understand whether a change in shopping centre classification, which represents different amenities, facilities, and sq. ft. among other variations, changes the level of excessive production. The fifth hypothesis, CI, was developed to ascertain whether the utilisation of CI in FM operations positively impacts excessive production, as it is documented to in production and manufacturing industries. The sixth and final hypothesis, performance measurement, explores whether the use of performance measurement reduces the level of excessive production in FM cleaning operations within UK shopping centres.

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Chapter Four
Methodology

4.1 Introduction

The central aim of this research is the identification and elimination of excessive production in FM cleaning operations within UK shopping centres. This section will set out the methodology for the research including an overview of the research design, data collection and data analysis methods, which were employed to achieve the overall aim and set research objectives.

Researchers (e.g. Bryman and Bell, 2015; Easterby-Smith et al., 2012; Zikmund, 2003; Fink, 1995; Kurtz, 1983; Bryman & Cramer, 2011; Gray & Kinnear, 2012; Burns & Burns, 2008; Hinton, 2004; Newbold et al., 2013; Swift and Piff, 2010; Lawley, 2000; Emory & Cooper, 1991) have varying views surrounding their chosen techniques for collecting, analysing, and drawing conclusions from data. McLennan and Nutt (1992) recognise that the success of FM research depends on the development of suitable methodologies. This study is based on a quantitative research methodology, as it aligns with the researcher's positivist research philosophical belief.

4.2 Research Paradigms

With research taking place within a framework (Grix, 2004), varying research philosophies are available to researchers. These research philosophies underpin the research as a whole and guide the decisions made regarding research paradigms, methodologies and even the research methods to be employed. This task however is not easy, and requires justification from the researcher as to which choice has been made and why. Understanding and implementing research philosophy is rather complicated, as some philosophical terms are used interchangeably (Easterby-Smith et al., 2002). Due to the correspondence between ontologies, epistemologies and methodologies, researchers need to be aware of the philosophical positions. Whether tacit or explicit, all researchers hold philosophical assumptions and will hold a certain philosophical preference. In fact, it has been argued that most of the central research debates surround ontology and epistemology, with social and natural scientists not necessarily choosing the same assumptions when developing their respective methodologies for conducting research (Easterby-Smith et al., 2015).

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Deciding on an ontological position, or belief of reality, is the starting point for research, and only after this point should epistemology and methodology be considered. From an ontological perspective the question is: what is the nature of reality? For this the researcher needs to decide whether to see the world as objective, external to the researcher, or socially constructed, and understood only by observing the human actors (Hussey & Hussey, 1997). Grix (2010) further simplifies ontology as what is known.

There are arguably two ontological positions relevant to business and management researchers: objectivism, and subjectivism. Objectivism depicts things such as social entities that exist as a meaningful reality external to those social actors concerned with their existence (Crotty, 1998), whereas subjectivism claims that social phenomena are created through perceptions and actions by the social actors affected within the research (Saunders et al., 2012). Taking an objective stance is an ontological decision for positivism, whereas taking a subjective stance is an ontological decision for constructionism, as discussed later in this chapter.

After locating an ontological position, the researcher is faced with a further choice - that of epistemology. Hessler (1992) describes epistemology as the branch of philosophy that dissects the nature of knowledge. Being a general set of assumptions, epistemology portrays ways of inquiring into the nature of the world, and it is from this set of assumptions that has led to debate among researchers of how social science research should be conducted, for example, with positivism and interpretivism (Easterby-Smith et al., 2015), two of the various forms of research philosophy. To expand this further, positivists believe that only phenomena which are observable and measurable can be validly regarded as knowledge, thus trying to maintain an objective and independent stance (Hussey & Hussey, 1997). To the contrary, interpretivists believe that it is necessary for the researcher to understand differences between humans in our role as social actors (Saunders et al., 2012), thus taking a subjective and involved stance.

According to Hussey and Hussey (1997), the question set by epistemology surrounds the relationship of the researcher to the subject being researched. This directly affects the data that can be collected by choosing between quantitative data, as the researcher is independent from that being researched, and qualitative data, as the researcher interacts with that being researched. Moreover, epistemology is concerned with how the researcher perceives reality

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and what data could, or should be utilised within the research. In brief, epistemology is what can be known, and how someone can know about it (Grix, 2010).

Following on from the research paradigms, the types of research methodology that could be chosen for this study are the next consideration. It is interesting to note how a researcher's choice of research paradigm can, at times, dictate the research methodology that should be followed. An important aspect of research methodology is the form of the data collected, with quantitative data simplified as being mainly numbers with some words, and qualitative simplified as being words as opposed to numbers (Easterby-Smith et al., 2015).

Research methodology is the overall approach to the research process, from the theoretical underpinning to the data collection and analysis. The research methodology will assist the researcher to know why to collect data, how to collect data, and how it will be analysed (Hussey & Hussey, 1997). The methodology is usually determined by the researcher's position on the research paradigm. For example, a positivist will most likely utilise a quantitative research methodology, whereas a constructivist will most likely utilise a qualitative research methodology. This can however be interchanged (Bryman & Bell, 2015). Research methodology will be explored in greater detail later in this Chapter.

Research paradigms refer to the progress of research-based practice, considering people's philosophies and assumptions about the world. This, whilst aiming to conclude how research, should be conducted (Hussey & Hussey, 1997) through utilising a group of fundamental theories (Bryman & Bell, 2015). To this end, research paradigms provide researchers with a framework for ways in which data can be defined, and furthermore analysed. This study will proceed to explore research paradigms in greater detail.

Being an epistemological position that advocates the application of the methods of the natural sciences to study the social reality and beyond Bryman (2016), positivism is the stance held by this study. Many alternative terms are used for variations of positivism, including objectivist, scientific, experimentalist and traditionalist (Hussey & Hussey, 1997). However, all should align with Crotty's (1998) positivist recommendation that the study remains neutral and detached, and therefore objective.

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In line with this objective description, the positivist stance is independent from the observer, thus being objective and making human interest irrelevant. During development of positivist research, the concepts will need to be defined so that they can be measured, with conclusion explanations demonstrating causality (Easterby-Smith et al., 2015). Irrespective of these constraints, there are many advocates of positivism, and the benefits that it provides. Positivism, for example, provides the best way of investigating human and social behaviour (Easterby-Smith et al., 2015; Easterby-Smith et al., 2002). Just as within the natural world, positivists believe that there are patterns and regularities, causes and consequences in the social world (Denscombe, 2002, cited in Grix, 2010).

Positivism is widespread and has many uses in social science and philosophy. It embraces any approach applying scientific method to human affairs to open an objective enquiry (Hollis, 1999). An objective enquiry is aided within positivism by the researcher being objective and the analyst and interpreter of tangible social reality (Remenyi et al., 1998), and usually deductively testing a found theory, before generating a new one.

A key principle of the positivist position is generalisability. Easterby-Smith et al. (2015) recognise the importance of providing assurances of generalisability for both experimental design and statistical procedures, finding it a critical feature. Hussey and Hussey (1997) acknowledge that for the positivist paradigm a sample will need to be constructed, from which the findings should be found within the population. This is however not guaranteed, and may require many similar studies with different focus groups to be proven, thus extending the length, and potential cost, of the study. Positivism applies mainly a quantitative approach in collecting and analysing data, utilising large surveys and questionnaires to provide analysis through correlation and regression (Easterby-Smith et al., 2015).

Different from positivism, post-positivism, or critical realism, can be understood as a research paradigm situated between positivism and interpretivism (Grix, 2010), emerging initially as critique of logical positivism (Baronov, 2012). As the name suggests, post-positivism uses the same beliefs as positivism. Post-positivists argue that although objectivity is an ideal stance, only with an increased check on the validity of the findings through a use of qualitative techniques, can social reality be possibly known (Blaxter et al., 2006). The inherently relative nature of knowledge statements is seen as the first premise of post-positivism (Baronov, 2012).

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Irrespective of the documented similarities (Grix, 2010; Baronov, 2012; Blaxter et al., 2006), post-positivism is an alternative to positivism, whereby it is reductionist in that it aims to reduce into small discrete variables so as to assist in testing hypotheses and research questions. Academics may choose to name post-positivism as realism to describe anything between positivism and interpretivism, with critical realism described as the core of post-positivism. Critical realists generally aim not only to understand, but to also explain the social world (Grix, 2010), whereas it has been claimed that within post-positivism the truth can never be found, with researchers claiming a failure to reject the hypothesis, as opposed to proving it (Phillips & Burbules, 2000).

An opposing view of positivism is constructionism, also commonly combined with interpretivism and social constructionism. Constructivists develop subjective, as opposed to the positivist objective meanings of their experiences, leading the researchers to look for complexity rather than narrow meanings. The research findings are formed mainly through interaction; thus, constructivists often address processes of interaction among, or between people or things. Different to positivism, constructionism aims to make sense of, or interpret the world (Creswell, 2014).

A quantitative research methodology will usually be utilised to test theory, which can be achieved by comparing and contrasting numerical facts with other numerical facts. Quantitative variables can be measured on an independent scale, for example height and weight are measured as true value with no room for interpretation (Gray & Kinnear, 2012). Before any such analysis can happen, data needs to be collected. Many options are available to achieve various forms of data collection, with specific attention provided to cost, response rate, speed, quantity of information collected, and quality of information collected (Oakshott, 2016). Data collection, and the subsequent data analysis, will be discussed in greater depth later in this chapter.

An alternative method of research methodology, different from the quantitative form, is qualitative research methodology. The qualitative research methodology utilises mainly interviews and observations. This leads mostly to an inductive view of the relationship between theory and research, and, based on its interpretivist epistemological position, qualitative research focuses on the people within the study and their interpretation of the world.

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Furthermore, the ontological position described as constructivist implies that social properties are outcomes of the interactions between individuals (Bryman, 2015).

Highlighting a difference between data collection for qualitative and quantitative research methodologies, Creswell (2014) states how qualitative data can be gained through interviews, utilising open-ended questions, and continuing to advise that this collected data can be analysed by themes, patterns, and interpretation. A quantitative collection method, the questionnaire, offered by Oakshott (2016) advises closed ended questions that will lead to a quantitative study aiming to quantify the variation in a phenomenon, situation, problem, or issue, by utilising mainly quantitative variables to analyse and ascertain the magnitude of the variation (Kumar, 1996). The fundamental differences between quantitative and qualitative research strategies are shown in Figure 4.1, and discussed further in the next section of this chapter:

Figure 4.1 - Fundamental Differences Between Quantitative and Qualitative Research Strategies.

	Quantitative	**Qualitative**
Principal orientation to the role of theory in relation to research	Deductive, testing of theory	Inductive, generation of theory
Epistemological orientation	Natural science model, in particular positivism	Interpretivism
Ontological orientation	Objectivism	Constructionism

Source: Bryman and Bell (2015)

Quantitative data is utilised within FM and Lean. The rationale for using a quantitative approach is that the professional discipline of FM has progressed from being a narrowly defined set of functional tasks, delivered in a mechanical manner to meet a specific requirement, to an integrated management approach which perceives its role as being a significant determinant of corporate goal achievement (Pathirage et al., 2006). To achieve this, although not found to be widespread in the literature review chapter of this study, the cleaning industry publishes some quantitative data. Cleaning benchmarking surveys are conducted annually in the UK by the Association of Public Service Excellence (APSE). Reviewing previous surveys in 2008/2009, Klungseth (2014) commented that 89%/87% maintain an internal cleaning service organisation, and the responsibility is for building cleaning only at 42%/37%. This highlights that quantitative data is produced and recognised in FM cleaning

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operations, such data that this study produces. Furthermore, quantitative results are recognised in literature pertaining to lean, and its associated aspects of which excessive production is one. This study uncovered positive quantitative results from lean implementation, although mostly within a hospital setting and not specific to UK shopping centres (Hussain and Malik, 2015; NHS111, 2007; Soriano-Meier et al., 2011).

4.3 Research Methodology

In line with the positivist research paradigm, the quantitative research methodology was utilised for this study. Due to the size of the survey population, UK shopping centres, it is necessary to use generalisation of the sample, as made possible by utilising the quantitative research methodology. Moreover, the collected data is analysed numerically by utilising the Statistical Package for Social Science (SPSS) providing clear and true findings that will test any correlation between variables, as opposed to those produced through interpretation.

Research methodology is the overall approach to the research process, from the theoretical underpinning to the collection and analysis of the data. Therefore, the methodology forms the framework for the research to happen, informed primarily from the researcher's philosophical assumptions. Ventovuori et al. (2007) recognise that to draw valid research conclusions within FM, methodical issues should be clearly delineated, highlighting that the FM discipline must increasingly employ hypothesis testing to provide more robust data analysis techniques. Based on recent developments in the field, FM meets several criteria that qualify it as an academic discipline, raising the question of whether a unique FM research methodology exists, or if one is at all needed, considering that FM is considered to display multidisciplinary characteristics (Junghans & Olsson, 2014).

Different research paradigms deliver varying methodological directions; however, all can be described as a combination of techniques used to inquire into a specific situation (Easterby-Smith et al., 2015). Qualitative researchers seek to make sense of personal stories and the ways in which they interact, generally studying things in their natural setting and utilising case study, personal experience, and interview as methods of data collection. Quantitative researchers seek explanations and predictions that will generalise to other areas and places, utilising numbers, and statistical methods as methods for analysing data (Thomas, 2003). Another approach is mixed methods research, an alternative to qualitative and quantitative research. Mixed method

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research advocates the use of whichever methodological tools the researcher thinks will answer the question (Teddie & Tashakkori, 2009).

There has been a long simmering conflict in applied research regarding the usage of either research methodology, with researchers choosing distinctly between them (Kerwin, 1992). Thomas (2003) argues that any contest between qualitative and quantitative methods are ill-founded and a waste of time, as the decision to choose either qualitative or quantitative research is based on the question/s that the research is supposed to answer. This study utilised the quantitative research methodology. As relating to positivism, quantitative researchers hold that data must yield proof in probability terms, therefore providing a firm basis for prediction and control, with assumptions built into the approach incorporating objectivity, reliability and generalisability. Truth, within the positivist paradigm is usually fixed, reflecting a casual and factual view of reality (Burns & Burns, 2008). As this study was grounded in positivism, the research philosophy was objective, and deductive.

When conducting quantitative research data analysis, researchers will measure amounts, frequencies or magnitudes of objects, ideas, or events (Thomas, 2003). This, whilst aiming to recognise and evaluate errors involved in quantifying experiences, especially when generalising from a small group, the sample, to a large group, the population, and calculating correlation between variables (Collis & Hussey, 2003). Reflecting this, administering correct and appropriate data analysis is vital as data collection in quantitative research is about gathering the facts (Blaxter et al., 2006).

Quinton and Smallbone (2006) present surveys, and the extensive statistical testing of the results as is the tradition for quantitative management research, to which this study mirrored. The data produced is usually highly specific and precise, using large samples and generalising from the sample to the population (Hussey & Hussey, 1997), focusing attention on measurements and amounts of the characteristics by people and events that the researcher studies (Thomas, 2003). This methodology allowed the study to achieve the sample required for generalising across the full population of FM cleaning employees within UK shopping centres.

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An aspect of FM, sustainable facilities management (SFM), is an emerging discipline within current research addressing important questions. However, this is considered by Nielsen et al. (2016) as limited and scattered, with the body of empirical data often being quite small, or with methodological approaches producing only one type of knowledge. For this reason, it can be assumed that the choice of data collection is key to gaining acceptance within FM. Data collection is discussed in greater detail later in this chapter, in section 4.5.

4.4 Research Design

Research design is the science of planning procedures for conducting studies to get the most valid findings (Vogt, 1993, cited in Collis & Hussey, 2003). The types of information needed to be collected from the respondents for the study and how best to elicit that information are two key decisions to be made early in the survey design phase (Czaja & Blair, 2005). In order to ensure the results are reliable and of immediate practical value, the researcher must use all of the skills and experience available, especially within FM, with analysis carried out within a strong conceptual framework (Barrett, 1992).

Within social science, authors discuss the use of inductive and deductive research and their respective capabilities (Ghauri & Grønhaug, 2010; Hall & Hall, 1996; Ticehurst & Veal, 2000). Inductive research commences with specific observations that are used to develop a general theory, whereas deductive research starts with theory, using it to explain observed actions (Hall & Hall, 1996). Through categorising inductive and deductive research as two ways of establishing what is true and false, and subsequently drawing conclusion, Ghauri and Grønhaug (2010) define them similarly, as inductive research based on empirical evidence, and deductive based on logic. Although explained that the positivist paradigm, as followed by this study, is also known as deductive, and the interpretivist paradigm is also known as inductive, Ticehurst and Veal (2000) contend that these methodologies can be interchanged. Ticehurst and Veal (2000) continue to state that both positions, inductive and deductive, make significant assumptions concerning approaches to research, and that they need to be carefully considered before choosing a research methodology. This study set out to test existing identified theory surrounding Muda, lean, UK shopping centres, and FM, aligning with the deductive position (Ghauri & Grønhaug, 2010; Hall & Hall, 1996; Ticehurst & Veal, 2000).

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Considering Warner's (2008) suggestion that many elements are required for research in behavioural and social sciences, including experimental control and comparison of scores, it is at the point that the researcher has formulated the research problem that the research design must be developed (Zikmund, 2003). Kumar (2014) puts forward three different perspectives by which all quantitative study designs can be classified: the number of contacts with the study population, the reference period of the study, and the nature of the investigation. Interestingly, Kumar (2014) also groups quantitative research designs into three categories based on the number of contacts with the study population: cross-sectional, before-and-after, and longitudinal studies.

This study gathered information utilising questionnaires at one point in time, with the aim of the study being to generalise the findings across the wider population. This aligns with Bryman and Bell's (2015) depiction of the cross-sectional design, or social survey design, as they are connected in most people's minds with questionnaires and structured interviewing. Cross-sectional designs are interested in variation, data of variables collected more or less simultaneously, quantitative, or quantifiable data, and patterns of association. Creswell (2009) strengthens this, suggesting experimental designs and surveys (non-experimental designs) as alternative strategies of inquiry for quantitative research. Aligning with de Vaus (2002) and cross-sectional design, the researcher collected measures from at least two groups of people at one point in time and compared any differences on the determined dependent variable or variables.

4.5 Data Collection Method

This study proceeded to explore data collection methods, and those chosen to support the central aim of the study, the identification and elimination of excessive production in FM cleaning operations within UK shopping centres.

Bryman and Bell (2015) suggest that data collection is the key point of any research project and put forward interviewing and questionnaires as familiar methods. Irrespective of the method chosen, there are a number of prerequisites for data collection including ensuring motivation to share the required information by the respondents, providing a clear understanding of the questions and ensuring that the respondents have the information sought (Kumar, 2014). The study conducted by Ventovuori et al. (2007) reviewing the classification

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of academic research in FM found that surveys were the most common method of data collection regarding FM in general, and this research study also represented this.

Secondary data has, as explained by McNeill (1990), been produced, and processed before it was received by the researcher. Secondary data does however have many uses. Secondary data is not only utilised to solve research questions, but also to better understand and explain a research problem (Ghauri & Grønhaug, 2010). Ghauri and Grønhaug (2010) further suggest that the secondary data search begins at the literature review phase of a research study, which aligns with the structure of this study.

Primary data collection is the stage of the study in which the questionnaire is administered, and the subsequent data collected (Frazer & Lawley, 2000). This study recognises the availability of other methods for primary data collection, and also that it is only once the research design has been formulised that the data collection can commence (Zikmund, 2003). To address this, this study chose at the commencement of the research design to use the structured questionnaire survey to achieve the aims of the study, as this will provide a platform to gather data from various regional areas, many respondents and at a low cost (Kumar, 2014). Furthermore, this study did not influence the responses or findings, thus aligning with the positivist research paradigm as adopted by the researcher (Bryman & Bell, 2015). In addition, the questionnaire was self-administered, thus not influencing the respondents' answers.

Data collection is however not without possible limitations, as errors can occur, which is fundamental to a quantitative study. Warner (2008) suggests social desirability bias, deliberately faking good or bad, and giving random responses without reading the question as common problems when collecting self-reported data. Warner (2008) puts forward quality control during data collection to limit the impact of the common problems within quantitative data collection. Further control is offered by Hardy and Bryman (2004) when utilising a cross-sectional study to collect data, in order to improve and control the timings of data collection, thus strengthening the justification for this study utilising a cross-sectional design.

This study utilised a questionnaire survey as the tool for primary data collection. Fink (1995) describes a survey, or questionnaire, as a system for collecting information to describe, compare, or explain knowledge, attitudes, and practices or behaviour. By utilising mail or

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online questionnaire surveys, a research study is able to gather data from a large sample quickly, whilst not being present at the questionnaire survey completion and so not influencing the respondent's responses directly, thus offering greater anonymity and affording comparatively low cost compared with other data collection methods (Kumar, 2014). Similarly, Trochim (2005) promotes questionnaires as relatively inexpensive, as providing the opportunity to send the exact questionnaire to a wide number of people and allowing the respondent to answer at their own convenience. Trochim (2005) also interestingly recognises weaknesses in questionnaires, being that they often provide low response rates, calculated by dividing the number that respond by the number of eligible respondents (Fink, 1995), and are not ideal for gaining detailed responses. The application of structured questionnaire surveys is however limited to the study population, can produce a low response rate, offers no opportunity for spontaneous responses, and the response to a question could be influenced by the response to other questions (Kumar, 2014). All of these points need to be considered at the questionnaire development stage, as discussed next in this chapter.

4.6 Questionnaire Development Process

Progressing from the previous section, this section outlines the process followed by this study to design and develop the questionnaire that was utilised as the tool for primary data collection. As Fink (1995) describes, a survey, or questionnaire is a system for collecting information to describe, compare, or explain knowledge, attitudes, and practices or behaviour, and for these reasons significant emphasis was given by this study to ensure that they were met. To this end, the steps in constructing a questionnaire by Peterson (2000) were followed. This section proceeds to discuss these steps in detail, as set out in sections 4.6.1 through to 4.6.8.

4.6.1 Step 1: Review Information Requirements

In response to finding that surveys are often carried out on the basis of insufficient design, conceptualisation is suggested with the aim of achieving an improved and more detailed statement of the research study objectives. The use of conceptualisation is preferably accompanied by theoretical underpinnings, and could require re-conceptualisation at a later stage if the reason for conducting the study changed (Oppenheim, 1992). Peterson (2000) utilises the first step of the questionnaire development stage by asking what the specific requirements of the research problem are, and what the decision was that led to the need for a questionnaire. From this understanding, the questionnaire questions need to be aimed at answering the research questions (Bryman & Bell, 2015).

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The general concepts and specific use are also of importance. It is documented that theories and methods can be deemed as general, leading to many varying research problems being derived. It is in this scenario that these theories, concepts, and models can contain no content regarding the specific research problem (Ghauri & Grønhaug, 2010). To counter this possible pitfall, Ticehurst and Veal (2000) suggest that the questionnaire design stage should be approached carefully, remembering why the research is being conducted.

The target population of this study are the front-line FM cleaning operations employees within UK shopping centres, those involved with the cleaning of the shopping centres.

4.6.2 Step 2: Development of the Research Questions

In constructing a questionnaire, it is possible that research questions can be developed by examining how the answers will be analysed, anticipating what information will be provided, and understanding how the information derived from the data collected will be used (Peterson, 2000). The questions raised to meet the research objective, and to analyse excessive production from the front-line FM cleaning employee's perspective within UK shopping centres, were developed from the secondary data collection phase of this study, the literature review, as discussed previously in this chapter.

The variables utilised in this study are classified as either dependent or independent. The dependent variable is excessive production, and the independent variables are facilities management service delivery, in-house/outsource, management presence, shopping centre classification, continuous improvement, and performance measurement.

Questions pertaining to the dependent variable, excessive production, are developed from a study into how to find potential for improvements, utilising Muda, and its eight documented elements, as a tool for manufacturing companies (Golińska-Dawson et al., 2015). From the twelve questions originally utilised by Golińska-Dawson et al. (2015), only seven have been taken for this study. Although the seven questions utilised for this study relate to another waste, as well as excessive production, the five that have been omitted related to five other wastes. Considering this, and not to dilute the findings by over exploring other wastes, this study utilised the seven questions only.

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In the next part of this chapter, the outline for the questioning utilised in the questionnaire, and the associated scoring, in line with the Likert scale is presented (Emory & Cooper, 1991; Frazer & Lawley, 2000) to enable SPSS data analysis (Bryman & Cramer, 2011) for the dependent variable, and specific questioning for the independent variables.

Excessive Production – Dependent Variable

As discussed above in section 4.6.2, the dependent variable questions are developed from a previous study by Golińska-Dawson et al. (2015) into how to find potential for improvements by utilising Muda and its eight documented elements, as a tool for manufacturing companies. Minor changes were made to the measuring items, as presented by Golińska-Dawson et al. (2015) as questions. The questions pertaining to the dependent variable utilised by this study are listed in Figure 4.2.

Figure 4.2 - List of Questions Pertaining to the Dependent Variable.

List of Questions Pertaining to the Dependent Variable
Are up-to-date cleaning operational goals and performance measures for those goals available?
Are cleaning work instructions and cleaning quality specifications visible at all work areas?
Are updated charts on cleaning productivity, quality, safety, and problem solving visible for all teams?
Are work teams trained, empowered, and involved in problem solving and ongoing improvements?
Do you engage with continuous improvement?
Is there an effective project management process, with cost and timing goals, for new cleaning initiatives?
Would you pay for this cleaning operation as a customer?

Source: Developed by the author

All of the above questions regarding the dependent variable are scored by the Likert scale, with the same narrative: strongly disagree, disagree, neutral, agree, and strongly agree. The Likert

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scale is concerned with uni-dimensionality, by which it ensures that all items measure the same thing (Oppenheim, 1992). This study aligns with this, along with the Likert scaling technique as advocated by Ticehurst and Veal (2000) by asking respondents to indicate their agreement or disagreement with a proposition, or to attach their importance to a statement using a standard set of responses. The Likert scale provides, in line with the question options offered in this study, five possible answers, as opposed to the seven offered by the semantic differential scale. In addition, the response categories are constant across all scales for the dependent variable (Peterson, 2000). This constant, or consistent, approach complies with the proposal by Fink (1995) that questions should be presented in an uncluttered, easy to complete way, as is discussed later in this chapter, see section 4.6.6.

Facilities Management Service Delivery – Independent Variable

The data for this variable was obtained by answering yes or no to whether the company for which the respondent works provides all facilities management tasks, including maintenance at the shopping centre, thus providing TFM. In addition to a FM service providing either hard services or soft services alone, it is proposed that an FM service can be provided through TFM, described as where a single entity takes responsibility for all facets of FM (Atkin & Brooks, 2009). This study recognises that the variance of service delivery model, hard service alone, soft services alone, TFM, could have a positive or negative impact on the level of excessive production, although the literature does not suggest either way (Atkin & Brooks, 2009; Brown, 1996; Moss et al., 2007). Considering this, this study further accepts and recognises that a variance is possible, thus providing a reason to explore what facilities management service delivery could have on the level of excessive production found in FM cleaning operations within UK shopping centres, thus contributing to achieving the central aim of this study.

In-house / Outsource – Independent Variable

The data for this variable was obtained by answering yes or no to whether the FM cleaning operation was directly managed by the shopping centre, thus providing an understanding of whether the cleaning is provided in-house or outsourced. An overall consensus in choice of in-house or outsourced cleaning service provider is not found in the reviewed literature in the literature review chapter of this study. Although the level to which FM cleaning operations is in-house service delivery in UK shopping centres was also not confirmed, a study by Bröchner et al. (2002) into outsourcing FM in the process industry identified that individual activities

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can be categorised by either a high degree, intermediate degree, or low degree of outsourcing. In the comparison of three Swedish companies and three UK companies, cleaning was found to be outsourced to an intermediate degree (26%-75%). Furthermore, Sambrowski (2016) found that many in-house staff are excellent workers, which could positively impact the level of excessive production.

Management Presence - Independent Variable

The data for this variable was obtained by answering in the form of a nominal scaling as 'yes' or 'no' to whether the respondent's manager is based at the shopping centre. Similar to FM, the cleaning industry recognises a requirement for an onsite manager, coined as facilities manager in FM, although no criteria provided was found at the literature review stage of this study for when it is required. To deliver FM, a facilities manager can be utilised, a role that must be flexible and willing to change (Tuveson, 1998). Further requirements of a facilities manager have been documented earlier. A facilities manager looks after many stakeholders and shareholders, of which Finch (1992) acknowledges four: the facilities manager, the employees, the customers, and the community. The facilities manager looks after the stakeholders and shareholders by maintaining the value of the corporate estate; the employees by enhancing the working environment; the customers by maintaining and reinforcing the corporate image; and the community by ensuring that a company's impact on the environment and the community is favourable to all. Considering these benefits, this study utilised this independent variable to ascertain if an additional benefit is the elimination of excessive production.

Shopping Centre Classification - Independent Variable

Authors provide varying suggestions for what sizes and classifications should be attributed to shopping centres, and the stores within them (REVO, 2018; ICSC, 2019; Banham, 2006; Pitt & Musa, 2009; Ibrahim et al., 2018; Ronse et al., 2015; Fennell, 2007; Robertson and Fennell, 2007), with various criteria and sub-criteria offered to categorise them. Considering the discrepancy in the literature, this study finds that no consensus is made regarding sizes and classifications of shopping centres. Categories of shopping centres are determined also by the REVO (2018) shopping centre standard classification of four categories, which are regional scheme, sub-regional scheme, local scheme, and neighbourhood scheme, all of which are also represented in this study as sub-hypotheses, in addition to an overall UK shopping centre hypothesis.

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The standardised classification for retail assets was developed by REVO (2018) to support the goal of creating a common, objective, fairer and more positive vernacular for retail assets in the UK. As it represents the current UK classification for retail assets (REVO, 2018), this study utilised it as an independent variable. As it was considered by this study that the respondents would not necessarily know the category of the shopping centre in which they work, the questionnaire provided groups of shopping centres for the respondent to choose from. As each group, regional scheme, sub-regional scheme, local scheme, and neighbourhood scheme contained three shopping centres each, the confidentiality of the respondent was upheld (Peterson, 2000).

Continuous Improvement - Independent Variable

The data for this variable was obtained by answering 12 questions, utilising the Likert scale: strongly disagree, disagree, neutral, agree, or strongly agree. CI is found to provide significant positive effects on a company, which was found to be documented by many key authors (e.g. Sweeney, 2017; McWhorter, 2017; Sayer & Williams, 2012; Narusawa & Shook, 2009; Alexander, 2003; Amaratunga, 2001; Wauters, 2005). It is from this literature that the 12 questions were developed.

Performance Measurement – Independent Variable

The data for this variable was obtained by answering five questions, utilising the Likert scale: strongly disagree, disagree, neutral, agree, or strongly agree. Amaratunga (2001) explains a concept for integrating CI into FM, although this is not specifically related to process waste. Performance measurement has become a popular topic with both an academic and management focus. The five questions pertaining to performance measurement were developed from Amaratunga's 2001 paper.

4.6.3 Step 3: Evaluate Potential Research Questions

Peterson (2000) offers three questions relating to examining the administrative viability and how respondents might react to them. Firstly, can study participants understand the question? Secondly, can study participants answer the question? Thirdly, will study participants answer the question? To achieve this, Ghauri and Grønhaug (2010) provide some guidance, suggesting that each question should cover only one aspect or dimension. The reason given being that if

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several aspects or dimensions are mixed, it will present difficulty for the respondent to answer correctly (Ghauri and Grønhaug, 2010).

Bryman and Bell (2015) warn against an excessive use of yes/no questions. On evaluation of the questions utilised in this study, the over reliance on yes/no questions has been avoided. The yes/no questions have been used solely to gather data relating to independent variables. Questions pertaining to the dependent variable utilise the Likert scale, thus providing answers that can form quantitative data (Oppenheim, 1992). Further areas for question examination are also documented. Hall and Hall (1996) suggest that each question needs to be examined to whether it is essential for the study, desirable but not essential, and merely input to satisfy curiosity. Furthermore, Hall and Hall (1996) recognise that a questionnaire could become excessive in length during development and offer additional guidance, questioning whether each question really needs to be asked, how each question will be used in the final report, and whether the informant would understand what the question is asking for. This study adopted this guidance in the development of the survey questions, reducing the number of questions throughout the process based on the additional guidance provided by Hall (1996).

4.6.4 Step 4: Determine Types of Questions to be Asked

Survey design is not quick and simple, as is thought by many students, but is rather an intensive process requiring multiple drafts before it reaches any potential respondents (Maylor & Blackmon, 2005). Fink (1995) presents purposeful and concrete questions as necessary survey construction guidelines, with purposeful questions being questions logically related to the survey's objectives and concrete questions being precise and unambiguous. At the same time considering adding more detail in the question to gain a more reliable answer, for instance introducing a time period e.g., in the last three months is carried out.

Close-ended questions require a greater range of considerations, as unlike open-ended questions, the researcher cannot simply provide sufficient writing space for an answer. Survey data are organised in terms of variables, or specific characteristics; thus the researcher must decide which measurement scale to use (Rea & Parker, 1992). In addition to aligning with Fowler's (2002) statement that using questions as measures is an essential part of the survey process, Rea and Parker (1992) present three measurement scales for use with close-ended questions: the nominal scale, placing into categories and counted only with regard to frequency

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of occurrence; the ordinal scale, providing information about the ordering of categories; and the interval scale, labelling, ordering, and using constant units of measurement to indicate the exact value of each category of response. This is elaborated by Fowler's (2002) examples, proposing male or female as a nominal measure; very good or good as an ordinal measure; and Fahrenheit temperature as an interval measure. As explained by De Vaus (2002), cause-and-effect variables can be distinguished between dependent, independent, and intervening variables. De Vaus (2002) sets out a causal diagram utilising effect outcome for the dependent variable, cause predictor for the independent variable, and mechanism for the intervening variable. The dependent and independent variables, and the reasoning behind their inclusion for this study are explained in section 4.6.2.

4.6.5 Step 5: Decide on Specific Wording of Each Question to be Asked

Critical to survey research is the questionnaire development process. Rea and Parker (1992) recognise that most questionnaires have inherent advantages and flaws, suggesting that a large number of considerations are required for sound questionnaire construction. Similar to Rea & Parker (1992), Parten (1965) focuses on the fine detail of the specific question development as key, highlighting the wording of the questions and the avoidance of technical terms that could be interpreted differently by respondents.

Questionnaires can be easily misunderstood as research deception can occur when participants understand a different purpose from that of the researcher (Creswell, 2009). Mitigation against this was proposed earlier by Fink (1995), suggesting that questions should be logically related to the survey's objectives. Considering this, and to not inadvertently confuse the respondents, multipurpose questions should be avoided by not introducing two or more issues with the expectation of a single response. Furthermore, inappropriate emphasis should be avoided such as the underlining of specific words, as this could influence the answer by the respondent, and any use of biasing words or phrases are avoided as these have the power to elicit emotions, thus again potentially influencing the answer by the respondent (Rea & Parker, 1992). This study consulted the seventeen-point question wording checklist presented by de Vaus (2002) to address the question wording dilemmas. However, it also recognises de Vaus's (2002) suggestion that six principles must be built into question design, even before consideration of the question wording, reliability, validity, discrimination, response rate, providing the same understanding and relevance for all respondents.

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Considering Litwin's (1995) idea that good surveys are those that yield critical information and provide an insight into the centre of the topic of interest, the questions for this study questionnaire were developed from information gathered at the secondary data analysis stage, ensuring that they are focused to obtain relevant, and critical, information. Further to this, the selection of respondents was key to obtaining information to address the questions or hypotheses developed during the study. Considering this guidance, this study developed the questions to form the content of the survey questionnaire. The specific questions utilised for this study are set out in section 4.6.2.

4.6.6 Step 6: Determine Questionnaire Structure

A questionnaire was developed from the secondary data collection stage of the research, the literature review, contributing to understanding, identification and elimination of excessive production in FM cleaning operations within UK shopping centres, which is the central aim of this study. Acknowledging the importance highlighted by Fink (2014), this study recognises the literature review as providing a systematic, explicit method for identifying, evaluating, and synthesising the existing body of completed and recorded work produced by researchers, scholars, and practitioners.

Many varying methods are documented for gathering data through questionnaires and surveys (Oakshott, 2016; Bryman & Bell, 2015; Ghauri & Grønhaug, 2010; Ticehurst & Veal, 2000). Figure 4.3 outlines four different methods, and their specific advantages and disadvantages pertaining to cost, response rate, speed, quantity of information collected, and quality of information collected.

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Figure 4.3 - Methods of Data Collection

	Postal Questionnaire	**Telephone Interviewing**	**Face-to-Face Interviewing**	**Online**
Cost	Low	Moderate	High	Low
Response Rate	Low	Moderate	High	Moderate
Speed	Slow	Fast	Fast	Fast
Quantity of Information Collected	Limited	Moderate	High	Limited
Quality of Information Collected	Depends on how well the questionnaire has been designed	Good	High	Depends on how well the questionnaire has been designed

Source: Oakshott (2016)

Due to the associated low response rates to questionnaire surveys, Bryman (2016) suggests making the instrument appear as short as possible in order for it to be less likely to deter prospective respondents from answering. Bryman and Bell (2015) offer clear presentation as a further consideration in the designing of self-administered questionnaires. Fink (1995) similarly discusses the issue of cluttering questionnaires, stating that questions should be presented in an uncluttered, easy to complete way. Furthermore, and relating directly to the method of mail questionnaires, Thomas (2004) suggests that the questionnaire should be visually attractive, look interesting, be short, easy to complete and easy to return. The importance of the questionnaire layout is strengthened further by Gillham's (2000) description of questionnaire design as being twofold: how it looks and how it works.

Considering the importance of structure and appearance of the questionnaire, as outlined above, this study consulted the checklist for formatting questionnaires suggested by Bourque and Fielder (1995), to design the questionnaire, as set out in Figure 4.4.

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Figure 4.4 - Checklist for Formatting a Questionnaire

Do not make unrealistic time estimates.
Ask enough questions to obtain the information needed.
Use space between questions.
Use vertical format, space, boxes, arrows, shading, or other devices consistently to maximise the clarity and order of questions.
Do not avoid pre-coded response categories, but clearly indicate the code that corresponds to each response.
Consider the use of simple grids.
Use a booklet format when possible.
Have good contrast between print and paper.
Use 10-point pitch.
Use an easy read, equally spaced font, such as courier.
Avoid italics.
Use bold, underlining, or capitals judiciously and consistently for emphasis and instructions.
Do not split instructions, questions, and associated responses between pages.

Source: Bourque and Fielder (1995)

This study posted and emailed the questionnaires to each respective shopping centre, as explained in later sections of this chapter. Similar to surveys administered through the internet (Fowler, 2002), mail questionnaires require no direct interviewer involvement. This method aligns with the positivist philosophy of the researcher by conducting research in a way that is value free, and therefore objective (Bryman, 2016). This method however does not promote high response rates. Gillham (2000) describes the frustration of receiving questionnaires back from respondents, as a demoralising experience. Adams et al. (2007) recognise that in many surveys researchers are content with only 20% response rate, making the method of administration and maximising response rates important factors for a researcher.

Frazer and Lawley (2000) recognise two main constraints for mail questionnaire administration, time, and cost, and suggest four steps in order to achieve a maximum response rate within the constraints. The four steps were utilised to meet the needs of the proposed study, as set out in Figure 4.5.

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Figure 4.5 - Steps to Achieve Maximum Response Rate

Step	Timing	Procedure	Contents
1.	Commencement	Questionnaire sent to whole sample	• Questionnaire • Cover-letter • Reply-paid envelope
2.	1 week after step 1	Combined thank you/reminder sent to whole sample	• Thank you/reminder letter or postcard
3.	2 weeks after step 2	Reminder sent to non-respondents only	• Questionnaire • Reminder letter • Reply-paid envelope
4.	2 weeks after step 3	Reminder sent to non-respondents only	• Telephone call urging response

Source: Frazer and Lawley (2000)

4.6.7 Step 7: Evaluate Questionnaire

By utilising mail or online questionnaire surveys, a researcher is able to gather data from a large sample quickly, whilst not being present at questionnaire survey completion and not influencing the respondent's responses directly, thus offering greater anonymity and affording comparatively low cost compared with other data collection methods (Kumar, 2014). Trochim (2005) promotes questionnaires as being relatively inexpensive, and provides the opportunity to send the exact questionnaire to a wide number of people and allowing the respondent to answer at their own convenience. Trochim (2005) also interestingly recognises weaknesses in questionnaires, being that they often provide low response rates, calculated by dividing the number that respond by the number of eligible respondents (Fink, 1995), and are not ideal for gaining detailed responses.

Considering this, an alternative data collection method offering similar benefits is available in the form of semi-structured interviews. Zikmund et al. (2010) suggest that semi-structured interviews usually come in written form and provide advantages such as an ability to address more specific issues, providing responses that are easier to interpret than other qualitative approaches and, since the researcher can prepare the questions in writing ahead of time they are administered without an interviewer and can therefore be cost effective. The time to

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complete would however be longer for the respondents than a questionnaire survey and could negatively affect the response rate. Questionnaires allow for data to be collected from a large number of people, as will be required to gain a suitable sample size from UK shopping centres, and considering any potential logistical issues, providing advantage when considering the cost is also low. Maylor and Blackmon (2005) argue this point by suggesting that the cost of scaling up from 100 to 200 questionnaires is relatively small, considering low postage and printing costs, whereas adding just one additional interview to a research study is as expensive as every other interview, augmenting the cost of data collection each time.

The quantitative findings from the questionnaire surveys will provide suitable analysis against the findings of the literature review, and afford opportunity for inference, recommendation, and conclusion. Warner (2008) however offers caution at this stage in relation to quantitative research, acknowledging that the importance of researchers to recognise the ability to draw causal inference is based on the nature of the research design. Further to this, Bryman (2016) recognises limitations with self-administered questionnaires, highlighting that no-one is present to prompt or assist the respondents, and there is no certainty that the correct person has answered. This could without consideration affect any perceived inference or generalisation from the data.

4.6.8 Step 8: Conduct a Pilot / Pre-test Study

This specific step is not recognised by Peterson (2000) in the documented steps in constructing a questionnaire, however it is presented by several authors as key to questionnaire development (Zikmund et al., 2010; Rea & Parker, 1992; Czaja & Blair, 2005; Litwin, 1995; Oppenheim, 1992; Ticehurst & Veal, 2000).

A pilot study is a small-scale research project that collects data from respondents similar to those that will be used in the full study (Zikmund et al., 2010), but which could however benefit by using a pretesting phase for the data collection. The suggestion involves using a small subsample that may determine whether or not the data collection plan is appropriate for the main study (Zikmund, 2003). At this stage, the researcher is however not interested in statistical accuracy from the pretest, but rather the feedback concerning the overall quality of the questionnaire's construction (Rea & Parker, 1992), and any feedback recognising the structure, layout and physical appearance issues that may require improvement.

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Pretesting can form different phases. Czaja and Blair (2005) discuss how initial phases of questionnaire pretesting aim to gain feedback on individual questionnaire items, whereas later phases will test the entire questionnaire and the survey procedures. The latter phase is however only commenced once the researcher is satisfied with the draft questionnaire. Rea and Parker (1992) suggest a pre-test to assess questionnaire clarity, comprehensiveness, and acceptability.

Although it requires extra time and effort, pilot testing is important and necessary in survey development, providing useful information about how the survey instrument plays in the field and assessing the practical application of the survey instrument (Litwin, 1995). Considering this, this research conducted a pilot study of the questionnaire survey to ensure there were no typographical errors, the vocabulary was appropriate for the respondents, and it was not too long, thus assisting in gaining the required response rate and complying with many aspects of Litwin's (1995) checklist for pilot testing.

This study conducted a pilot study for the developed questionnaire survey at a suitable UK shopping centre that fitted within the REVO (2018) shopping centre classification list of regional, sub-regional, local, and neighbourhood schemes, as discussed in the theoretical framework chapter. The pilot questionnaires were sent via post, in line with the initial distribution method for the main study, on 8th July 2020 and received back at 35% response rate (7 questionnaires) on 6th August 2020. The pilot feedback was received as positive, with no requirement for layout or vocabulary alterations.

4.7 Sampling Design

According to Trochim (2005), sampling is the process of selecting units from a population of interest, by which the sample can generalise the results from the population that the sample was chosen, thus achieving a research aim to generalise the findings across the wider population of UK shopping centres. Of further relevance to this study is Bryman and Bell's (2015) association between surveys and the quest for representative samples. This is strengthened by Fink's (1995) description that a good sample is an accurate and efficient model of a population; however, Fink (1995) further recognises that irrespective of how proficient a study is, sampling bias or error is inevitable. Moreover, a large sample is not sufficient to guarantee the accuracy of the results (Moser & Kalton, 1971).

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This study utilised the secondary data collection phase of the study to confirm the target population of UK shopping centres as front-line FM cleaning employees, from which the sample was achieved. Considering the margin of error, the study determined the required sample and the estimated coverage required to achieve it. This was achieved through selecting a simple random sample of UK shopping centres; therefore, every member of the population has an equal probability of being selected for the sample (Lindsey, 2004). This is achievable however only if all members of the population are known, and cannot be guaranteed within the scope of UK shopping centres. Lindsey (2004) presents a calculation for sample size requirement, first by knowing the parameter of the two models to be compared, the data set, and a set based on an assumption of what is set out to learn from the study. The population for generalisation is all UK shopping centres, of which the sizes and classifications are confirmed in the literature review chapter of this study. All of these contain soft FM, and therefore cleaning, as is required to meet the central aim of this study, the identification and elimination of excessive production in facilities management cleaning operations within UK shopping centres.

The sample selected for this study was chosen with the aim of saving time and effort, and to obtain consistent and unbiased estimates of the population (Sapsford & Jupp, 2006; Hardy & Bryman, 2004). To achieve this, this study utilised random sampling and convenience sampling (Bryman, 1988; De Vaus, 2002; Denscombe, 2010; Bryman & Cramer, 2011), made available by the use of gatekeepers within the shopping centres (Seale, 2004), as shown in Figure 4.6. As Figure 4.6 depicts, the participant sampling process was managed first by choosing a random sample of UK shopping centres. The random sample was achieved through an internet search of UK shopping centres, as no accurate UK shopping centre list is available, and randomly choosing the sample (De Vaus, 2002). Regional scheme, sub-regional scheme, local scheme, and neighbourhood scheme shopping centres with contact details available during the search provided this study with convenience sampling. This approach aligned with the suggestion by Denscombe (2010) that it is reasonable that where there is scope for choice between two or more equally valid sample possibilities available in the sample, that the study should choose the most convenient. The contact details available for each UK shopping centre in the sample also provided the study with the opportunity to ulitise a gatekeeper. The initial communication with each shopping centre, and specifically with the gatekeeper, was key to

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data collection, as the gatekeeper is the sponsor who controls access to the data (Seale, 2004). Without their assistance, access to the data would not have been achieved.

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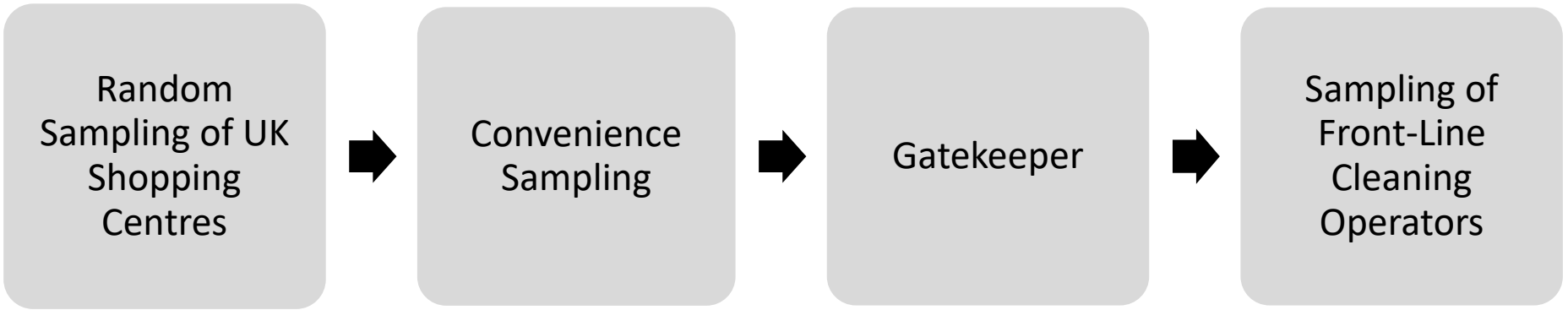
Figure 4.6 – Participant Sampling Flow Diagram



Source: Developed by the author

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Each of the four sizes and classification categories used by this study explore the dependent variable, regional scheme, sub-regional scheme, local scheme, and neighbourhood scheme, of which three shopping centres were surveyed from each classification. This provided an equal representation of each shopping centre size and classification variable within the population, and therefore aligns with a quota sample, as described by Ghauri and Grønhaug (2010). Ghauri and Grønhaug (2010) also suggest an alternative option by choosing a non-probability sample, although this is stated to provide misleading results and no basis for evaluating the size of the sampling variation, and any subsequent error of estimation. Irrespective of this, sampling accuracy is considered more important than the size of the sample (Oppenheim, 1992).

The data collection for this study commenced on 16th September 2020 by postal distribution. The initial response was positive, however, the UK's second COVID-19 lockdown for one month from 5th November 2020 halted any progress (first shopping centre closure from 23rd March 2020 until 15th June 2020). Considering this disruption, this study chose to extend the distribution to additional shopping centres by email on 10th November 2020. This enabled the sites to print the documents themselves, limiting any potential misplaced questionnaires during the lockdown period.

Based on the different sizes, and operations, within the varying shopping centre categories, regional scheme, sub-regional scheme, local scheme, and neighbourhood scheme, the desired response rates were different. This study received 111 questionnaires responses through the utilisation of both distribution methods: 87 from postal delivery, and 24 from email delivery. In aiming for a return from neighbourhood scheme of 10 questionnaires each from 3 shopping centres, local scheme of 15 questionnaires each from 3 shopping centres, sub-regional scheme of 20 questionnaires each from 3 shopping centres, and regional scheme of 25 questionnaires each from 3 shopping centres, the overall response rate is calculated at 53%. This consists of 62% postal response rate and 34% email response rate. From this however, 4 postal questionnaires were excluded due to missing data, providing 107 questionnaires for data analysis at 51% response rate. From this, however, 5 questionnaires were removed from the sample due to outlier issues, as discussed in the data analysis chapter. In light of this, 102 questionnaires were carried forward for analysis.

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4.8 Description of the Sample

In aiming to achieve improved reliability, improvement of the entire statistical programme through clarification of aims and purpose, and enhance speed to gain data (Deming, 1960), sampling was of significant importance to this study. It was also of importance to understand the demographics of the sample, which was achieved through specific characteristics. Peterson (2000) documents that regardless of its purpose, almost all questionnaires directed at individuals, as this study does, contain demographic related questions covering characteristics such as gender, marital status, education, age, and income.

This study incorporated several demographic questions within the questionnaire, although none of them were analysed in the data analysis phase. Figure 4.7 sets out the responses from the 107 questionnaires to the demographic questions.

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Figure 4.7 – Analysis of Demographical Data

Age	**Question**	*What is your age group?*				
	Answer	**25 and Under**	**26-35**	**36-45**	**46-55**	**Over 55**
	Response	12	23	25	27	20
Employment	**Question**	*Who employs you at the shopping centre?*				
	Answer	**An FM Company**	**A Cleaning Company**	**The Shopping Centre**	**An Agency**	
	Response	65	35	5	2	
Shift	**Question**	*What is your working shift at the shopping centre?*				
	Answer	**Day Shift**	**Evening Shift**	**Night Shift**	**A combination**	
	Response	71	23	1	12	
Service	**Question**	*How long have you worked for your company?*				
	Answer	**Less Than 1 Year**	**1-2 Years**	**2-3 Years**	**3-4 Years**	**4 Years +**
	Response	14	18	17	17	41
Experience	**Question**	*What is your experience in the cleaning industry?*				
	Answer	**Less Than 1 Year**	**1-2 Years**	**2-3 Years**	**3-4 Years**	**4 Years +**
	Response	10	10	13	16	58
Team	**Question**	*How many cleaning employees work at the shopping centre?*				
	Answer	**Less Than 10**	**10-25**	**26-50**	**51-100**	**Over 100**
	Response	26	33	45	2	1

Source: Author's analysis of data

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4.9 Data Analysis

The decision of data analysis by this study at the research design stage was imperative to the success of the project. Bryman and Bell (2015) suggest that a mistake that researchers can make when conducting a quantitative research project is to not plan how to analyse the data until it has been collected. It is further suggested by Bryman and Bell (2015) that researchers may believe that planning the data analysis will impinge on how the data is collected, contrary to Easterby-Smith et al. (2012) who emphasise the importance of being clear about the unit of analysis in advance, as it is the basis for collating the data that will subsequently be analysed.

Recognising that varying analytical techniques can be utilised based on the information requirements, the characteristics of the research design, and the nature of the data collected, Zikmund (2003) suggests that analysis is the application of reasoning to understand and interpret the data that have been collected. Easterby-Smith et al. (2012) explain how traditions exist for both qualitative and quantitative research methodologies, but that the possibility is present for cross-dressing, whereby qualitative data can be analysed in quantitative ways, and quantitative data can be analysed in qualitative ways.

A checklist is available for choosing a method to analyse survey data: establish the number of independent variables, determine if the data on the independent variables are nominal, ordinal, or numerical, and repeat for the dependent variables. This check can be carried whilst leaning positively towards utilising statistical analysis techniques to answer the research questions or hypotheses. The benefit of statistical analysis for the research is the organising and interpreting of the numerical data collected at the primary data phase, the results of which can analyse the descriptions, relationships, comparisons, and predictions (Fink, 1995). Tools are available to achieve this statistical analysis. Two statistical techniques in consideration for the researcher are regression analysis and correlation analysis. Regression analysis is a method for prediction that enables the researcher to predict a value of a dependent variable (y) that is likely to be associated with an independent variable (x). However, researchers are not always interested in designating one variable as dependent and one as independent, but rather in evaluating how two variables (x & y) are associated, and the correlation coefficient, or correlation analysis, provides such a measure (Kurtz, 1983).

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This study achieved the statistical techniques by utilising SPSS. SPSS allows the opportunity to generate basic regression information relating to the relationship of two variables (Bryman & Cramer, 2011). Further advantages of using SPSS are the ability to score and analyse quantitative data efficiently, thus eliminating the long hours spent working out scores and completing complicated calculations which can inevitably lead to mistakes. SPSS also enables the researcher to utilise more complicated and appropriate statistical techniques than those already known (Bryman & Cramer, 2011; Gray & Kinnear, 2012). Two such statistical techniques available through SPSS are inferential statistics and descriptive statistics. Inferential statistics are used to infer, or predict, population parameters from sample measures, thus achieving generalisation by tendering a description of a population from observation of a sample. Descriptive statistics allows the process of collecting, organising, and presenting data, while reducing the mass of data into easily understood values, such as averages, percentages, and counts (Burns & Burns, 2008; Hinton, 2004), and also focusing on graphical and numerical procedures that are used to summarise and process data (Newbold et al., 2013).

Having considered the advantages of computer aided analysis, this study also recognises, as suggested by Swift and Piff (2010), that sole reliance on computer analysis is not sufficient, as understanding and interpreting computer output as well as realising when something is wrong requires the researcher to have an idea of how to do the calculations. In addition, and in line with Frazer and Lawley (2000), this study understands the criticality of considering data analysis at the questionnaire design stage, ensuring that sufficient data is available to use for the appropriate data analysis techniques. Considering this, questioning techniques are key to gaining the required data from the questionnaire survey.

Considering the volume of data it is able to provide, its perceived reliability compared to other scales, and ease to construct (Emory & Cooper, 1991), the Likert scale was utilised for the majority of items in the questionnaire survey instrument. The approach requires the researcher to make a statement reflecting a particular opinion or attitude per question. This is developed from the secondary data collection phase of the research design for the respondents to indicate their level of agreement or disagreement, thus providing data from the various questions and allowing for data analysis and subsequent generalisation, and thus aligning with principles of the researcher's positivist research philosophy. The question answers, in line with the Likert scale, were influenced by Frazer and Lawley's (2000) suggestion of five options ranging from

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strongly disagree to strongly agree. The specific answer options per question for this study are set out in section 4.6.2.

The analysis specifically performed in this study has addressed different research issues including data preparation and screening, response rate, missing data, outliers, normality, and linearity. It was from these analyses that the suitability of the data was confirmed, and further advanced analysis could commence to explore reliability and validity of the research questionnaire. The analysis continued onto descriptive statistics, including frequencies, mean and standard deviation, and relative importance index, before advanced analytical tests to provide support of the proposed conceptual model, and multiple regression to test relationships between the independent and dependent variables. All of this is discussed in further detail in the data analysis chapter.

4.10 Validity and Reliability of Measures

Reliability and validity are presented as major criteria for good measurement. Reliability is an indicator of a measure's consistency, and validity is the accuracy of a measure or the extent to which a score truthfully represents a concept, with sensitivity being an instrument's ability to accurately measure variability in stimuli or responses (Zikmund et al., 2010).

Reliability is further concerned with the consistency of the variable (Hardy & Bryman, 2004), together with the question of whether the results of a study are repeatable (Bryman & Bell, 2015). Validity is concerned with the integrity of the conclusions that are generated from a piece of research (Bryman & Bell, 2015), and whether a variable has measured what it was designed to measure (Hardy & Bryman, 2004).

In this study, the reliability and validity of the research questionnaire were supported through analysis of the research constructs, face value and content validity, construct validity, convergent validity, and discriminant validity. All of this is discussed in further detail in the data analysis chapter.

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4.11 Ethical Considerations

The University of Gloucestershire promotes the importance of professional codes of conduct of external agencies and organisations as a default position, recognising general responsibilities towards research participants and other researchers (Glos.ac, 2008). Denscombe (2010) further suggests that social researchers are expected, on moral grounds, to approach their task in an ethical manner, identifying also that research codes of conduct are available.

In line with the quantitative methodology utilised by the researcher, Ransome (2013) highlights privacy, anonymity and confidentiality as ethical considerations in questionnaire development and implementation. Any study should take care to ensure that potential respondents are not pressurised into participation, making them aware of their right to refuse participation. This, whilst attempting to foresee, and guard against, any possible harmful consequences of their research for participants (Glos.ac, 2008). By not being pressurised into participation, informed consent was achieved through respondents answering the questions at their own will (Bryman & Bell, 2015). This study recognises however that the return of questionnaires is generally no longer considered appropriate or robust as a form on research consent, contrary to the suggestion by Bryman and Bell (2015). A more robust approach could be achieved by including a tick box, that when ticked by the questionnaire respondent indicates informed consent, and that the respondent understands that by completing the questionnaire means that the data can be used for the research study. Although, no reward was offered to the respondents for questionnaire completion for this study, and the purpose of the study was made clear in the wording of the cover letter that accompanied the questionnaire, as shown in Appendix B.

To mitigate against research deception in questionnaires (Creswell, 2009), Fink (1995) suggests that questions should be purposeful and logically related to the survey's objectives by being precise and unambiguous. Considering this, and to not inadvertently confuse the respondents, multipurpose questions were avoided by not introducing two or more issues with the expectation of a single response. Furthermore, inappropriate emphasis was avoided, such as the underlining of specific words, as they could influence the answer by the respondent. Any use of bias words or phrases were also removed as they have the power to elicit emotions, thus again potentially influencing the answer by the respondent (Rea & Parker, 1992).

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The recent general data protection regulations (GDPR) concern the processing of and movement of personal data (Cornock, 2018). To comply with GDPR and the Data Protection act, this study has ensured that questionnaire respondents were made aware of the data usage plans, as shown in Appendix B, and were given the option to opt out (Datoo, 2018). A further ethical consideration for the researcher is the means to copy someone else's ideas without acknowledgement, plagiarism, and this is a problem in all disciplines. It is a form of stealing and consequently greatly harms academic integrity (Farrimond, 2013). Finally, this study also considered all ethical considerations as set out in the University of Gloucestershire's guidelines, recognising that the primary responsibility for the conduct of ethical research lies with the researcher (University of Gloucestershire, 2008).

4.12 Chapter Summary

This study followed the positivist paradigm for a variety of reasons. This study proposed to develop testable hypotheses based on current theory surrounding FM cleaning operations and waste elimination, specifically excessive production. This was proposed in order to achieve the overall aim of the study: the identification and elimination of excessive production in FM cleaning operations within UK shopping centres.

Owing to positivism, the research philosophy of this study, this study utilised the quantitative research methodology. From this, a deductive research approach was also adopted. A quantitative approach involves the development of a theory that is subjected to a rigorous test, concluding in generalisation, based on samples of sufficient numerical size (Saunders et al., 2009), which assists in achieving a sample across a wide regional area.

This study gathered information utilising questionnaires at one point in time, with the aim to generalise the findings across the wider population. This aligns with Bryman and Bell's (2015) depiction of the cross-sectional design, or social survey design, as they are connected in most people's minds with questionnaires and structured interviewing.

This study utilised a questionnaire survey as the tool for primary data collection. By utilising mail or online questionnaire surveys, a research study is able to gather data from a large sample quickly, whilst not being present at questionnaire survey completion and not influencing the respondent's responses directly, thus offering greater anonymity and affording comparatively

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low cost compared with other data collection methods (Kumar, 2014). The steps for the questionnaire development process offered by Peterson (2000) were utilised for this study, in addition to an extra pilot/pretest stage not originally presented by Peterson (2000).

This study utilised the secondary data collection phase of the study to confirm the target population of UK shopping centres as front-line FM cleaning employees. Considering the margin of error, the study determined the required sample, and the estimated coverage required to achieve it. This was achieved through selecting a simple random sample; therefore, every member of the population has an equal probability of being selected for the sample (Lindsey, 2004). The population for generalisation is all UK shopping centres, of which the sizes and classifications are confirmed in the literature review chapter of this study, and all of which contain soft FM, and therefore cleaning. With the aim of achieving improved reliability, improvement of the entire statistical programme through clarification of aims and purpose, and enhance speed to gain data (Deming, 1960), sampling was of significant importance to this study.

This study achieved the statistical techniques by utilising the SPSS. SPSS allows the opportunity to generate basic regression information relating to the relationship of two variables (Bryman & Cramer, 2011). Further advantages of using SPSS are the ability to score and analyse quantitative data efficiently, eliminating the long hours spent working out scores and completing complicated calculations which can inevitably lead to mistakes.

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Chapter Five
Data Analysis

5.1 Introduction
This chapter commences by addressing how data preparation and screening was performed, before presenting the usage of response rate, missing data, outliers, normality, and linearity. The chapter will then examine the reliability and validity of the research constructs through utilisation of face value and content validity, construct validity, convergent validity, and discriminant validity, before exploring descriptive statistics for the independent and dependent variables, and finally testing the research hypotheses using standard regression. The chapter concludes with a summary table of research objectives, analytical methods, and results of the hypotheses testing, an overview of the research hypotheses that were supported, and those that were not supported.

5.2 Data Preparation and Screening
This section describes how any missing data was treated and prepared for data analysis, as well as explaining the response rate achieved from the questionnaire survey instrument. This section also presents an assessment of the main multivariate assumptions by explaining actions and tests that were conducted to ensure that data was ready for advanced analysis, as is achieved in later sections in this data analysis chapter.

5.2.1 Response Rate and Missing Data

5.2.1.1 Response Rate of the Research Questionnaire
This section discusses the response rate of the research questionnaire utilised for this study. As outlined in the Methodology Chapter, the survey of the questionnaire was conducted in UK shopping centres, and commenced on 16th September 2020 and concluded on 1st December 2020. To meet the overall research objectives of the study, the questionnaire was surveyed to front-line operatives within UK shopping centres. In total, 12 UK shopping centres were surveyed, with 3 from the neighbourhood scheme, 3 from the local scheme, 3 from the sub-regional scheme, and 3 from the regional scheme (REVO, 2018). The questionnaire presented the volunteer participants with 34 questions which represented the constructs within the research model.

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Two delivery methods were utilised to distribute the questionnaire: postal delivery and email. Email delivery was introduced from 10th November 2020 to increase the questionnaire response due to UK shopping centres being closed for one month from 5th November because of COVID-19 government lockdown. This followed a previous closure from 23rd March 2020 to 15th June 2020, as discussed in Chapter Two.

This study received 111 completed questionnaires through the utilisation of both distribution methods: 87 from postal delivery and 24 via email delivery. The study aimed for a return of 10 questionnaires from each neighbourhood scheme shopping centre, 15 from each local scheme shopping centre, 20 from each sub-regional shopping centre, and 25 from each regional scheme shopping centre. This gives an overall response rate of 53%, which consists of 62% postal response rate and 34% email response rate.

From this, however, 4 postal questionnaires have been excluded due to missing data exceeding the 5% acceptable tolerance level (Tabachnick & Fidell, 2013). These were from 1 neighbourhood scheme, 1 local scheme, 1 sub-regional scheme, and 1 regional scheme. Following this, in total 107 questionnaires were entered in SPSS for further analysis with no missing data. The overall response rate was recalculated as 51%, consisting of 59% postal response rate and 34% email response rate.

By achieving 51% response rate, this study exceeds the level expected for questionnaire survey data collection. This study recognises that consensus exists regarding an acceptable level of response rate, with different authors offering varying views, across different data collection methods (Trochim, 2005; Fink, 1995; Kumar, 2014; Gillham, 2000; & Adams et al., 2007). Adams et al. (2007) recognise that in many surveys, researchers are content with only 20% response rate, making the method of administration and maximising response rates important factors for a researcher. However, utilising a questionnaire for data collection presents challenges. Trochim (2005) recognises weaknesses in questionnaires in being that they often provide low response rates. The application of a structured questionnaire survey is also limited to the study population, offering no opportunity for spontaneous responses, and where the response to a question could be influenced by the response to other questions (Kumar, 2014).

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To assist in achieving the 51% response rate, this study aligned with guidance from Bourque and Fielder (1995), focusing on the questionnaire layout and ease of completion. The basis for this decision was centred on the checklist provided by Bourque and Fielder (1995), which helped to produce an easy to follow, and clear and concise questionnaire, which led to a successful pilot phase of the study. The pilot feedback was positive with no requirement for layout or vocabulary alterations.

Due to unforeseen circumstances, the COVID-19 global pandemic, and the subsequent shopping centre closures as detailed in the Methodology Chapter, this study expanded the questionnaire survey data collection methodology from postal delivery to include also email delivery. This allowed for the printing of the questionnaire onsite at the convenience of the shopping centre. This also allowed for the means for this study to remind the shopping centre through a follow up email, thus aligning with Frazer and Lawley's (2000) steps to maximise the response rate. As mentioned previously in this section, the email response rate was lower than the postal response rate at 34% to 59 %, although without this addition an acceptable number of responses may not have been achieved.

5.2.1.2 Missing Data

Newbold et al. (2013) explain that data files usually contain missing data, sometimes due to respondents not wanting to answer questions. In response to this, Wegner (2007) presents questions that data analysts should ask to ascertain the severity of the missing data. For example, what percentage of cases does the missing data represent?, how serious is the problem?, and how will the missing percentage affect the validity of the overall results?

Of the 111 questionnaires returned, only 4 contained missing data. As all of the 4 questionnaires had more than more than 5% missing data, the guidance by (Tabachnick & Fidell, 2013) was followed to remove them from the data set. The 4 questionnaires removed represented each of the 4 shopping centre classifications equally by providing 1 from each. The overall missing data equated to 15% across the 4 questionnaires (neighbourhood scheme 12%, local scheme 18%, sub-regional scheme 24%, and regional scheme 9%). As a result of these omissions, this study utilised a sample of 107 usable questionnaires.

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This study appreciates that had some questionnaires containing under 5% missing data been utilised, SPSS would offer a solution. Recognising two kinds of missing values, system-missing and user-missing, Gray and Kinnear (2012) detail the treatment of the missing data using SPSS.

5.2.2 Outliers

Describing an outlier as a score that is very different from the rest of the data set, Field (2013) explains that it can bias estimates of parameters, such as the mean score, and affect the sum of squared errors, thus exerting undue leverage upon the value of statistics (Gray & Kinnear, 2012). Outliers arise for two separate reasons. Firstly, they are legitimate observations whose values are unusually large or small, and secondly, they are an error in measurement, poor experimental technique, or a mistake in recording or entering data (Milton & Arnold, 2003). Wegner (2007) proposes 4 questions that should be asked when dealing with outliers: how many there are, what their magnitudes are, how influential or inconsequential they are, and how they should be treated once identified.

Outliers have been documented in two forms: univariate and multivariate. Univariate outliers pertain to investigating one single variable, whereas multivariate outliers pertain to more different variables (De Vaus, 2002). The two outlier forms are treated differently. de Vaus (2002) explains one way to detect univariate outliers is to examine a frequency table once the mean and standard deviation is obtained, and he further suggests utilisation of a scatterplot to visually view a relationship between two interval variables.

Occasionally, outliers are obvious and can be detected by inspection, however it is suggested that an analytical and graphical technique is utilised (Milton & Arnold, 2003). To achieve this, a number of statistical methods are available to detect outliers, four of which have been considered for this study: the standardised residuals method examines standardised residuals to identify cases with strange combinations of values on both independent and dependent variables; the leverage statistic method identifies cases which influence the regression model more than others; Cook’s distance method identifies cases with unusual values that have a considerable influence on the summary statistics; and Mahalanobis’ distance method identifies cases that have an unusual value on the independent variable, and focuses on unusual combinations of values on two or more variables (de Vaus, 2002).

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Authors suggest varying approaches once the outliers have been identified (Wegner, 2007; Williams et al., 2012; Milton & Arnold, 2003; & Silver, 1997). Wegner (2007) recommends that outliers should be retained as part of the analysis in descriptive statistics, as utilised by this study, whereas they can be removed in inferential analysis as they will potentially distort the findings of inferential tests and estimates based on model building.

Williams et al. (2012) suggest that outliers can be unusual data values that have been recorded correctly, and therefore belong to the data set and should remain. Considering this, and with the aim of retaining the unusual data values, as removal could discover relationships when none exist (Silver, 1997), this study has made every effort to ensure that the data was entered correctly into SPSS. This has ensured that the outliers are in fact relevant to the study, and should be retained in the data set.

Once entered into SPSS, outliers were identified within the data set. Two questionnaires were identified to have outliers on all three constructs of continuous improvement, performance measurement, and excessive production. Three further cases were identified that associated solely with the dependent variable of excessive production, all of which were subsequently removed from the data set. All remaining outliers are considered to be within the acceptable level, as suggested by Tabachnick and Fidell (2013) and hence do not have any significant impact on the data analysis. Figure 5.1 shows the outliers found in the sample from the dependent variable of excessive production, and the independent variables of continuous improvement, and performance measurement, before the five cases were removed.

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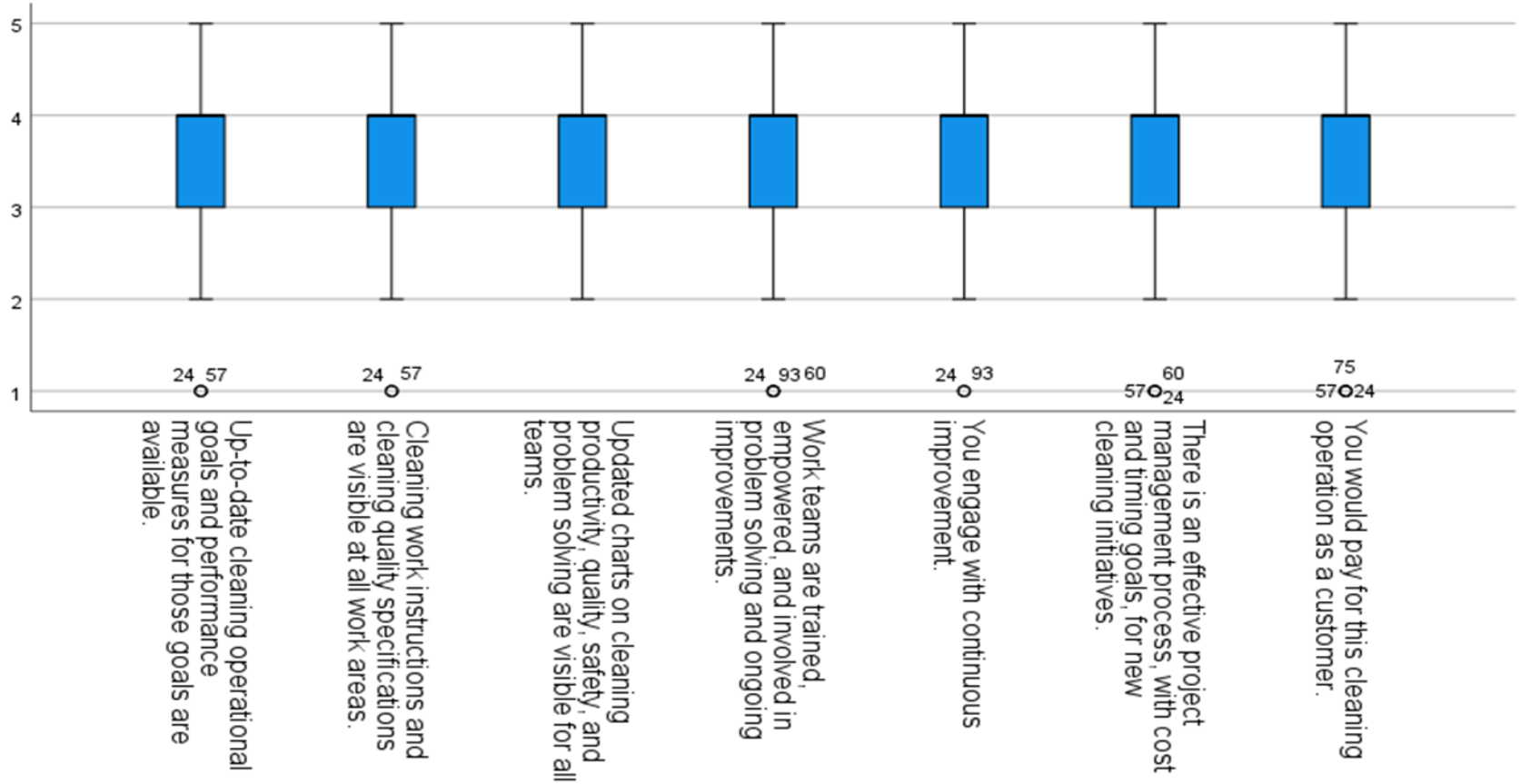
Figure 5.1 – Outliers Within the Variables

Excessive Production – Dependent Variable



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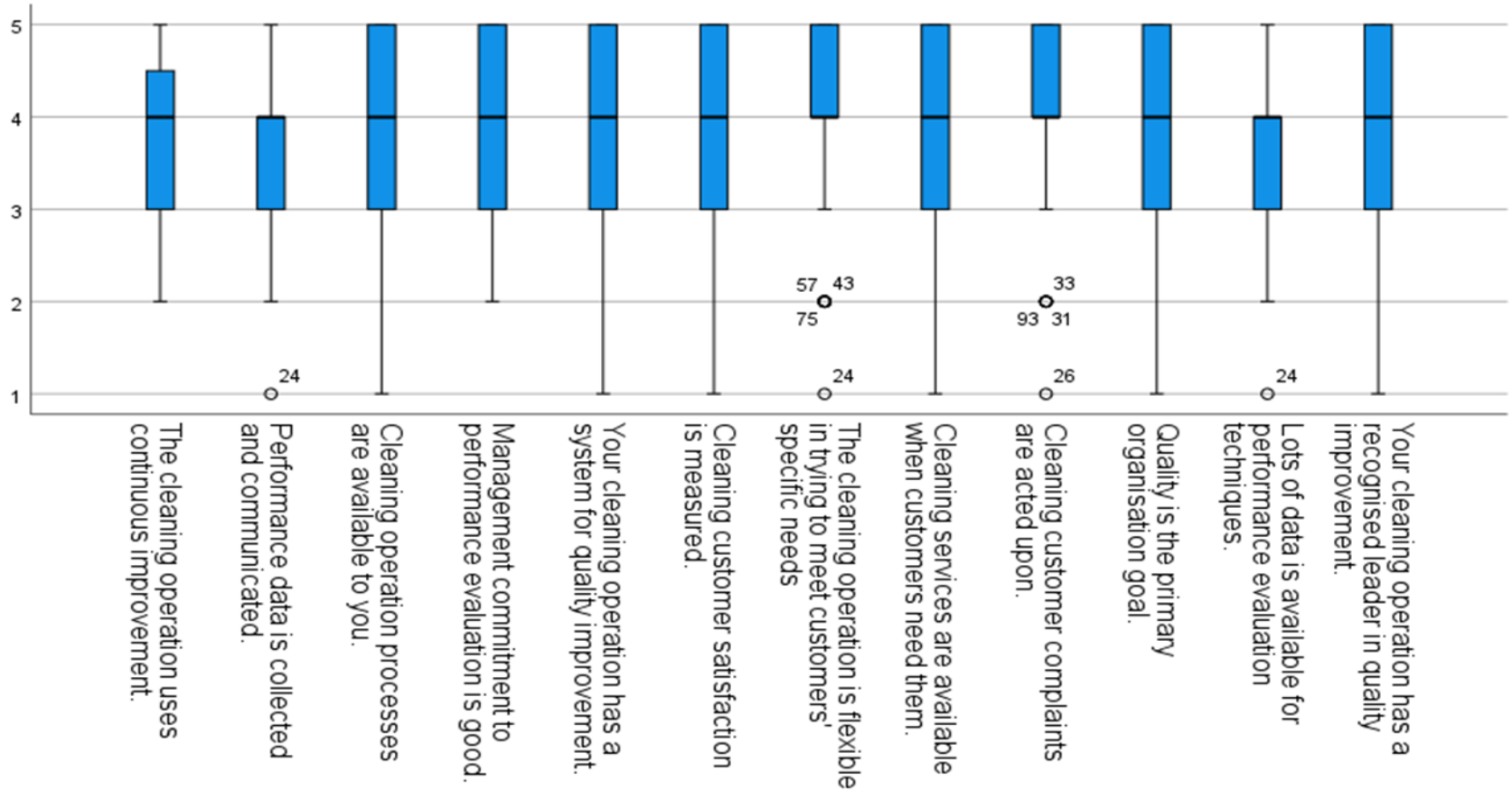
Continuous Improvement – Independent Variable



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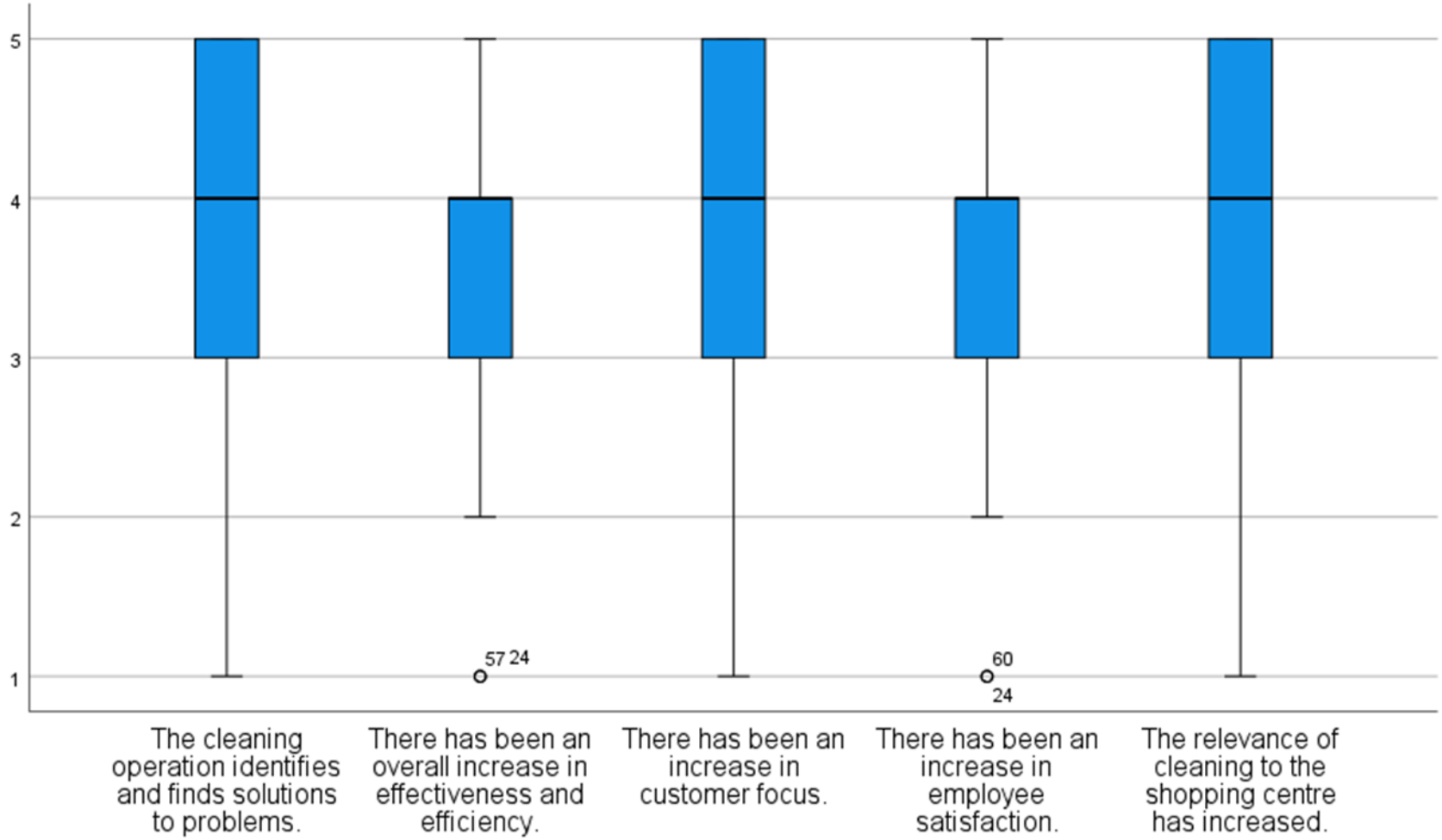
Performance Measurement – Independent Variable



Source: Author's analysis of data

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5.2.3 Normality

Following the examination of the outliers, the normal data distribution was assessed. The assumption of normality can be checked visually as well as analytically (Milton & Arnold, 2003), as is achieved in this study using SPSS. The normal distribution has been utilised in many practical applications in which random variables are heights, weights, scientific measurements, and other similar values (Williams et al., 2012). From this data, a normal distribution can be assumed if a smooth bell shaped curve is observed, with it being symmetrical about the central mean value, and the tails of the curve are asymptotic, the distribution is described by the mean and standard deviation parameters, the total area under the curve equals one, and the probability associated with the particular range of x-values is described by the area under the curve between the limits of the given x range (Wegner, 2007).

According to Field (2013), two main ways exist in which a distribution can deviate from the normal, symmetry, known as skew, and pointiness, known as kurtosis. As a skewed distribution is not symmetrical, it can be expected that the most either positively skewed, or negatively skewed, both of which have unique characteristics frequent scores are clustered at one end of the scale. It is described by Field (2013) as a positively skewed distribution as it has the most frequent scores clustered at the lower end and the tail points towards the higher or more positive scores. A negatively skewed distribution has the frequent scores clustered at the higher end and the tail points towards the lower or more negative scores.

Documenting it as the degree to which scores cluster at the ends of the distribution, Field (2013) describes two variations of kurtosis: leptokurtic, known as positive kurtosis, and platykurtic, known as negative kurtosis. Leptokurtic kurtosis has many scores in the tails and is pointy, whereas Platykurtic kurtosis is thin in its tails and tends to be flatter than normal.

Considering this, and Field's (2018) suggestion that, in order to check whether the distribution of scores is approximately normal, the values of skewness and kurtosis in the output should be observed; this study tested skewness and kurtosis regarding the normal distribution. To achieve this, the analysis and descriptive statistics function was utilised before the data was transferred to Table 5.2 and further analysed.

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Table 5.2 – The Skewness and Kurtosis Values of Normality

Items / Constructs	N	Mean	SD	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Sd. Error	Statistic	Sd. Error
The cleaning operation uses continuous improvement.	102	3.85	0.92	-0.41	.239	-0.62	.474
Performance data is collected and communicated.	102	3.77	0.89	-0.23	.239	-0.70	.474
Cleaning operation processes are available to you.	102	4.01	0.95	-0.66	.239	-0.49	.474
Management commitment to performance evaluation is good.	102	3.84	0.97	-0.34	.239	-0.92	.474
Your cleaning operation has a system for quality improvement.	102	3.89	0.92	-0.32	.239	-0.85	.474
Cleaning customer satisfaction is measured.	102	3.99	0.90	-0.49	.239	-0.61	.474
The cleaning operation is flexible in trying to meet customers' specific needs	102	4.09	0.81	-0.62	.239	-0.07	.474
Cleaning services are available when customers need them.	102	4.05	0.85	-0.59	.239	-0.28	.474
Cleaning customer complaints are acted upon.	102	4.08	0.86	-0.81	.239	0.63	.474
Quality is the primary organisation goal.	102	4.05	0.87	-0.55	.239	-0.49	.474
Lots of data is available for performance evaluation techniques.	102	3.80	0.90	-0.18	.239	-0.85	.474
Your cleaning operation has a recognised leader in quality improvement.	102	4.00	0.88	-0.62	.239	-0.24	.474
Continuous Improvement - Independent Variable	102	3.95	0.73	-0.45	.239	-0.50	.474
The cleaning operation identifies and finds solutions to problems.	102	3.93	0.89	-0.54	.239	-0.38	.474
There has been an overall increase in effectiveness and efficiency.	102	3.90	0.84	-0.33	.239	-0.53	.474
There has been an increase in customer focus.	102	3.92	0.90	-0.35	.239	-0.77	.474
There has been an increase in employee satisfaction.	102	3.81	0.83	-0.38	.239	-0.28	.474
The relevance of cleaning to the shopping centre has increased.	102	4.08	0.88	-0.52	.239	-0.69	.474
Performance Measurement - Independent Variable	102	3.93	0.74	-0.36	.239	-0.74	.474
Up-to-date cleaning operational goals and performance measures for those goals are available.	102	3.71	0.87	-0.11	.239	-0.71	.474
Cleaning work instructions and cleaning quality specifications are visible at all work areas.	102	3.79	0.93	-0.34	.239	-0.71	.474
Updated charts on cleaning productivity, quality, safety, and problem solving are visible for all teams.	102	3.74	0.98	-0.27	.239	-0.94	.474
Work teams are trained, empowered, and involved in problem solving and ongoing improvements.	102	3.68	0.99	-0.20	.239	-1.03	.474
You engage with continuous improvement.	102	3.79	0.96	-0.40	.239	-0.74	.474
There is an effective project management process, with cost and timing goals, for new cleaning initiatives.	102	3.66	0.92	-0.04	.239	-0.85	.474
You would pay for this cleaning operation as a customer.	102	3.76	0.94	-0.18	.239	-0.91	.474
Excessive Production - Dependent Variable	102	3.73	0.84	-0.20	.239	-0.88	.474

Source: Author's analysis of data

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The results of the skewness and kurtosis value of normality test, as depicted in Table 5.2, indicate that the data meets the normality assumption. This is confirmed by the data sitting within the ranges set out by Hair et al. (2014) with all constructs being between -1 and +1 for skewness, and between -3 and +3 for kurtosis, a view shared by Kline (2011).

5.2.4 Linearity and Multicollinearity

In relation to multivariate analysis, it is important to establish whether or not a relationship is linear, especially considering that many methods of statistical analysis assume that variables are related in a linear fashion (de Vaus, 2002). Caution has however been documented with regards to confirming any relationship. Jarrett and Kraft (1989) present a source of misconception of statistics in the area of correlation and regression as making inference of a cause-and-effect relationship between characteristics based on the appearance of a strong linear relationship.

Looking at the assumption of linearity relates to errors, or residuals in a model to enable the plotting of the values of the residuals against the corresponding values of the outcome predicted by the model, which can be achieved by utilising a scatterplot (Field, 2018). Gray and Kinnear (2012, p.401) also utilise a scatterplot to visualise a linear relationship, as well as finding that an elliptical shape signifies that although the relationship between the variables is “basically clear, each score has a random, error component.”

Whereas linearity observes an association between two variables, multicollinearity is a phenomenon of when a variable in a multiple regression model can be linearly predicted from the others, and with a substantial degree of accuracy (Jarret & Kraft, 1989). Multicollinearity is caused, as explained by Hinton (2004), when multiple variables are correlated with each other.

To observe linearity within the independent variables, this study utilised Pearson’s correlation test within SPSS. Pearson’s correlation test holds two ranges by which the data is evaluated, and by which the correlation is significant at either 0.01 or 0.05, both being 2-tailed. To demonstrate correlation between independent variables, Gray and Kinnear (2012) document that the absolute value of correlation is 0.90, with a negative correlation of - 0.90 representing the same strong degree of linear association as a positive correlation of + 0.90.

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Table 5.3 sets out the findings from Pearson's correlation test of the independent variables. Such a test could only be applied to those variables that have met the normality assumption. The test has uncovered a value of 0.89 between continuous improvement (IV5) and performance measurement (IV6). Although this is a relatively high correlation value, it can be concluded that no multicollinearity is evident (see Tabachnick & Fidell, 2013).

Table 5.3 – Correlation Matrix of Independent Variables

Constructs		
	IV5	IV6
	Continuous Improvement	**Performance Measurement**
Continuous Improvement	1	
Performance Measurement	.89**	1

*. Correlation is significant at the 0.05 level (2-tailed), **. Correlation is significant at the 0.01 level (2-tailed).
Source: Author's analysis of data

5.3 Reliability and Validity of the Research Constructs

This section sets out the actions that have been applied to the data to ensure reliability and validity. In order to ensure that the measurement error is kept to a minimum, Field (2018) suggests validity, which sets out to find whether an instrument measures what it sets out to measure, and reliability, which sets out to find whether an instrument can be interpreted consistently across different situations.

5.3.1 Reliability of the Research Constructs

Relating specifically to questionnaire development, Hinton (2004) states that the measure needs to be both valid and reliable, ensuring that the ability of a measuring instrument measures in a consistent manner. Utilising reliability tests assess whether or not a system functions adequately under the conditions for which they were specifically designed (Milton & Arnold, 2003). A variety of methods for evaluating the reliability of measures have been developed. In support of this, de Vaus (2002) documents four such methods: the test-retest methods, which administers a question to the same sample on two occasions and correlates the answers; the pane-of-judges-method, which tests the reliability of the way the data are coded; the parallel-

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forms method, which is slightly different from the test-retest and offers respondents two different but equivalent measures on the one occasion; and the internal consistency method, which administers one multi-item measure at a single point in time to a simple sample.

This study has utilised the Cronbach alpha, calculated using SPSS, to test for reliability, through assessing internal consistency. This statistic, as recommended by Pallant (2013), provides an indication of the average correlation among all of the items that make up the scale. The values for Cronbach alpha range from 0 to 1, with higher values indicating greater reliability. Although finding that varying levels of reliability are required based on the purpose of the scale, Pallant (2013) suggests a minimum level of 7 Cronbach alpha, dependent on the number of items in the scale. As the number of items per scale are below 10 for two scales that utilised the Likert scale, performance measurement (5 items) and excessive production (7 items), the Cronbach alpha values can be low. The other independent variable that utilised the Likert scale, continuous improvement, contains 12 items and is therefore above the 10 range and should not allow for a lower value.

The internal consistency of the research instrument, containing the three main research constructs (continuous improvement, performance measurement, & excessive production) was examined using Cronbach alpha in SPSS covering the full 102 questionnaire sample. The alpha coefficients of each construct are presented in Table 5.4, which visualises the highest coefficient of alpha 0.957 for the excessive production construct, and the performance measurement construct possessing the lower value at 0.905. These values are high based on the parameters of Cronbach alpha set out by Pallant (2013) previously in this section, which demonstrates that a reliable research instrument has been utilised to collect data for this study.

Although the assessment of a scale's reliability is important, it does not assess the scale's validity. de Vaus (2002) explains that a reliable measure consistently hits the same place on a target, whereas a valid measure is on target, providing further reason to assess validity in addition to reliability.

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5.3.2 Validity of the Research Constructs

Validity pertains to a whether an instrument measures what it is intended to measure (Field, 2018). However, Pallant (2013) documents that no single clear indicator is available to test a scale's validity, and recommends the use of two tests: content validity and construct validity. The construct validity is explored, as in line with Pallant's (2013) recommendation, through convergent validity and discriminant validity, assessing the relationship with other constructs, convergent being related and discriminant being unrelated. The results of these investigations are presented later in this section.

5.3.2.1 Face Value and Content Validity

As with self-reporting measures, for which questionnaires were utilised for this study, the degree to which individual items represent the construct being measured can be assessed. This constitutes content validity when the assessment covers the full range of the construct (Field, 2018). Content validity differs from face value validity as it refers to the representation of the portion of the construct, whereas face validity refers to the items measuring exactly what they are intended to measure (Zikmund et al., 2013).

An assessment of content validity examines the extent to which the measure explores the varying aspects of the concept. de Vaus (2002, p.28) continues to explain how the validity of a test depends on "the use to which it is put and not the test per se". From this, de Vaus (2002) finds that it is difficult to develop measures whose validity is widely accepted as a disagreement about the content of many social science concepts exist.

This study considered content validity in the early stages of the questionnaire development and before data collection, using two approaches. Firstly, an extensive literature review explored all relevant literature surrounding the objectives of the study, as discussed in the Literature Review chapter. The literature review guided this study in developing relevant and valid questions based on the intended respondents, UK shopping centre front-line cleaning service operators. Of main interest were the use of language and terminology, so as not to influence or confuse the respondents, thus covering the full range of the construct and focusing on the questions representing the construct being measured. Secondly, this study consulted the two research supervisors assigned by The University of Gloucestershire Business School to assist fellow academics and subject experts in the fields of both Muda and cleaning. These

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discussions, held throughout the development of the questionnaire survey, guided the content of the questions.

This chapter proceeds to discuss construct validity, which was applied by this study to confirm the validity of the survey instrument.

5.3.2.2 Construct Validity

Different from face value and content validity, construct validity refers to the behaviour of measures, with the aim of understanding whether the measures behave as they are expected to from both a theoretical, and knowledge understanding of the concepts they were designed to measure (de Vaus, 2002). Again, different from face value and content validity, construct validity tests a scale against a single criterion (Pallant, 2013), and is measured quantitatively (Zikmund, 2013).

This study has utilised two methods for assessing construct validity. Firstly, convergent validity, and secondly, discriminant validity (Pallant, 2013). These two methods were used for all items that utilised the Likert scale, including continuous improvement, performance measurement, and excessive production. This chapter proceeds to discuss these two methods.

5.3.2.3 Convergent Validity

In line with Hair et al. (2014), this study assesses convergent validity following three requirements: FAC (factor loadings), AVE (average of variance extracted), and the value of reliability achieved through utilisation of Cronbach alpha in SPSS. As displayed in Table 5.4, all items meet the recommended value for FAC of being higher than 0.05, ranging from 0.602 as the lowest and 0.791 as the highest. This finding supports convergent validity of the research survey instrument. As all items have achieved above the recommended parameter for factor loadings analysis, no items require exclusion from the data set.

The recommended value for AVE being higher than 0.5 was also met for each of the 3 research constructs of continuous improvement, performance measurement, and excessive production. The performance measurement research construct scored the highest value of 0.927, with the excessive production research construct scoring the lowest value of 0.908. This finding further supports convergent validity of the research survey instrument. As all items have achieved

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above the recommended parameter for AVE analysis, no items require exclusion from the data set.

Following de Vaus (2002), this study analysed Cronbach alpha for the 3 research constructs based on the recommendation that to be reliable a value of at least 0.7 should be realised. This study confirms that this value was achieved for all 3 research constructs with excessive production scoring highest with 0.957, and performance measurement scoring lowest with 0.905. This finding confirms reliability as well as further supporting convergent validity of the research survey instrument. As all items have achieved above the recommended parameter for Cronbach alpha analysis, as per de Vaus (2002), no items require exclusion from the data set.

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Table 5.4 – Convergent Validity

Constructs	Items	FAC_Loading	Aplha	AVE
Continuous Improvement	CI1	0.675	0.954	0.926
	CI2	0.732		
	CI3	0.707		
	CI4	0.646		
	CI5	0.744		
	CI6	0.602		
	CI7	0.668		
	CI8	0.722		
	CI9	0.843		
	CI10	0.756		
	CI11	0.760		
	CI12	0.791		
Performance Measurement	PM1	0.624	0.905	0.927
	PM2	0.656		
	PM3	0.627		
	PM4	0.755		
	PM5	0.647		
Excessive Production	EP1	0.743	0.957	0.908
	EP2	0.658		
	EP3	0.747		
	EP4	0.716		
	EP5	0.625		
	EP6	0.686		
	EP7	0.707		

Source: Author’s analysis of data

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5.3.2.4 Discriminant Validity

Described as an alternative validity test, discriminant validity is an "approach based on the argument that two different concepts should not correlate with one another" (De Vaus, 2002, p.30). Different from convergent validity, which explores the relationship with other constructs which are related, discriminant validity explores the relationship with related constructs (Pallant, 2013). In line with guidance from Fornell and Larcker (1981), this study of the square root values of AVE and correlation coefficients were used to assess the discriminant validity, as well as factor loading. With this method, to demonstrate discriminant validity the square root of AVE should be higher than that of the correlation coefficients.

Discriminant validity is proven in Table 5.5 by presenting that the square root of AVE is greater than all of the correlation coefficients. The result of this test, and the previous tests within this chapter, strongly supports and confirms the face, content, and construct validity of the questionnaire survey instrument.

Table 5.5 – Discriminant Validity

Constructs	IV5	IV6	DV
	Continuous Improvement	**Performance Measurement**	**Excessive Production**
Continuous Improvement	**.96**		
Performance Measurement	.89**	**.96**	
Excessive Production	.87**	.87**	**.95**

*. Correlation is significant at the 0.05 level (2-tailed), **. Correlation is significant at the 0.01 level (2-tailed).
Values of the square root of AVE reported in bold at the diagonal line
Source: Author's analysis of data

5.4 Descriptive Analysis of the Research Constructs

This section will discuss and explain responses to the questionnaire survey instrument utilised to measure the three main research constructs of continuous improvement, performance measurement, and excessive production, as proposed in the conceptual model displayed in

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Chapter Three, the Theoretical Framework. This study utilised two methods of descriptive analysis, frequency analysis and the relative importance index (RII), both of which provide different analysis. Frequency analysis explores the mean and standard deviation of each item, whereas RII rates and ranks all items and constructs individually, based on the level of their importance (Rust & Rao, 1996). The analysis will include detailed discussion for each.

The RII values, ranking, and level of importance are calculated based on the mean score of each item, and overall construct, utilising SPSS. With regards to RII specifically, the importance was rated on a scale of five levels: high (H) ($0.8 \leq RII \leq 1$), high- medium (H-M) ($0.6 \leq RII < 0.8$), medium (M) ($0.4 \leq RII < 0.6$), medium-low (M-L) ($0.2 \leq RII < 0.4$), and low (L) ($0 \leq RII < 0.2$).

Of the 6 independent variables, 2 were explored by the questionnaire survey instrument utilising the Likert scale, continuous improvement, and performance measurement, and is analysed as outlined previously in this section. The dependent variable, excessive production, was also explored by the questionnaire survey instrument utilising the Likert scale and is analysed in the same way.

5.4.1 Descriptive Statistics Analysis of the Independent Variables

The two independent variable constructs that were measured by the Likert scale as independent variables, continuous improvement, and performance measurement, utilised the same 5-point scale. Respondents were presented with 5 possible answers for both independent variables: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. This provided each individual respondent the opportunity to score each question based on their specific viewpoint. As mentioned previously in this chapter, excluding the 4 returned questionnaires which contained over 5% of missing data, and the 5 questionnaires containing unacceptable outliers, the respondents answered all questions in the 102 questionnaires used for data analysis.

This Chapter will now proceed to present the analysis for each of the two constructs relating to the independent variables individually. The analysis was conducted using SPSS and MS Excel.

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5.4.1.1 Descriptive Statistics Analysis of Continuous Improvement

This construct was represented and measured by 12 items that were developed at the literature review stage of this study and presented in Chapter Three, the Theoretical Framework. To analyse the responses of each item, and as an overall mean, standard deviation, and RII was utilised. In addition, as in line with RII, each individual item was ranked based on importance. The findings are presented in Table 5.6. The data shows a mean range from 3.77 to 4.09, with the overall mean calculated at 3.95, and a RII score range from 0.720 to 0.779, with an overall score of 0.775. The data also show a standard deviation range from 0.810 to 0.972.

All items were placed as high-medium (H-M) on the RII. The highest ranking on the RII is item CI7, “the cleaning operation is flexible in trying to meet customers’ specific needs,” scoring 0.779 RII value, and the lowest ranking on the RII is item CI2, “performance data is collected and communicated” scoring 0.720. This is also reflected in the mean score with item CI7 receiving the most positive responses (4.09), and CI2 receiving the most negative responses (3.77).

In summary, a high overall mean score of 3.95 indicates a strong presence of CI in cleaning operations within UK shopping centres.

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Table 5.6 – Descriptive Statistics Results for Responses to Continuous Improvement Items

	Statistics		Relative Importance Index		
	Mean	**SD**	**Value**	**Ranking**	**Level**
Continuous Improvement					
CI1	3.85	0.916	0.735	8	H-M
CI2	3.77	0.889	0.720	11	H-M
CI3	4.01	0.949	0.764	4	H-M
CI4	3.84	0.972	0.733	9	H-M
CI5	3.89	0.922	0.742	7	H-M
CI6	3.99	0.895	0.761	6	H-M
CI7	4.09	0.810	0.779	1	H-M
CI8	4.05	0.849	0.772	3	H-M
CI9	4.08	0.864	0.778	2	H-M
CI10	4.05	0.872	0.772	3	H-M
CI11	3.80	0.901	0.725	10	H-M
CI12	4.00	0.879	0.763	5	H-M
Overall	**3.95**	**0.730**	**0.775**		**H-M**

Source: Author’s analysis of data

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5.4.1.2 Descriptive Statistics Analysis of Performance Measurement

This construct was represented and measured by 5 items that were developed at the literature review stage of this study and presented in Chapter Three, the Theoretical Framework. To analyse the responses of each item, and as an overall, mean, standard deviation, and RII was utilised. In addition, as in line with RII, each individual item was ranked based on importance. The findings are presented in Table 5.7.

The data shows a mean range from 3.781 to 4.08, with the overall mean calculated at 3.93, and a RII score range from 0.727 to 0.778, with an overall score of 0.770. The data also show a standard deviation range from 0.829 to 0.898.

All items were placed as high-medium (H-M) on the RII. The highest ranking on the RII is item PM5, “the relevance of cleaning to the shopping centre has increased,” scoring 0.778 RII value, and the lowest ranking on the RII is item PM4 “there has been an increase in employee satisfaction,” scoring 0.727. This is also reflected in the mean score with item PM5 receiving the highest response (4.08) and PM4 receiving the lowest response (3.81).

In summary, a high mean score of 3.93 indicates a strong presence of performance measurement in cleaning operations within UK shopping centres. Considering the connection found in the literature review between CI and performance measurement, it is interesting to find similar mean scores (CI at 3.95, as shown in Table 5.6).

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Table 5.7 – Descriptive Statistics Results for Responses to Performance Measurement Items

	Statistics		Relative Importance Index		
	Mean	**SD**	**Value**	**Ranking**	**Level**
Performance Measurement					
PM1	3.93	0.893	0.750	2	H-M
PM2	3.90	0.839	0.744	4	H-M
PM3	3.92	0.898	0.748	3	H-M
PM4	3.81	0.829	0.727	5	H-M
PM5	4.08	0.875	0.778	1	H-M
Overall	**3.93**	**0.739**	**0.770**		**H-M**

Source: Author's analysis of data

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5.4.1.3 Descriptive Statistics of Non-Likert Scale Questions

Four independent variables, facilities management service delivery, in-house/outsource, management presence, and shopping centre classification, were represented in the questionnaire by non-Likert scale questions. Analysis of this data finds that 62.7% of the services provided by the respondents are through TFM, meaning that more than one single delivery method was found. For example, 48% is directly managed by the shopping centre signifying over half of the respondents work for a company managed by the shopping centre, and 91.2% have an onsite manager, which highlights a reliance on site management of cleaning at UK shopping centres. Furthermore, 45.1% of the respondents were represented by regional scheme shopping centres, 30.4% by sub-regional scheme shopping centres, 12.7% by local scheme shopping centres, and 11.8 % by neighbourhood scheme shopping centres, which demonstrates that all REVO (2018) shopping centre categories were represented. These descriptive statistics are displayed in Table 5.8.

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Table 5.8 – Descriptive Statistics of non-Likert Scale Independent Variables

IV1	**Question**	*Does your company provide all Facilities Management tasks, including maintenance, at the shopping centre?*			
	Answer	**Yes**		**No**	
	Response %	37.3%		62.7%	
IV2	**Question**	*Is the cleaning operation directly managed by the shopping centre?*			
	Answer	**Yes**		**No**	
	Response %	48%		52%	
IV3	**Question**	*Is your manager based at the shopping centre?*			
	Answer	**Yes**		**No**	
	Response %	91.2%		8.8%	
IV4	**Question**	*Please tick the scheme box under which your shopping centre is:*			
	Answer	**Neighbourhood Scheme**	**Local Scheme**	**Sub-Regional Scheme**	**Regional Scheme**
	Response %	11.8%	12.7%	30.4%	45.1%

Source: Author's analysis of data

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5.4.2 Descriptive Statistics Analysis of the Dependent Variable

The one construct that was measured by the Likert scale as the dependent variable, excessive production, utilised the same 5-point scale. Respondents were presented with 5 possible answers for both independent variables: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. This provided each individual respondent the opportunity to score each question based on their specific viewpoint. As mentioned previously in this chapter, excluding the 4 returned questionnaires which contained over 5% of missing data, and the 5 questionnaires containing unacceptable outliers, the respondents answered all questions in the 102 questionnaires used for data analysis.

This chapter will now present the analysis in the next section as to the construct relating to the dependent variable. The analysis was conducted using SPSS and MS Excel.

5.4.2.1 Descriptive Statistics Analysis of Excessive Production

This construct was represented and measured by 7 items that were developed at the literature review stage of this study and presented in the Theoretical Framework Chapter. To analyse the responses of each item, and as an overall mean standard deviation, RII was utilised. In addition, as in line with RII, each individual item was ranked based on importance. The findings are presented in Table 5.9.

The data shows a mean range from 3.66 to 3.79, with the overall mean calculated at 3.73, and a RII score range from 0.697 to 0.723, with an overall score of 0.731. The data also show a standard deviation range from 0.874 to 1.007.

All items were placed as high-medium (H-M) on the RII. The highest ranking on the RII is shared by two items: EP2 “Cleaning work instructions and cleaning quality specifications are visible at all work areas,” and EP5 “you engage with continuous improvement,” scoring 0.723 RII value. The lowest ranking on the RII is item EP6, “there is an effective project management process, with cost and timing goals, for new cleaning initiatives” scoring 0.697. This is also reflected in the mean score with items EP2 and EP5 receiving the highest response (3.79) and EP6 receiving the lowest response (3.66).

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To summarise, an overall mean score of 3.73 is lower than that found for the two independent variables analysed in this section (CI at 3.95 & performance measurement at 3.93). However, the score is above the ‘neutral’ Likert scale answer, thus indicating a level of agreement.

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Table 5.9 – Descriptive Statistics Results for Responses to Excessive Production Items

	Statistics		Relative Importance Index		
	Mean	**SD**	**Value**	**Ranking**	**Level**
Excessive Production					
EP1	3.71	0.874	0.707	4	H-M
EP2	3.79	0.926	0.723	1	H-M
EP3	3.74	0.984	0.712	3	H-M
EP4	3.68	1.007	0.701	5	H-M
EP5	3.79	0.958	0.723	1	H-M
EP6	3.66	0.917	0.697	6	H-M
EP7	3.76	0.935	0.718	2	H-M
Overall	**3.73**	**0.842**	**0.731**		**H-M**

Source: Author's analysis of data

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5.5 Model Testing and Research Hypotheses

This section outlines the procedures and methods that have been applied to examine the effect of the independent variables (e.g. facilities management service delivery, in-house/outsource, management presence, shopping centre classification, continuous improvement, and performance measurement) on the dependent variable (excessive production), as well as setting out the statistical tests utilised. In addition to testing the proposed research model, this section will also test the 6 research hypotheses.

5.5.1 Model Summary and Analysis of Variance (ANOVA)

As a model in which an outcome is predicted through a linear relationship of two or more predictor variables, multiple linear regression is an extension of single regression (Field, 2013). As outlined in the Theoretical Framework Chapter, this study proposed a conceptual model based on the effect of the 6 independent variables on the dependent variable, which meets the criteria for multiple linear regression.

In order to predict the effect of the independent variables on the dependent variable, this study utilises the multiple linear regression statistical model, complying with ANOVA (Field, 2013). The use of ANOVA enabled this study to test hypotheses that the means of two or more groups are equal (Silver, 1997). When applied, ANOVA allows for comparison of the ratio of systematic variance to unsystematic variance in an experimental study (Field, 2013). This is appropriate as this study has one single dependent variable. Multivariate analysis of variance (MANOVA) would be required if a study has two, or more dependent variables (Gray & Kinnear, 2012).

Multiple linear regression was conducted by this study to (1) ensure the conceptual model's fitness for the collected data, (2) examine relationships between the independent variables and the dependent variable (Lind et al., 2015), and (3) test for serial correlations between errors, and whether adjacent residuals are correlated using the Durbin-Watson test (Field, 2013). To achieve the multiple linear regression analysis, the independent (predictors) variables, facilities management service delivery, in-house/outsource, management presence, shopping centre classification, continuous improvement, and performance measurement, and dependent (outcome) variable, excessive production, were entered into SPSS.

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The results of the multiple linear regression are presented in Table 5.10.

Table 5.10 – Multiple Linear Regression Model

Model	R	R^2	Adjusted R^2	F	Sig.	Durbin-Watson
1	.894[a]	.800	.796	197.615	.000[b]	1.863

Source: Author's analysis of data

Note - Predictors: Facilities management service delivery, in-house/outsource, management presence, shopping centre classification, and performance measurement. Outcome: excessive production

Table 5.10 provides important statistics about the proposed conceptual model, namely:

(1) In assessing the overall model's fit to the data, in addition to explaining the contribution of the predictor variables on the outcome variable, the R^2 statistic was examined (Field, 2013). The R^2 value, as shown in Table 5.9, of .800 indicates that 80% percent of the explanatory power of excessive production (outcome variable) is explained by the predictor variables. This signifies that the predictor variables represent 80% of the variation in excessive production within cleaning operations in UK shopping centres, which is a high value considering that R^2 values range from 0 – 1, with 1 representing 100%.

(2) The adjusted R^2 value is observed as .796, as displayed in Table 5.10, which is a variation of .004 and not significant. As explained by Lind et al. (2015), this low variance between the R^2 and the adjusted R^2 indicates that if this study were actually carried out on the population, instead of the sample, the variance could be predicted at .004, equating to 0.4%. From this understanding, and an explanation by Field (2013), it can be concluded that the model would generalise to a high degree.

(3) The Durbin-Watson test scored 1.863, as shown in Table 5.10. A Durbin-Watson test statistic can vary between 0 and 4, with a score of 2 indicating that the residuals are uncorrelated (Field, 2013). Field (2013) explains other scores as a value greater than 2 indicating a negative correlation between adjacent residuals, and a score lower than 2

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indicating a positive correlation. Understanding this, and the further suggestion from Field (2013) that values less than 1 or greater than 3 are cause for concern, the 1.863 score strongly indicates no issue of autocorrelation, as the value is within the acceptable range.

From the statistics presented in Table 5.10, and the analysis above, it can be concluded that the proposed conceptual model meets the standards of overall fitness with the data. Considering this, it could be suggested that the predictor variables (facilities management service delivery, in-house/outsource, management presence, shopping centre classification, continuous improvement, & performance measurement) contribute positively to excessive production in cleaning operations within UK shopping centres.

The next section of this Data Analysis Chapter will analyse the specific contribution of each independent variable on the dependent variable. The results from which will test the 6 research hypotheses.

5.5.2 Testing Research Hypotheses

Based on the fact that all research constructs have been found to be significantly correlated, as shown in section 5.2.4, the research hypotheses have been tested. The testing of the research hypotheses is concerned with the effect of each independent variable on the dependent variable.

5.5.2.1 Testing the Effect of Independent Variables on the Dependent Variable

This study utilised a standard regression analysis to examine any effect of the predictor variables (facilities management service delivery, in-house/outsource, management presence, shopping centre classification, continuous improvement, & performance measurement) individually on the outcome variable (excessive production), as shown in Table 5.11. Analysis of this data tests the 6 research hypotheses, as set out in the Theoretical Framework Chapter.

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Table 5.11 – Results of Regression Analysis

Variable	Model	Standardised Coefficients β	t-value	sig. (p)
Outcome	1 Constant Excessive Production			
Predictor	Continuous Improvement	.452	4.288	.000***
Predictor	Performance Measurement	.484	4.554	.000***
Predictor	Facilities Management Service Delivery	.034	0.525	.601
Predictor	In-house / Outsource	-.028	-0.443	.659
Predictor	Management Presence	.008	0.136	.892
Predictor	Shopping Centre Classification	-.053	-0.820	.414

Note: R^2 = .820, adjusted R^2 = .810; *p< .05, **p< .01. ***p< .001

Source: Author's analysis of data

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For analysis of the results of the standard regression, as shown in Table 5.11, this study focused on the standardised beta (β) values, t-statistics, and the significance values for each predictor variable.

The standardised beta values inform the study of the gradient of the regression line and the subsequent strength of any relationship between a predictor and an outcome variable (Field, 2013). As a measure of units of standard deviation reflecting the amount of change on the predictor variable as a result of change to the outcome variable (Gray & Kinnear, 2012), the overall range found in this study is .484 to -.053, with the performance measurement predictor variable providing the highest value, and the shopping centre classification predictor variable providing the lowest, and negative value.

In statistics, and hypotheses testing, the t-value is the ratio of the departure of the estimated value of a parameter from its hypothesised value to its standard error (De Vaus, 2002). In this study, the t-values range from 4.554 to -.820, with the performance measurement predictor variable providing the highest value, and the shopping centre classification predictor variable providing the lowest, and negative value.

Statistical significance (p) pertains to hypothesis testing indicating something as unlikely to have occurred given the null hypothesis, thus by meeting the statistical significance level ($p<.05$) by either lower or equal to, it can be concluded that the effects reflect the characteristics of the entire population, and rejecting the null hypothesis (Field, 2013; de Vaus, 2002; Gray & Kinnear, 2012).

Hypothesis 1

Hypothesis 1: There will be a significant relationship between facilities management service delivery and the level of excessive production within its front-line operation.

The results show a statistically insignificant relationship between the facilities management service delivery predictor variable and the excessive production dependent variable ($\beta = .034$, $t = .525$, $p = >.05$), which does not support hypothesis 1.

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Hypothesis 2

Hypothesis 2: There will not be a significant relationship between in-house/outsource and the level of excessive production within its front-line operation.

The results show a statistically insignificant relationship between the in-house/outsource predictor variable and the excessive production dependent variable (β = -.028, t = -.443, p= >.05), which does support hypothesis 2.

Hypothesis 3

Hypothesis 3: There will be a significant relationship between having management presence and the level of excessive production within its front-line operation.

The data shows a statistically insignificant relationship between the management presence predictor variable and the excessive production dependent variable (β = -.008, t = -.136, p= >.05), which does not support hypothesis 3.

Hypothesis 4

Hypothesis 4: There will be a significant relationship between shopping centre classification and the level of excessive production within its front-line operation.

The data shows a statistically insignificant relationship between the shopping centre classification predictor variable and the excessive production dependent variable (β = -.053, t = -.820, p= >.05), which does not support hypothesis 4.

Sub Hypothesis 4.1: There will be a significant relationship between the regional scheme shopping centre classification and the level of excessive production within its front-line operation.

The data shows a statistically insignificant relationship between the regional scheme shopping centre classification predictor variable and the excessive production dependent variable (β = -.053, t = -.820, p= >.05), which does not support hypothesis 4.1.

Sub Hypothesis 4.2: There will be a significant relationship between the sub-regional shopping centre classification and the level of excessive production within its front-line operation.

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The data shows a statistically insignificant relationship between the sub-regional scheme shopping centre classification predictor variable and the excessive production dependent variable (β = -.053, t = -.820, p= >.05), which does not support hypothesis 4.2.

Sub Hypothesis 4.3: There will be a significant relationship between the local scheme shopping centre classification and the level of excessive production within its front-line operation.

The data shows a statistically insignificant relationship between the local scheme shopping centre classification predictor variable and the excessive production dependent variable (β = -.053, t = -.820, p= >.05), which does not support hypothesis 4.3.

Sub Hypothesis 4.4: There will be a significant relationship between the neighbourhood scheme shopping centre classification and the level of excessive production within its front-line operation.

The data shows a statistically insignificant relationship between the neighbourhood scheme shopping centre classification predictor variable and the excessive production dependent variable (β = -.053, t = -.820, p= >.05), which does not support hypothesis 4.4.

Hypothesis 5

Hypothesis 5: There will be a significant relationship between continuous improvement and the level of excessive production within its front-line operation.

The results show a statistically significant positive relationship between the continuous improvement predictor variable and the excessive production dependent variable (β = .452, t = 4.288, p= <.001, which supports hypothesis 5.

Hypothesis 6

Hypothesis 6: There will be a significant relationship between performance measurement and the level of excessive production within its front-line operation.

The results show a statistically significant positive relationship between the performance measurement predictor variable and the excessive production dependent variable (β = .484, t = 4.554, p= <.001), which supports hypothesis 6.

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5.6 The Final Conceptual Framework Model

The final conceptual framework model, as presented in Figure 5.12, presents the statistical significance (p) found between each individual independent variable (facilities management service delivery, in-house/outsource, management presence, shopping centre classification, continuous improvement, and performance measurement) and the dependent variable (excessive production).

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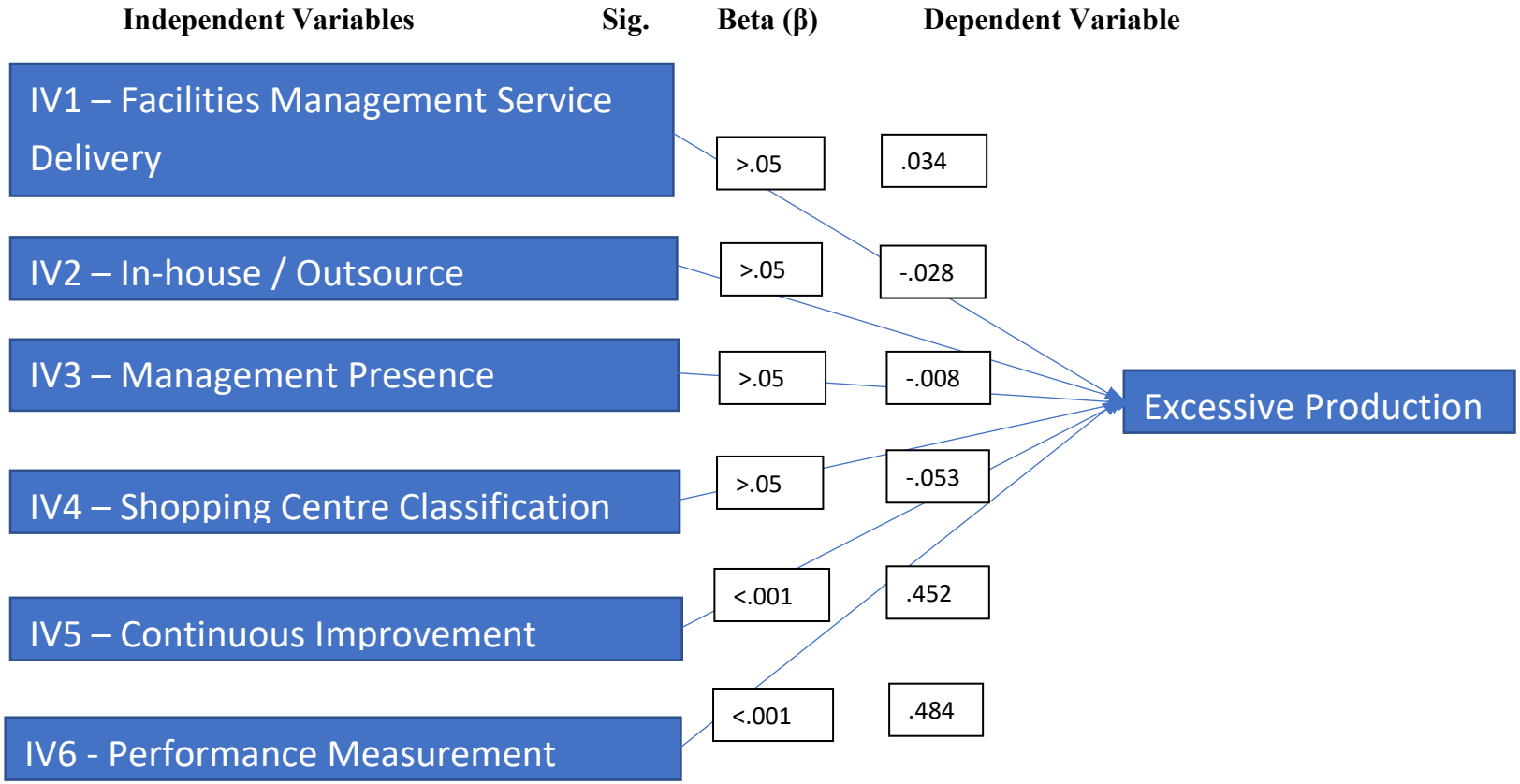
Figure 5.12 – The Final Conceptual Framework Model



Source: Created by the author

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5.7 Chapter Summary

In this Chapter, a variety of statistical test have been discussed, performed, and analysed, in order to address the central aim of the research, the identification and elimination of excessive production within UK shopping centres. To achieve the research objectives, which are to analyse excessive production from the front-line FM cleaning employee's perspective within UK shopping centres, and to establish a conceptual framework that helps to eliminate excessive production in FM cleaning operations within UK shopping centres.

The analysis performed in this chapter has addressed different research issues including data preparation and screening, response rate, missing data, outliers, normality, and linearity. It is from these analyses that the suitability of the data was confirmed, and further advanced analysis could commence to explore reliability and validity of the research questionnaire. The reliability and validity of the research questionnaire is supported through the analysis of the research constructs, face value and content validity, construct validity, convergent validity, and discriminant validity. Furthermore, descriptive statistics, including frequencies, mean and standard deviation, and relative importance index, have been utilised to explain the responses of the questionnaire survey instrument.

Following this, a variety of advanced analytical tests were conducted, from which proof was derived that supported the proposed theoretical framework. Correlation analysis was conducted to test any relationship between the research constructs, from which significant relationships were uncovered. Finally, multiple regression and analysis of variance were conducted to test the proposed theoretical framework, and examine the relationships between the independent variables (facilities management service delivery, in-house/outsource, management presence, shopping centre classification, continuous improvement, & performance measurement) and the dependent variable (excessive production).

Considering the above, this study has statistically assessed the proposed conceptual model, as documented in Table 5.13.

In summary, the results of the data analysis support the suitability, reliability, and validity of the data, leading to appropriate regression analysis to test the research hypotheses. Overall, the

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data analysis supports 3 of the 6 research hypotheses, as shown in Table 5.13, with 3 research hypotheses not supported.

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Table 5.13 – Summary of Research Objectives, Analytical Methods, and Results of the Hypotheses Testing

Objective	Model Testing and Researcg Hypotheses	Analytical Method	Result
To statistically assess the proposed theoretical framework of this study.	The full proposed theoretical framework fits the data gathered for this study.	Regression analysis and analysis of variance (ANOVA).	Supported
To analyse excessive production from the front-line FM cleaning employee's perspective within UK shopping centres.	Hypothesis 1: There will be a significant relationship between Facilities Management service delivery and the level of excessive production within its front line operation.	Regression analysis	Not supported
To analyse excessive production from the front-line FM cleaning employee's perspective within UK shopping centres.	Hypothesis 2: There will not be a significant relationship between in-house/outsource and the level of excessive production within its front line operation.	Regression analysis	Supported
To analyse excessive production from the front-line FM cleaning employee's perspective within UK shopping centres.	Hypothesis 3: There will be a significant relationship between having management presence and the level of excessive production within its front line operation.	Regression analysis	Not supported
To analyse excessive production from the front-line FM cleaning employee's perspective within UK shopping centres.	Hypothesis 4: There will be a significant relationship between shopping centre classification and the level of excessive production within its front line operation.	Regression analysis	Not supported
To analyse excessive production from the front-line FM cleaning employee's perspective within UK shopping centres.	Sub-Hypothesis 4.1: There will be a significant relationship between the regional scheme shopping centre classification and the level of excessive production within its front line operation.	Regression analysis	Not supported
To analyse excessive production from the front-line FM cleaning employee's perspective within UK shopping centres.	Sub-Hypothesis 4.2: There will be a significant relationship between the sub-regional scheme shopping centre classification and the level of excessive production within its front line operation.	Regression analysis	Not supported

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To analyse excessive production from the front-line FM cleaning employee's perspective within UK shopping centres.	Sub-Hypothesis 4.3: There will be a significant relationship between the local scheme shopping centre classification and the level of excessive production within its front line operation.	Regression analysis	Not supported
To analyse excessive production from the front-line FM cleaning employee's perspective within UK shopping centres.	Sub-Hypothesis 4.4: There will be a significant relationship between the neighbourhood scheme shopping centre classification and the level of excessive production within its front line operation.	Regression analysis	Not supported
To analyse excessive production from the front-line FM cleaning employee's perspective within UK shopping centres.	Hypothesis 5: There will be a significant relationship between continuous improvement and the level of excessive production within its front line operation.	Regression analysis	Supported
To analyse excessive production from the front-line FM cleaning employee's perspective within UK shopping centres.	Hypothesis 6: There will be a significant relationship between performance measurement and the level of excessive production within its front line operation.	Regression analysis	Supported

Source: Created by the author

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Chapter Six
Discussion

6.1 Discussion Introduction

The previous Data Analysis Chapter presented and analysed the data for this study followed by a critical discussion. Leading from this, this Chapter provides a discussion specifically based on the existing theory and literature pertaining to the central aim of this study, the identification and elimination of excessive production in FM cleaning operations within UK shopping centres. To achieve this outcome, all six hypotheses are addressed and discussed.

6.2 Discussion of Research Findings

This study has tested the effect of six independent variables: facilities management service delivery, in-house/outsource, management presence, shopping centre classification, continuous improvement, and performance measurement. The dependent variable used in the study was excessive production, which enabled the responses of front-line cleaning service operators to be gained. Based on the above, this section presents the discussion, as the results centre on addressing the six hypotheses. The first hypothesis focused on facilities management service delivery, the second hypothesis focused on in-house or outsourced delivery, the third hypothesis focused on management presence, the fourth hypothesis focused on shopping centre classification, the fifth hypothesis focused on continuous improvement, and the sixth hypothesis focused on performance measurement.

The Data Analysis Chapter showed that there were varied responses to the questions that were developed to explore the six hypotheses, three of which were supported and three of which were not supported. The responses from the survey questionnaire supported that there will not be a significant negative relationship between in-house/outsource and the level of excessive production within its front-line operation, that there will be a significant positive relationship between continuous improvement and the level of excessive production within its front-line operation, and that there will be a significant positive relationship between performance measurement and the level of excessive production within its front-line operation. Alternatively, the responses from the survey questionnaire did not support that there will be a significant negative relationship between facilities management service delivery and the level

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of excessive production within its front-line operation; that there will be a significant positive relationship between having management presence and the level of excessive production within its front-line operation; and that there will be a significant negative relationship between shopping centre classification and the level of excessive production within its front-line operation. This chapter will now proceed to address and discuss these findings.

6.2.1 Hypothesis 1

There is no significant relationship between facilities management service delivery and the level of excessive production within its front-line operation.

The original assumption made in this study is contradicted by the findings. The original assumption was that soft services only service delivery could have an enhanced operational efficiency focus. This assumption was made because the literature suggested that a soft service only service delivery method is not required to diversify into hard FM services. Which utilises specific cleaning operational concepts, such as scheduling and checklists (Walkiden, 1994), to achieve operational efficiency.

From this understanding, the first hypothesis explored the relationship between facilities management service delivery and excessive production in FM cleaning operations within UK shopping centres. The results in Chapter Five reveal that facilities management service delivery has no significant link with excessive production. From the analysis of the responses, the findings show that there was no significant negative relationship between facilities management service delivery and excessive production, meaning that irrespective of soft services only, or TFM service delivery, no variance of excessive production will be present. This signifies that all service delivery methods have scope to improve efficiency in their operations, and by doing this could deliver greater value to the customer, as per the first principle of lean value (Olesen at al., 2015). It can therefore be confirmed that value is not maximised to the customer in FM cleaning operations within UK shopping centres from either FM service delivery method, soft services, or TFM, confirming a gap which was also present within the literature reviewed.

Although soft services only service delivery was found to be the most prominent service delivery from the questionnaire responses with 62.7%, TFM service delivery was also present.

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These results are supportive of the findings of previous studies (Ee, 2015; Shine, 2018; Atkin & Brooks, 2000; Moss et al., 2007; Brown, 1996), which show that soft services only, and TFM service delivery methods are both present in FM operations. The marginal 62.7% majority of soft services only service delivery indicates that there is no clear preference of service delivery method. If one delivery method, either soft services only or TFM, chose to adopt a distinct focus on efficiency, in particular excessive production, it would have a unique selling point, thus providing a reason to choose that service delivery method. This confirmed benefit from an efficiency focus would improve FM cleaning operations throughout the industry, as companies would need an efficient service, in order to be successful with tender bids for contracts.

The TFM service delivery method offers many advantages, including taking responsibility for all facets of FM and offering the possibility to outsource specific elements to specialist contractors for works that are not able to be delivered in-house. This study did however not find operational efficiency to be one such advantage or disadvantage, which could cross all the four shopping centre classifications: regional, scheme, sub-regional scheme, local scheme, and neighbourhood scheme (REVO, 2018). Furthermore, it could not give reasoning for a consensus on FM service delivery that neither option is more or less efficient, thus contradicting the findings of Shine (2018) that all businesses require a range of services in order to operate smoothly, as is offered by TFM (Atkin & Brooks, 2000). This contradiction suggests that irrelevant of size or service delivery elements, an FM operation will be similarly efficient, which could be because there is no specific focus on excessive production attributed to any singular, or grouped, FM service delivery. Thus, all FM service delivery options produce similar levels of operational efficiency. Furthermore, this study contradicts the findings of Ee (2015), Shine (2018), Atkin and Brooks (2000), Moss et al. (2007), and Brown (1996), that soft services only FM service delivery can only be proven to provide an enhanced operational efficiency focus, through scheduling and checklists, whilst not needing to also deliver hard services.

This study found no preference or reasoning in relation to FM service delivery method and excessive production in FM cleaning operations within UK shopping centres. Therefore, in choosing either FM service delivery method of soft services only or TFM, excessive production should not influence the decision of FM service delivery when deciding how to deliver the

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cleaning in a UK shopping centre. As a result, this does not enhance, nor contradict, the determining factors for implementing solutions as proposed by Atkin and Björk (2007) in FM process theory, which could be attributed to no current focus on excessive production being present in FM operations. From this finding it is possible to conclude that when property management award contracts for FM cleaning operations, no consideration is given to excessive production, and likewise, FM cleaning operations do not consider excessive production when developing their tender documents in order to gain cleaning contracts. However, if property management aimed to reduce excessive production within FM cleaning operations, the choice of facilities management service delivery would not influence a change.

The findings of this study do however contradict the FM process theory by Atkin and Björk (2007). The FM process theory clearly shows that at the monitor service provision stage, best value is delivered. Considering the importance of the first principle of lean, value (Olesen et al., 2015), the FM process theory therefore suggests that lean is in operation and that value to the customer has been determined. This study confirms that lean, and in particular a focus on excessive production, is not present in all FM cleaning operations, meaning that the FM process theory does not relate to all FM operations, and that best value is not delivered to the customer. This finding suggests also that property management will potentially be told, based on the FM process theory, that best value will be delivered by the FM operation that they have chosen to provide the cleaning service. This study proves that any such claim would be false, and that best value to the customer across all FM operations could only be achieved through an industry wide focus on lean implementation, and associated standards developed to confirm successful delivery of efficiency in FM cleaning operations within UK shopping centres. Considering that FM is progressing as an industry (Amaratunga, 2001), the efficiency improvement that this study has uncovered confirms a means to progress it further.

Based on the literature review, as presented in Chapter Two, it was hypothesised that there will be a significant relationship between facilities management service delivery and the level excessive production within its front-line operation. This original assumption was not supported as the results show that irrespective of facilities management service delivery of FM cleaning operations in UK shopping centres, the level of excessive production is not negatively affected. This study has therefore proved that neither soft services only nor TFM has a greater, or lesser, focus on identifying and eliminating excessive production in FM cleaning operations

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within UK shopping centres. This does not offer the service provider, nor the property management, with guidance on choosing a more efficient cleaning service delivery. Moreover, this study has proved, by finding no significant negative relationship between facilities management service delivery and excessive production, that efficiency levels will not change irrespective of the number of services that are being provided, either by soft services only, or TFM service delivery.

6.2.2 Hypothesis 2

There is no significant relationship between in-house/outsource and the level of excessive production within its front-line operation.

The original assumptions surrounding in-house/outsource were that FM cleaning operations within UK shopping centres can be delivered by either in-house or outsource, and that neither service sourcing option has a greater focus on operational efficiency. The reviewed literature suggests that both delivery options can compete for FM cleaning contracts, and that each offer both benefit and risk. However, no specific performance difference between the two sourcing options has been documented.

It was from this understanding that the second hypothesis was developed to explore the relationship between in-house/outsource and excessive production in FM cleaning operations within UK shopping centres. The findings in Chapter Five found that in-house/outsource is not particularly linked with excessive production. From the analysis of the responses, it is shown that there is not a significant negative relationship between in-house/outsource and excessive production, meaning that whether delivered in-house or outsourced, no variance of excessive production is predicted. This means that neither a facilities management company, cleaning company, a shopping centre, or an agency, has a lesser focus on providing an efficient FM cleaning operation.

The findings of this study agree with the documented in-house/outsource expectation by Bröchner et al. (2002) by presenting an outsourced percentage between 26% and 75%, and into which knowledge is added by this study, placing FM cleaning operations in UK shopping centres within this outsourced percentage scope at 52%. The choice of either in-house or outsourced service delivery of FM cleaning operations in UK shopping centres is found to be

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near equal at 48% in-house and 52% outsourced, with no apparent preference either way, however, this does offer a variance from medium-sized UK hotels which only outsources 5% (Jones, 2002). This finding offers insight, as it suggests shopping centres and hotels offer varying levels of in-house/outsourced delivery, and further variation is possible in other working environments. This study can therefore generalise that an increase in hotel FM cleaning operations in-house delivery would not affect the level of excessive production realised. The findings of this study however do not provide insight into why either sourcing option would be chosen, and therefore cannot reject or confirm any of the 39 risk factors of the outsourcing of facilities management that have been documented by Ikedashi et al. (2012). Finding a significant negative relationship between in-house/outsource and excessive production would have signified an efficiency risk when choosing a sourcing option, thus increasing and enhancing the list provided by Ikedashi et al. (2012). However, this has not been found, and therefore cannot contribute to, or contest, this current knowledge.

Considering that no preference of either in-house or outsourced FM cleaning service delivery has been found, and finding a non-significant negative relationship between in-house/outsource and excessive production, this study does not offer a quantitative measure to support the suggestion that in-house staff are excellent workers (Sambrowski, 2016). Furthermore, it cannot be confirmed whether in-house staff excellence can be enhanced through a greater understanding of excessive production, however, the work by McWhorter (2017) and Sweeney (2017) suggests that staff output would be improved through a focus on efficiency, and therefore excessive production, and as a result staff excellence would be enhanced.

This finding from the second hypothesis does however align with the reviewed literature of Bröchner et al. (2002), Jones (2002), Knotter (2017), Jiménez et al. (2006), Sambrowski (2016) by providing no consensus in choice of in-house or outsourced cleaning service provider. Although this result meets the findings from the secondary data analysis, it also provides a further layer of understanding by relating specifically to FM cleaning operations in UK shopping centres. From this understanding, this study confirms that the level of efficiency provided by FM cleaning service operators does not change whether employed by the shopping centre or an independent cleaning service provider. Therefore, no efficiency advantage can be claimed by either sourcing option, in-house or outsourced, and contests the findings by Pitt and

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Musa (2009) by rejecting the idea that FM is on the same management level as property, tenant mix, and potential tenants.

Considering that both in-house and outsourced FM cleaning operations can compete for contracts (Atkin & Björk, 2007), the findings of this study suggest that both options have a near equal chance of winning FM cleaning operations at UK shopping centres. However, this does not contribute a definitive reason for choosing a sourcing option, as identified as a gap in knowledge in the literature reviewed. This advances knowledge for both FM cleaning service providers and property management. In direct relation to excessive production, FM cleaning service providers cannot claim during contract tenders that efficiency is improved by outsourcing, and property management can consider both sourcing options as equal value, based on efficiency. Since FM service plays such an important role in the overall service performance of a shopping centre (Hui et al., 2013), any improved FM cleaning operational efficiency would enhance the shopping centre performance. If independent cleaning providers focused on improving efficiency, they would hold a distinct advantage over in-house provided FM cleaning services, which would potentially enhance their desirability and increase the current 52% majority of FM cleaning operations outsourced in UK shopping centres, as found by this study.

From the literature review based on Bröchner et al. (2002), Jones (2002), Knotter (2017), Jiménez et al. (2006), and Sambrowski (2016), as shown in Chapter Two, it was hypothesised that there will not be a significant relationship between in-house/outsource and the level of excessive production within its front-line operation. This was supported as the results show that irrespective of in-house or outsourced FM cleaning operations in UK shopping centres, the level of excessive production is not negatively affected. This study has hereby proved that neither in-house nor outsource has a greater, or lesser, focus on identifying and eliminating excessive production in FM cleaning operations within UK shopping centres. This study has found that a near equal split of in-house and outsourced FM cleaning operations within UK shopping centres and suggests that a focus on operational efficiency would provide a distinct advantage, which would help achieve the success outcomes detailed by Evans (2019), and reduce the chance for longer-term contract implications which need to be considered before signing any outsourcing agreement (Johnson, 1997). This enhanced trust between the property management company and the FM cleaning service provider show that the operation is efficient

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and could lead to longer contract agreements. This would reduce the tendering and mobilisation costs for the FM cleaning, and as a result, increase profits.

6.2.3 Hypothesis 3

There is no significant relationship between having a management presence and the level of excessive production within its front-line operation.

The original assumption made regarding a management presence for an FM cleaning operation within UK shopping centres was that a facilities manager is guided by a set of specific operational objectives that could encompass minimising excessive production with the aim of achieving best cost service delivery, even if not known by the facilities manager. It was also assumed that a manager at a shopping centre would be closer to the FM cleaning operation than a manager working remotely, and therefore perfectly placed to positively influence the level of efficiency within the service.

From this, the third hypothesis was developed to explore the relationship between management presence and excessive production in FM cleaning operations within UK shopping centres. The results in Chapter Five reveal that management presence is not particularly linked with excessive production. From the analysis of the responses, it is shown that there is not a significant positive relationship between having management presence and excessive production, meaning that irrespective of a management presence or no management presence, no variance of excessive production is predicted. In consideration of the findings of Pitt and Musa (2009) that FM report directly into the centre management teams, this finding suggests that no greater operating efficiency is achieved from an onsite facilities manager, and therefore provides reasoning for remote management which could reduce costs, and potentially personnel. This is because a facilities manager could oversee FM cleaning operations in multiple UK shopping centres, whilst providing an equally efficient service delivery. This reduction in cost overhead would result in increased profits.

Contrary to this, and supporting the argument by Wauters (2005) that facilities managers need to add value to the organisational value chain, the large majority of management presence at 91.2% found in the result show the importance of the facilities manager to the FM cleaning operation at a UK shopping centre. This strong level of management presence allows the

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facilities manager to have full visibility of the operation along with a focus on cost, this being stated as the most common driver by Hodges and Sekula (2013). Further reasoning is provided for the strong management presence, as the importance of direct impact on the FM cleaning operation that the facilities managers have when based at the shopping centre (Alexander, 2003).

Specific to operations in UK shopping centres, this finding offers insight to both FM cleaning service providers and property management. FM cleaning service providers can assume that an onsite management presence is both normal and desired, and property management needs strong reasoning to choose a FM service provider that does not have onsite management presence. Considering the suggestion by Wauters (2005) that facilities managers need to add value to the organisation value chain, and the finding of this study that 91.2% of the surveyed shopping centres have an onsite facilities manager, it could be assumed that value would be delivered to the shopping centre. However, in order to understand what value is to the shopping centre requires achievement of the first principle of lean, value (Olesen et al., 2015). With the shopping centres containing a facilities manager providing the same level of excessive production as those without, it can be concluded that an onsite facilities manager has a greater understanding of value to the customer than a facilities manager based at another location (Pitt & Musa, 2009). On the other hand, it could also be expected that as an onsite facilities manager is working alongside the customer onsite, and would therefore have better communications, he could have a greater understanding of what is required, the value.

A significant positive relationship between having management presence and the level of excessive production within its front-line operation was hypothesised, based on the findings from the literature review in Chapter Two. This was not supported as the level of excessive production is not positively affected by having an onsite facilities manager, thus the level of excessive production is not proven to be reduced by having an onsite facilities manager. Therefore, this study has proved that a focus needs to be directed to the front-line service operators in order to identify and eliminate excessive production, and not solely expect the presence of a facilities manager to deliver an efficiency improvement. It is however the facilities managers that need to add value to the organisational value chain (Wauters, 2005).

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6.2.4 Hypothesis 4

There is no significant relationship between shopping centre classification and the level of excessive production within its front-line operation.

Sub Hypothesis 4.1: *There will be a significant relationship between the regional scheme shopping centre classification and the level of excessive production within its front-line operation.*

Sub Hypothesis 4.2: *There will be a significant relationship between the sub-regional shopping centre classification and the level of excessive production within its front-line operation.*

Sub Hypothesis 4.3: T*here will be a significant relationship between the local scheme shopping centre classification and the level of excessive production within its front-line operation.*

Sub Hypothesis 4.4: *There will be a significant relationship between the neighbourhood scheme shopping centre classification and the level of excessive production within its front-line operation.*

This study assumed that shopping centre classification and the level of excessive production produced by different shopping centre classifications will provide varying levels of excessive production, which was represented by an overall UK shopping centre classification hypothesis and four sub-hypotheses. This was based on the knowledge that shopping centre classifications vary by many aspects, such as definition/concept, characteristics, typical numbers of anchors, size in sq. ft., and typical catchment area/travel time (REVO, 2018). This study assumed that larger shopping centres will contain higher levels of excessive production due to providing a more complex and larger operation.

This assumption helped shape the fourth hypothesis, which explored the relationship between shopping centre classification and excessive production in FM cleaning operations within UK shopping centres. The results in Chapter Five reveal that shopping centre classification is not particularly linked to excessive production. This finding is contrary to that offered by BICSc

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(2019) that the sq. ft. could present a variation in the standard achieved for a cleaning operation, which related specifically in this study to excessive production. Therefore, the findings in this study do not support this theory. This means that excessive production is not affected by the sq. ft. of a FM cleaning operation within UK shopping centres, and demonstrates that larger operations are no more, or less, efficient, in regards to excessive production, than smaller operations. This confirms that irrespective of the size of a shopping centre, the cleaning service is operated in a similar way, and that there is no greater focus on efficiency in FM cleaning operations at prime regional scheme shopping centres where the cost for retail unit rental is much higher than at smaller neighbourhood scheme shopping centres. In considering that the cleaning industry operates in many different guises and for varying purposes (Djellal, 2002; Creighton, 2007), this finding confirms that all shopping centre classifications are cleaned for the same purpose, and in the same way, irrespective of the different characteristics.

Similarly, REVO (2018), whose classifications were utilised as an independent variable in this study, suggests that other unique characteristics, such as definition/concept, characteristics, typical numbers of anchors, and typical catchment area/travel time, that define each of the four shopping centre classifications could present a variation in operations. This study however contests this claim when attributed to FM cleaning operations within UK shopping centres. This study confirms that neither definition/concept, characteristics, typical numbers of anchors, or typical catchment area/travel time, affect the level of excessive production. This indicates that cleaning efficiency is not more successfully managed in prime regional shopping centres than in small neighbourhood shopping centres. Moreover, this suggests that FM cleaning operations perform to a standardised method across all four shopping centre classifications, regional scheme, sub-regional scheme, local scheme, and neighbourhood scheme, which contain the same levels of inefficiency. Considering this, introducing an efficiency focus to the standardised method would improve efficiency across all UK shopping centres, irrespective of size. Such a change to cleaning practice aligns with Djellel's (2002) suggestion that the cleaning industry is undergoing major changes to scope.

The classifications do however differ in many ways. The four REVO (2018) classifications range from a regional scheme that has typically three or more anchor stores, containing a selection of flagship stores with long dwell times, high footfall, and often used for experiential visits and a high degree of discretionary spend. Representing smaller shopping centres is the

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neighbourhood scheme that is easily accessible, serving the daily needs of the direct local catchment, with convenience occupiers, and is highly likely to be underpinned by a food store, and used throughout the week. This suggested variation was however not proven in the results. Whether a FM cleaning operation in a UK shopping centre is required to service high footfall areas or a local catchment, areas with flagship stores or convenience occupiers, the level of excessive production is not affected. This finding does however not reject the claim by Jiménez et al. (2006) that cleanliness is directly tied to customer satisfaction and performance quality levels. It is possible that due to the customer related environment that a UK shopping centre represents, the FM cleaning operation makes every effort to overclean, and therefore, continually delivers excessive production. Adding to Carreira's (2005) proposal that overcleaning does in fact represent excessive production, the finding in this study confirms that overcleaning is present within FM cleaning operations within UK shopping centres. The result of this is that efforts are being made by the FM cleaning operations and its front-line employees that are unnecessary and are non-value-added activities, and therefore need to be eliminated (McWhorter, 2017). Failure to remove these non-value-added activities will mean that FM cleaning operations within UK shopping centres will continue to make efforts that cost, either through front-line employees' wages or electricity usage that adds no value to the customer, thus not conforming to the first principle of lean, value (Olesen et al., 2015).

From the literature review based on BICSc (2019), Carreira (2005), Creighton (2007), Djellal, (2002), Jiménez et al. (2006), and REVO (2018), a significant relationship between shopping centre classification and the level of excessive production within its front-line operation was hypothesised. This assertion was not supported in the findings of this study, as the level of excessive production is not affected by shopping centre classification.

6.2.5 Hypothesis 5

There is a significant relationship between continuous improvement and the level of excessive production within its front-line operation.

This study assumed a positive relationship regarding continuous improvement and the level of excessive production in FM cleaning operations within UK shopping centres. Since continuous improvement is a direct derivative of lean, and aims to change processes and operations for the better, it was assumed that if a cleaning operation utilised continuous improvement it would

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have a lower level of excessive production than a cleaning operation that did not utilise continuous improvement. The fifth hypothesis recognises this. The fifth hypothesis explored the relationship between continuous improvement and excessive production in FM cleaning operations within UK shopping centres. The findings in Chapter Five found that continuous improvement is particularly linked with excessive production. From the analysis of the responses, it is shown that there is a significant positive relationship between continuous improvement and excessive production, meaning that lower excessive production can be predicted in a UK shopping centre cleaning operation that utilises continuous improvement.

A clear connection between CI and excessive production, and waste elimination in general, was found in the literature reviewed (McWhorter, 2017), and furthermore was supported by the findings of this study by proving a significant positive relationship. This positive relationship confirms that an FM cleaning operation within a UK shopping centre that utilises CI will have less excessive production. Interestingly, this contributes towards the argument documented by Hasle et al. (2012) that a division exists between lean supporters and objectors, with the supporters arguing that lean is not merely a production method, but a way of thinking that raises efficiency and rejects waste. The results of this study support this stance that lean, and specifically waste elimination, is transferable into FM cleaning operations. This finding adds to current knowledge, as it confirms that the benefits offered through waste elimination are available in FM cleaning operations within UK shopping centres, which aligns with the first lean principle of value (Olesen et al., 2015). Therefore, the opportunity for increased operational efficiency that a focus on excessive production offers (Carreira, 2005), is available within this working environment. Without the central aim of this study, the identification and elimination of excessive production in FM cleaning operations within UK shopping centres could not be achieved, as excessive production cannot be identified in an environment in which it does not exist.

Progressing this understanding of lean, the results of this study progress the current knowledge that lean is actually at an advanced stage in FM cleaning operations within UK shopping centres. In relation to the five key principles of lean model by Olesen et al. (2015), value, value stream, flow, pull, and perfection, as shown in Figure 2.1 in Chapter Two, the FM cleaning operations in UK shopping centres is operating at step two of the five key principles of lean, which is the value stream step. This has been achieved through CI and waste elimination, as

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proposed by Womack and Jones (1996), and are the two activities that make up the core of lean thinking. Therefore, this study has confirmed that lean thinking is present in FM cleaning operations in UK shopping centres. This finding adds to current knowledge as it confirms that the benefits offered through lean thinking are available in FM cleaning operations within UK shopping centres, and adds to the suggestion by Sweeney (2017) that companies need to adopt change in order to maintain a flexible position in the industry. Continuous improvement utilisation is the tool that this study confirms can be implemented to enable this change in FM cleaning operations within UK shopping centres.

To strengthen this understanding, the highest mean scoring CI questionnaire item "the cleaning operation is flexible in trying to meet customers' specific needs," demonstrates an understanding of the first lean principle of value (Olesen et al., 2015), as set out in Figure 2.1 in Chapter Two. An operation can only be flexible in trying to meet customers' specific needs if it identifies and creates products or services that add value to a client's objectives (Olesen et al., 2015). This finding is essential for both FM cleaning service providers and property management. Specific to UK shopping centres, FM cleaning service providers can claim that in general they are flexible in meeting the needs of the customer, and property management can expect that FM cleaning service providers should be flexible in meeting their needs. This again relates to the suggestion by Sweeney (2017) that companies need to adopt change in order to maintain a flexible position in the industry. Flexibility in the context of this study could be a change in characteristics of the shopping centre (REVO, 2018), for example an addition of an entertainment venue, with the FM cleaning provider amending their working operation to incorporate the augmented and different workload. To achieve this change to operations, CI could be utilised. Moreover, as proved by this study, with utilisation of CI comes an improvement regarding excessive production.

This study has also found that if an FM cleaning operation within UK shopping centres utilises CI, it will be more efficient than one that does not. This finding supports Sweeney's (2017) proposal that operations that adopt a Kaizen and CI culture could distinguish themselves from operations that do not, by an efficiency focus. This is proven by this study as CI utilisation has a positive impact on excessive production. This finding guides FM cleaning service providers to implement and utilise CI in order to improve efficiency.

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The findings of the literature review in Chapter Two based on Bateman et al. (2013), Hasle et al. (2012), McWhorter (2017), Olesen et al. (2015), Sweeney (2017), Womack and Jones (1996), concluded that a significant positive relationship between continuous improvement and the level of excessive production within its front-line operation would be found. This was supported as the level of excessive production is positively affected by continuous improvement. It can therefore be concluded that excessive production can be reduced by implementing and utilising CI in FM cleaning operations within UK shopping centres. This adds to current knowledge as it justifies a reason for utilising CI in an environment outside manufacturing and production, which is the setting for the key work on the subject (McWhorter, 2017; Hines et al., 1998; Sayer & Williams, 2012; Sweeney, 2017). This connection between CI and waste elimination advances the work by Womack and Jones (1996) as it confirms the connection in an FM environment, namely, FM cleaning operations in UK shopping centres.

6.2.6 Hypothesis 6

There is a significant relationship between performance measurement and the level of excessive production within its front-line operation.

This study assumed that performance measurement would impact on the level of excessive production in FM cleaning operations within UK shopping centres. Performance measurement is related to FM customer base, FM internal processes, FM learning and growth, and FM financial status, from both academic and management perspectives (Amaratunga, 2001). Therefore, it was assumed that the utilisation of performance improvement in FM cleaning operations within UK shopping centres would lessen the level of excessive production.

The sixth hypothesis explored the relationship between performance measurement and excessive production in FM cleaning operations within UK shopping centres. The results in Chapter Five reveal that performance measurement is particularly linked with excessive production. From the analysis of the responses, it is shown that there is a significant positive relationship between performance measurement and excessive production, meaning that lower excessive production can be predicted in a UK shopping centre cleaning operation that utilises performance measurement. This informs all FM cleaning operations within UK shopping centres in that with the utilisation of performance measurement, a more efficient operation will

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be achieved. This will prove to property management that the cleaning service they have chosen is providing value for money and not wasting resources unnecessarily, which will potentially enhance the possibility of contract extension, and possible additional works, thus increasing profits for themselves, and for the cleaning provider.

The relationship between performance measurement and excessive production, and lean in general, found in this study supports the reviewed literature by Amaratunga (2001). Amaratunga (2001) found that any improvement in FM is required to firstly provide improvement in quality and time, before progressing towards lower cost and service efficiency, which is achievable through an enhanced focus on excessive production (McWhorter, 2017). The results of this study support this by excessive production representing the most serious form of Muda and a significant move towards service efficiency (Kiff, 2000; Sweeney, 2017), and performance measurement is now proved to be a means in which to achieve efficiency in FM cleaning operations within UK shopping centres. This finding provides insight for FM cleaning service providers, as it guides them towards efficiency improvement with the use of performance measurement, and therefore progresses the knowledge of performance measurement commenced by Amaratunga (2001).

Amaratunga's (2001) theory relating to FM performance measurement addresses core performance measurement principles, including FM customer base, FM internal processes, FM learning and growth, and FM financial status, to propose a varied and enhanced focus on performance measurement in FM. This performance measurement focus is confirmed by this study to be in FM cleaning operations within UK shopping centres through a strong construct mean score of 3.93, thus finding that cleaning operations identify and find solutions to problems.

Furthermore, there has been an overall increase in effectiveness and efficiency, with an increase in customer focus, as well as an increase in employee satisfaction. Furthermore, the relevance of cleaning for the shopping centre has increased. These findings provide informed guidance for both FM cleaning service providers and property management. Specific for UK shopping centres, FM cleaning service providers need to maintain a performance measurement focus to continue to realise the strong mean score related achievements, and property management can expect a FM cleaning service provider to deliver such achievements.

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From the literature review, a significant relationship between performance measurement and the level of excessive production within its front-line operation was hypothesised. This was supported by the findings of this study as the level of excessive production is positively affected by performance measurement. It can therefore be concluded that excessive production can be reduced by implementing and utilising performance measurement in FM cleaning operations within UK shopping centres. Expanding on the work by Amaratunga (2001), this study has shown that a focus on excessive production provides efficiency improvement and could be added to the core performance measurement principles already in place, such as FM customer base, FM internal processes, FM learning and growth, and FM financial status. This enhancement of knowledge in the benefits possible within an FM operation also provides guidance to facilities managers that are challenged to add value to the organisational value chain (Wauters, 2005). Improving the operating efficiency of the FM cleaning operations within UK shopping centres would provide the value that the facilities managers need to succeed, complying with the first lean principle, value (Olesen et al., 2015).

6.3 – Key Findings and Synergy

This section sets out the key findings from the literature review and the synergy with the findings from this study. This is shown in Table 6.1, which will contribute to the following Chapter, the Conclusions.

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Table 6.1 – Key Authors Found in the Literature Review with Synergy

Year	Author/s	Study Title	Key Findings	Synergy
1989	Allen	Accommodation and Cleaning Services: Volume 1: Operations	The types of standards and services, relating to the cleaning industry, required in specific situations, providing an understanding of the types of services which can be provided, and the application of the methods of work planning.	The cleaning work planning suggested to deliver the types of standards and services suggested to be required to need knowledge by a supervisor or manager does not relate to efficiency as onsite management presence does not improve excessive production.
1989	Wilson	Specifying Cleaning Services	Certain cleaning standards need to be achieved, cleaning scheduling, and a subsequent breakdown of cleaning tasks, is documented as a means to not waste time and energy, but ensure that no uncompleted tasks are left. Further requirements include legal requirements, and details of the premises to be cleaned, including floor areas, finishes, fittings and types of accommodation and schedule of tasks.	There is no evidence found by this study to suggest that cleaning scheduling is treated any differently when applying it to different UK shopping centre classifications, meaning that floor area size is not considered, contrary to the suggestion by Wilson (1989).
1992	Finch	Facilities Management at the Crossroads	A facilities manager looks after four different stakeholders and shareholders, the shareholders, the employees, the customers, and the community. Argues that due to property managers no longer being able to assume that properties with the right location will sustain their value, a growing awareness that a permanent management structure for coping with change in the built environment is needed, which was coined FM.	There is no evidence found by this study to imply that facilities managers focus on efficiency in their respective operations. Furthermore, irrelevant of a permanent management structure onsite, or not, the level of excessive production was not affected.

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Year	Author/s	Study Title	Key Findings	Synergy
1993	Robson	Cleaning Services: Making a Clean Sweep	Multi-service contracts require an on-site manager in each respective building, being responsible for services including cleaning.	There is no evidence found by this study to imply that facilities managers focus on efficiency in their respective operations. This study finds also, contrary to Robson (1993), that FM services may not need an onsite facilities manager in each building, especially when considering excessive production, as it does not impact the output.
1994	Walkiden	Contract Cleaning: Starting and Running Your Own Business	Generalises a cleaning schedule divided by sections into daily tasks (offices), daily tasks (toilets), daily tasks (canteen), weekly tasks (general) and monthly tasks.	This scheduling maybe undertaken in FM cleaning operations within UK shopping centres, however, there is no benefit regarding efficiency from operating as soft services only or TFM as service delivery methods.
1996	Brown	Keeping Score: Using the Right Metrics to Drive World Class Performance	Presents a performance process framework that looks to elucidate the journey from inputs to outcomes. The model commences with input measures and progresses through process measures and output measures before concluding with outcome measures.	This study cannot prove any difference between soft services only and TFM in relation to efficiency. Therefore, whether either service deliver option has more effective use of inputs and outcomes remains unclear, particularly regarding excessive production within its respective FM cleaning operations.

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Year	Author/s	Study Title	Key Findings	Synergy
1996	Womack and Jones	Lean Thinking: Banish Waste and Create Wealth in Your Corporation	Offers an antidote to waste, lean thinking, which was promoted as a way to specify value, line up value-creating actions in the best sequence, conduct activities without interruption when someone requests them, and perform them more effectively. For example, waiting in a check-in, waiting in a customs line, and receiving the tickets by mail. It is documented that studied holiday journey took 13 hours and consisted of a total of 23 processing steps, many of which are incumbent, as many firms are involved, and usually contributing to only one step in the process.	This study has confirmed that lean is present within FM cleaning operations within UK shopping centres. This has been demonstrated as if CI, a derivative of lean and lean thinking, is in utilisation the level of excessive production is reduced. It is with this that the FM operation has improved efficiency
1997	Johnson	Outsourcing: In Brief	Presents that no outsourcing agreement should be signed before consideration is given to the longer-term implications.	This caution given to choosing outsourcing is not replicated if concerned with efficiency in FM cleaning operations within UK shopping centres. This study proves that excessive production is not influenced by the choice of either sourcing option.
1998	Hines et al.	Value Stream Management	Describes waste removal from the supply chain as perhaps the most important task facing the modern logistician. The overall approach requires the manager to identify a series of wastes that exist within the supply chain and to choose, apply and analyse the output from a series from chosen appropriate contingent tools.	Although this study cannot prove that facilities managers have identified wastes that exist within their supply chain, this study proves that with the implementation of CI, at least one waste, excessive production, is reduced.

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Year	Author/s	Study Title	Key Findings	Synergy
2000	Atkin and Brooks	Total Facilities Management. (3rd Ed.)	Presents the possibility to outsource, or subcontract, specialist elements of FM delivery, and that since its inception, FM has emerged as its own service sector, establishing a new professional discipline operating with its own codes, standards, and technical vocabulary.	Although no variance of excessive production was found in this study between soft services only and TFM service delivery, this study confirms that both service options are present in FM cleaning operations within UK shopping centres. Soft services only found to be more prominent at 62.7%, and TFM less so at 37.3%.
2000	Kiff	The Lean Dealership: A Vision for the Future: From Hunting to Farming	Describes excessive production as the most serious waste, whilst providing two separate examples to define excessive production waste.	Although a significant positive relationship has been proven between performance measurement and excessive production, this study does find the relevance of excessive production in FM. However, this does not confirm excessive production as the 'most serious waste'.
2001	Amaratunga	Theory Building in Facilities Management Performance Measurement: Application of Some Core Performance Measurement and Management Principles	Explains that performance measurement has become a popular topic with both a theoretical and practical focus, documenting how enabling of performance measurement is required in many planning and control tools, including CI, with a direct relationship to FM.	This study supports this proposal that performance measurement is a popular topic by proving that it is present also in FM cleaning operations within UK shopping centres. Furthermore, is a FM cleaning operation utilising CI, it can expect to have reduced excessive production, and therefore a more efficient operation.

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Year	Author/s	Study Title	Key Findings	Synergy
2002	Bröchner et al.	Outsourcing Facilities Management in the Process Industry: A Comparison of Swedish and UK Patterns	The cleaning service in particular was found to be outsourced on 26%-75% of occasions and considered as intermediate degree, as opposed to low degree (0%-25%) or high degree (76%-100%).	The outsourcing percentage of FM cleaning operations within UK shopping centres is within the range set out by Bröchner et al. (2002), however, can be confirmed more precisely at 52%.
2002	Djellal	Innovation Trajectories and Employment in the Cleaning Industry	The cleaning industry, as a service industry, is undergoing major changes to scope and increasing use of information technologies, and was initially not computerised. Describes cleaning as "a service industry whose final outcome is the removal of dirt and grime from the medium in which the service is being delivered."	There is no indication from the findings of this study that a change to sq. ft. or amenities for cleaning changes the level of excessive production delivered. This is irrelevant of technology onsite, and focuses on the final outcome of the cleaning and not how the efficiency of the cleaning could be improved. The UK shopping centre classification does not impact the level of efficiency produced.
2002	Fenix	Commercial and Residential Cleaning Services: A Resource Guide to Developing and Maintaining Your Own Janitorial or Home Cleaning Business	Management and supervision require a wide range of knowledge and skills. states that through consistent and efficient execution of services profit margins can be maintained. Consistency and efficiency is further presented as essential components of good cleaning practices that combined with specific knowledge of cleaning materials and equipment will prevent companies from losing contracts. This is achieved also through management and supervision, which are suggested require a wide range of knowledge and skills.	Performance measurement has been proven by this study to reduce the level of excessive production delivered. Which can be achieved through good working practices, as presented by Fenix (2002).

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Year	Author/s	Study Title	Key Findings	Synergy
2002	Jones	Facilities Management in Medium-Sized UK Hotels	5% outsourcing of cleaning in UK medium-sized hotels, offering possible benefits of continuing advancing facilities, concluding that efficient FM holds the potential for increasing profitability, improving reputation, safety, cleanliness, comfort, and the working environment.	The outsourcing percentage of FM cleaning operations within UK shopping centres is higher than the 5% specified by Jones (2002), at 52%. This shows a variance between sectors, in this instance FM and hotels, and demonstrates no consensus throughout industries.
2003	Alexander	A Strategy for Facilities Management	FM is a rapidly developing and growing discipline, vocation, and business service, finding that early developments have been made. The skilled facilities manager identifies processes that allow an organisation to sustain a quality operating environment and services to meet strategic needs, and at best cost, to which the facilities manager could contribute to achieving set targets by improving efficiency by eliminating excessive production.	The findings of this study do not support this assertion by Alexander (2003) that a skilled facilities manager identifies processes that allow an organisation to sustain a quality operating environment and services to meet strategic needs, and at best cost. This study confirms that having a facilities manager onsite does not reduce the level of excessive production, and therefore does not improve efficiency.
2003	Lynn	Start Your Own Cleaning Service: Your Step-by-Step Guide to Success	In addition to using cleaning scheduling, cleaning teams should be allowed flexibility and clean in an efficient and logical way, and travel time between cleaning jobs can be reduced by scheduling. Suggests that teams should be allowed flexibility, however, advises that when allowing flexibility, the teams should remain cleaning in an efficient and logical way.	This study has proven a significant positive relationship between performance measurement and excessive production. The performance measurement of cleaning activities allows for the operation to be more efficient in its service delivery, in agreement with Lynn (2003).

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Year	Author/s	Study Title	Key Findings	Synergy
2005	Carreira	Lean Manufacturing That Works: Powerful Tools for Dramatically Reducing Waste and Maximising Profits	Excessive production is producing more than you need to produce. Documents the steps required for both an oyster sandwich shop and a manufacturing operation, and the activities that can be carried out to eliminate excessive production. The only variations between the processes are specific to the intended product, the purchase or lease of tools and equipment, and the purchase of raw materials. Other than these, the process steps for both are identical, highlighting transferability between industries and services.	This is supported through the findings of this study confirming that CI in FM cleaning operations within UK shopping centres reduces the level of excessive production, and therefore improves operating efficiency. This agrees with Carreira's (2005) claim that there is transferability between industries and services.
2005	Taj and Berro	Application of Constrained Management and Lean Manufacturing in Developing Best Practices for Productivity Improvement in an Auto-Assembly Plant	The lean approach is focused on systematically reducing waste in the value stream, with the waste elimination process including not only defective products but also defective work and activities, warning that results may not be applicable to other industries.	The findings of this study support that the utilisation of lean, and in particular CI, reduce waste. This is demonstrated by this study confirming that CI reduces excessive, and therefore improves efficiency, in FM cleaning operations within UK shopping centres. However, this also challenges the stance by Taj and Berro (2005) in warning that results may not be applicable to other industries. The results are clearly applicable in FM, as confirmed by this study.

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Year	Author/s	Study Title	Key Findings	Synergy
2005	Then	A Proactive Property Management Model that Integrates Real Estate Provision and Facilities Services Management	FM is multi-faceted and operates in many different locations and environments. FM can be operationally delivered in many guises, with the approach determined by the processes required to meet the business demands.	Although no variance of excessive production was found in this study between soft services only and TFM service delivery, this study confirms that both service options are present in FM cleaning operations within UK shopping centres. Soft services only found to be more prominent at 62.7%, and TFM less so at 37.3%.
2005	Wauters	The Added Value of Facilities Management: Benchmarking Work Processes	Facilities managers need to add value to the organisational value chain, highlighting a realisation that the discipline of FM encompasses much more than costs alone.	This study can confirm that having a facilities manager present onsite does not reduce the level of excessive production in FM cleaning operations within UK shopping centres. Even though they are close to the team working around them, and close to the client to which they must report performance, and not only cost alone, as presented by Wauters (2005).
2006	Jiménez et al.	Contracting Cleaning Services in a European Public Underground Transportation Company with the Aid of a DSS	Cleanliness is directly tied to customer satisfaction and performance quality levels for the public transportation services, recognising that when done well, cleaning is often taken for granted, and when done poorly, it is immediately noticed.	This study confirms that performance measurement is utilised in FM cleaning operations within UK shopping centres, and that it reduces the level of excessive production, thus improving operating efficiency. This supports the proposal by Jiménez et al. (2006) that cleanliness is directly tied to performance quality levels.

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Year	Author/s	Study Title	Key Findings	Synergy
2007	Atkin and Björk	Understanding the Context for Best Practice Facilities Management from the Client's Perspective	Present a model for 'implementation solutions to FM needs' which shows that irrespective of in-house or outsourced services, there is a need for service needs specifications and service level agreements. Connect the lack of awareness, misconception and immaturity to the limited progress that has been made to understand the interrelationships and dynamics of FM processes.	This study has proven that irrelevant of in-house or outsourced service delivery, no variance in excessive production can be expected. This supports Atkin and Björk (2007) that both in-house and outsourced services share the need for specifications and service level agreements, however, does not provide an efficiency advantage for either sourcing option.
2007	Creighton	Snapshot of the Cleaning Industry	The cleaning industry is busy, and as a mature industry, the cleaning industry has made evolutionary changes through adopting technology to its tasks.	This study cannot confirm whether advanced technology is utilised is different UK shopping centre classifications, or that the cleaning industry has improved operating efficiency achieved through evolutionary changes, as proposed by Creighton (2007).
2007	Manuele	Lean Concepts: Opportunities for Safety Professionals	Connects the lack of awareness, misconception and immaturity to the limited progress that has been made to understand the interrelationships and dynamics of FM processes. Found that the work contained few references to accidents as a waste factor. This omission represents both a problem and an opportunity to make their presence felt, and that progressive safety professionals will react to this shortcoming by educating management on the advantage of including safety considerations as the lean process is applied.	The stance by Manuele (2007) that there is a lack of awareness, misconception and immaturity to the limited progress that has been made to understand the interrelationships and dynamics of FM processes suggests that onsite management presence would have an advantage through having a closer relationship with the property management team. This is however not supported by the findings of this study, as having onsite management presence does not reduce excessive production, and therefore not improve operating efficiency, indicting no enhanced understanding of the interrelationships onsite.

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Year	Author/s	Study Title	Key Findings	Synergy
2007	Moss et el.	Performance Measurement Action Research	Presents a framework that shows the importance of balanced performance measures, which should cover all aspects of inputs, process, outputs, and outcomes, all of which are present in FM.	This study confirms that irrelevant of any framework or balance performance to cover all aspects of inputs, process, outputs, and outcomes measures in place, when delivered by soft services only or TFM, the level of excessive production in the FM cleaning operation within UK shopping centres will be the same.
2008	Piercy and Rich	Lean Transformation in the Pure Service Environment: The Case of the Call Service Centre	Offer comparisons of improvements to management systems before and after lean implementation. Performance expectations improved from time standards established per task with defined routines to meeting customer needs effectively and reducing system failures. Also explains that as failure demand reduces, employees were able to concentrate on the management of the process cycle, improving productivity.	This study confirms that facilities managers that are onsite and those that work remotely achieve the same level of excessive production in their FM cleaning operation within UK shopping centres. Considering this, and the stance by Piercy and Rich (2008), a facilities manager can concentrate on the management of the process cycle, and improve productivity equally from working onsite a working remotely.
2009	Atkin and Brooks	Total Facilities Management. (3rd Ed.)	FM has emerged as its own service sector, establishing a new professional discipline operating with its own codes, standards, and technical vocabulary. Documents potential confusion regarding terminology, explaining that the word ‘facility’ is used in some parts of the world instead of ‘facilities’, recognising it as the same and the use of either word as a matter of individual preference.	The findings of this study confirm that facilities managers operate an equally efficient FM cleaning operation within a UK shopping centres either from working onsite or working remotely. This finding confirms also, in relation to Atkin and Brooks (2009), that the professional discipline of FM does not improve operating efficiency by working close to the operation.

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Year	Author/s	Study Title	Key Findings	Synergy
2009	Narusawa and shook	Kaizen Express: Fundamentals for Your Lean Journey	Breaks down efficiency into two categories, apparent efficiency, and true efficiency. Apparent efficiency being an increase in production output with no change to number of operators or equipment, and true efficiency being the production of a set number of parts or products that can be sold, whilst using the minimum number of operators and equipment. Although the examples given are clearly centred around a manufacturing and production background, there is no mention that they are not transferrable.	This study does not support the assertion by Narusawa and Shook (2009) that their examples about efficiency are clearly centred around a manufacturing and production background, and that there is no mention that they are not transferrable. This study has confirmed a significant positive relationship between CI and excessive production, and therefore confirmed that CI, and efficiency, is transferrable into FM cleaning operations within UK shopping centres.
2009	Pitt and Musa	Towards Defining Shopping Centres and Their Management Systems	Explains a shopping centre as a building that contains many units of shops, however, is managed as a single property. The complexities of shopping centres in terms of their size have led to confusion as to shopping centre identities.	This study cannot prove that UK shopping centre charge their cleaning rates by sq. ft., however, can confirm that a change in sq. ft., and therefore UK shopping centre classification, does not alter the level of excessive production that can be expected.
2010	Chen et al.	Lean Automated Manufacturing: Avoiding the Pitfalls to Embrace the Opportunities. Assembly Automation	Irrespective of industry, with correct identification of waste, and successful elimination of those found, it can lead to reduced manufacturing cost, higher product quality, improved customer satisfaction and increased profits. Found that products or features that customers do not want are considered Muda, as they do not generate revenue, but add cost.	This study cannot prove that UK shopping centre charge their cleaning rates by sq. ft., however, can confirm that a change in sq. ft., and therefore UK shopping centre classification, does not alter the level of excessive production that can be expected.

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Year	Author/s	Study Title	Key Findings	Synergy
2010	Wheatley	Outright Decision. Site Operations and Services	Outsourcing can offer cost-avoidance opportunities, claiming that direct cost savings 8%-10% are readily available, even before considering any account improvements in service delivery.	This study cannot confirm whether outsourcing can offer cost-avoidance opportunities. However, it can be confirmed that 52% of FM cleaning services within UK shopping centres are outsourced. The choice of delivering through an outsourced service could be influenced by cost, but it should not be influenced by wanting better operating efficiency. This study proved that neither in-house nor outsource delivers better operating efficiency as the level of excessive production delivered should be expected to be the same.
2012	Hasle et al.	Lean and the Working Environment: A Review of the Literature	A division between lean supporters and objectors exists, with supporters arguing that it is not merely a production method, but a way of thinking that raises efficiency and rejects waste. Specifying that the service sector is an area for lean exploration.	This study can confirm that lean, and in particular CI, raises operational efficiency in FM cleaning operations within UK shopping centres. This supports the proposal by Hasle et al. (2012) that lean raises efficiency and rejects waste, which in this study is excessive production.
2012	Ikedashi et al.	Analysis of Risks Associated with Facilities Management Outsourcing: A Multivariate Approach	Administered 146 questionnaires to registered members of the International Facilities Management Association (IFMA) at three levels of management, top level manager, middle level manager and low-level manager. Of the 41.8% response rate, the findings ranked the 39 risk factors associated with facilities management outsourcing. Poor quality of service presented the highest risk, and natural disasters were found to present the lowest risk.	The findings of this study confirm that operational efficiency is not a specific risk factor when considering outsourcing of FM cleaning operations within UK shopping centres. Whether delivering a cleaning service by in-house or outsourced service method, no variance in excessive production can be expected.

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Year	Author/s	Study Title	Key Findings	Synergy
2012	Sayer and Williams	Lean for Dummies. (2nd Ed)	Waste is eliminated in the value stream by doing Kaizen, or CI. However, finds that the scope that can be achieved through utilising Kaizen is limited, stating that a common problem in Kaizen implementation is oversized projects, or projects that gradually grow into an unmanageable size.	The findings of the study support the proposal by Sayer and Williams (2012) CI is utilised to eliminate waste. This study proves that if CI is implemented and utilised in FM cleaning operations within UK shopping centres, the level of excessive production will be reduced, and therefore operating efficiency will be improved.
2013	Bateman et al.	Wider Applications for Lean: An Examination of the Fundamental Principles Within Public Sector Organisations	Lean can be successfully applied in a public sector context, with only modest modifications required to its core principles.	This study cannot confirm whether or not lean can be successfully applied in a public sector context, as UK shopping centres are operated in the private sector. However, the findings of this study suggest that if a public sector operation utilised CI, it would have a positive impact on the level of excessive production delivered.
2013	Hodges and Sekula	Sustainable Facility Management: The Facility Manager's Guide to Optimizing Building Performance	Offers questions that facility managers could ask themselves to better understand if they are a high performing FM organisation. The questions range from asking whether there are established written and publicised operation and maintenance practices and procedures to how the maintenance and cleaning needs of the building's permanent interior elements are managed to ensure longevity of the asset, and comfort of the occupants.	Irrelevant to whether there are established written and publicised operation and maintenance practices and procedures to how the maintenance and cleaning needs of the building's permanent interior elements are managed, as proposed by Hodges and Sekula (2013), this study proves that having an onsite facilities manager does not reduce the level of excessive production delivered.

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Year	Author/s	Study Title	Key Findings	Synergy
2013	Hui et al.	Facilities Management Service and Customer Satisfaction in Shopping Mall Sector	The quality of FM service plays an important role in the overall service performance of a shopping mall.	As this study proves that 48% of FM cleaning operations within UK shopping centres are delivered in-house, it supports that the quality of FM service plays an important role in the overall service performance of a shopping mall as nearly 1 in 2 FM cleaning operations are managed directly by the shopping centre.
2015	Klungseth and Blakstad	Organising in-House Cleaning Services in Public FM	Generalise that cleaning represents 38%-55% of FM organisations workforce.	The findings of this study cannot confirm as it does not survey all FM workforces. However, this study can confirm that 52% of FM cleaning services within UK shopping centres are outsourced, and 48% of FM cleaning services within UK shopping centres are delivered in-house.
2015	Ee	Value-Based Facilities Management: How Facilities Practitioners Can Deliver Competitive Advantage to Organisations	The soft services delivery category contains support services, security, health and safety, and cleaning. FM aims to increase productivity.	The findings of this study do not support that FM aims to increase productivity, or efficiency, when offering either variation, soft services only, or TFM.

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Year	Author/s	Study Title	Key Findings	Synergy
2015	Olesen et al.	Using Lean Principles to Drive Operational Improvements in Intermodal Container Facilities: A Conceptual Framework	Presents the 5 key principles of lean theory that leads through to creating services and products that add value to a client's objectives, leading through to creating services and products that add value to a client's objectives. The theory identifies value to a client's objectives, identifies the vital steps that facilitate efficient production, eliminates steps in the workflow that potentially cause disruption, supplies on demand to ensure no resources are wasted and strives for perfection by continually removing layers of waste as they are uncovered.	This study can confirm that lean, and in particular a focus on efficiency, is present in FM cleaning operations within UK shopping centres. In order to achieve improved operating, through a reduction in excessive production delivered, FM cleaning operations must implement and utilise CI or performance measurement. This will continually remove layers of waste, as proposed by Olesen et al. (2015).
2015	Ronse et al.	Shopping Centre Siting and Modal Choice in Belgium: A Destination-Based Analysis	Proposes two factors by which the shopping centres are categorised, the size of the city, and the location of the shopping centre relative to the city centre. Addresses the issue of shopping centre classification, but also offers the variable as a way to better understand the results and increase the transparency of the statistical analysis.	Although the size and location of each city in which the UK shopping centres used for this study is no disclosed, there is no evidence found by this study to suggest that cleaning efficiency is different in relation to these two variables. Similarly, there is no evidence to suggest that FM cleaning is treated any differently when applying it to different UK shopping centre classifications.
2016	Sambrowski	In-House Cleaning Employees, Outstanding Cleaning Services Present Different Advantages	In relation to cleaning in government, public sector, it is considered that many in-house staff are excellent workers, proposing that with the switch from in-house to outsource comes overall cleaning improvement.	This study confirms that there is no variance between in-house and outsource FM cleaning operators regarding efficiency of service delivery. This therefore cannot support that in-house workers are excellent workers, specifically in relation to FM efficiency service delivery.

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Year	Author/s	Study Title	Key Findings	Synergy
2017	Amador	Real Stories, Lessons and Tips from Someone Who Started a Cleaning Company and Grew Revenues to Over $1m in 6 Years	Some companies charge solely by square footage to be cleaned, and use this to calculate the cost of cleaning.	This study cannot prove that UK shopping centre charge their cleaning rates by sq. ft., however, can confirm that a change in sq. ft., and therefore UK shopping centre classification, does not alter the level of excessive production that can be expected.
2017	Knotter	Justice for Janitors Goes Dutch. Precarious Labour and Trade Union Response in the Cleaning Industry (1988-2012): A Transnational History	Explains that outsourcing of cleaning has allowed for recruitment of people outside of regulated labour markets, finding that immigrants are overrepresented in the cleaning workforce, with specific attention paid to women with part-time, irregular jobs.	This study cannot confirm the nationalities, immigration status, or sex, of the respondents, and therefore the FM cleaning operators within UK shopping centres. However, can confirm that 52% of FM cleaning services within UK shopping centres are outsourced.

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Year	Author/s	Study Title	Key Findings	Synergy
2017	McWhorter	Introduction to Lean Manufacturing: The Road to Continuous Improvement	Offers CI and elimination of waste as the two activities that make up the core of lean thinking. The word Kaizen has been extensively used in lean manufacturing. Constructed from two Japanese words it is translated into English as, kai – change, to take part, and zen – good, for the better. Offers an example for necessary, non-value-added activities being quality checks. The customer ultimately wants quality, but is not willing to pay for the quality checks required to ensure that the product, or service, meets the expected criteria.	As this study proves that 48% of FM cleaning operations within UK shopping centres are delivered in-house, it supports that the quality of FM service plays an important role in the overall service performance of a shopping mall as nearly 1 in 2 FM cleaning operations are managed directly by the shopping centre.
2017	Sweeney	Lean Quick Start Guide: The Simplified Beginner's Guide to Lean. (2nd Ed)	More activities are required for an organisation to implement lean, and maintain a competitive, responsive, and flexible position within the marketplace. Continual elimination of waste, goals with a broad view, simplicity, CI, organisational visibility, and flexibility are presented as six pillars for the lean production method.	The positive significant relationship between CI and excessive production supports this as the implementation if CI makes the FM operation more efficient, and therefore more competitive. A more efficient operation is competitive by delivering value to the customer (Olesen et al., 2015).

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Year	Author/s	Study Title	Key Findings	Synergy
2018	Delane	Clean Up Cleaning Up: Learn the Secrets to Starting, Running and Growing Your Own Professional Cleaning Business	Having the right tool for the job cuts down on time and increases productivity. Although intended for a house cleaning business not a shopping centre, the progressed checklist concept offered provides information on how long a certain area takes to clean, guiding the employees on task completion and assisting in charging the client correctly.	This is supported by the significant positive relationship between performance measurement and excessive production. This is epitomised by the highest-ranking question response item for the performance measurement independent variable "the relevance of cleaning to the shopping centre has increased".
2018	Ibrahim et al.	Shopping Centre Classification Scheme: A Comparison of International Case Studies	Offers twenty-one different categories over the world for shopping centres including super regional, shopping arcade and sub regional. Recognise FM in detail in their conceptual framework classification of shopping centre for grading of shopping centres. Shopping centres are graded on a five-scale system, excellent, above average, average, below average, and poor, to help the owners rank portfolio holdings and potentially sell low-scoring properties. Categories are utilised for grading and are broken down into further criteria and sub criteria as validated by expert opinion.	This set of shopping centre classifications was not used for this study. However, it could be further hypothesised from the findings of this study that no variance in excessive production should be observed between each of the shopping centre categories proposed by Ibrahim et al. (2018).

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Year	Author/s	Study Title	Key Findings	Synergy
2018	REVO	UK Classification for Retail Assets	Offers four different shopping centre classifications, regional scheme, sub-regional scheme, local scheme, and neighbourhood scheme, all of which contain varying characteristics. Recognised how the retail environment was fast-changing, with increasingly selective and purpose led customer shopping trips. It was proposed that new classifications would allow investors, owners, valuers, and advisors to utilise a widely accepted lexicon to describe UK retail assets.	Contrary to hypothesis 4, and the variance in characteristics in UK shopping centres, the findings of this study confirm that irrelevant of UK shopping centre classification, no variance in excessive production is expected.
2018	Shine	The Essential Guide to Maintenance and Facilities Management. (2nd Ed.)	Recognises a relationship between the reliance of innovative, integral, flexible equipment to achieve quality, efficiency, equipment reliability and cost effectiveness to both modern manufacturing processes and aspects of FM., in order to allow for the acquisition of tools and parts in the fastest and easiest manner, by clearing out all unnecessary things, lean manufacturing offers 5S.	The findings of this study do not show any efficiency improvement from either service delivery method, soft services only, or TFM. This does not support the combination of services and relationship between the reliance of innovative, integral, flexible equipment to achieve quality and efficiency. This study proves that the same level of excessive production, and therefore efficiency, is achieved by a singular service, soft services only, or a combination, TFM.
2019	BICSc	Best Value Standards Specifications and Productivity Rates	States that the “best value and value for money continue to be an important requirement for customers involved in the management or procurement of cleaning services.” Describes cleaning as scientific, and although usually judged subjectively by a given expectation, cleaning is an industry in which innovation is possible.	There is no evidence found by this study to suggest that cleaning scheduling is treated any differently when applying it to different UK shopping centre classifications, meaning that floor area size is not considered, contrary to the suggestion by BICSc (2019).

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Year	Author/s	Study Title	Key Findings	Synergy
2019	Evans	Scottish Shopping Centre Goes on Sale for £1	Facilities managers are responsible to the centre management teams of shopping centres. At the top of the management structure are the owners: developers, investors, and local authority. It is the owners that have the success or failure outcomes.	This study provides evidence that irrelevant of in-house/outsource, that level of excessive production delivered is not negatively affected. This could imply that the top of the management structure do not consider efficiency as important, and that success and failure targets regarding efficiency are not more stringent for outsourced FM services.
2019	ICSC	Europe Shopping Centre Classification and Typical Characteristics	ICSC presented its own classification and characteristics pertaining to grouped shopping centres based on location.	This set of shopping centre classifications was not used for this study. However, it could be further hypothesised from the findings of this study that no variance in excessive production should be observed between each of the grouped shopping centres proposed by ICSC (2019).

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6.4 – Chapter Summary

This Chapter has addressed and discussed all six hypotheses developed to meet the central aim of the study, namely the identification and elimination of excessive production in FM cleaning operations within UK shopping centres. Finding that with the utilisation of CI and performance measurement excessive production is reduced within this working environment, this study confirms that excessive production is present, and therefore there is opportunity for improvement.

In addition to outlining the key findings from the literature review and the synergy with the findings from this study, this chapter also concludes multiple additions to current knowledge pertaining to each of the six hypotheses. In summary, FM service delivery, in-house/outsource, management presence, and shopping centre classification do not impact the level of excessive production in FM cleaning operations within UK shopping centres. However, the utilisation of continuous improvement and performance measurement in FM operations within UK shopping centres will reduce the level of excessive production, and as a result, deliver greater value to the customer.

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Chapter Seven
Research Conclusions

7.1 Research Conclusions Introduction

This Chapter commences by overviewing current research, before outlining the research methodology utilised for this study. This Chapter then progresses to document the conclusions and results, and contributions to knowledge, research limitations, and future research. All sections of this chapter consider each of the six research hypotheses, which relate to FM service delivery, in-house/outsource, management presence, shopping centre classification, CI, and performance measurement, and their respective relationships to the level of excessive production in FM cleaning operations within UK shopping centres.

7.2 Overview of the Current Research

The current research reviewed for this study guided the development of the six research hypotheses and four additional sub-hypotheses.

The first hypothesis, FM service delivery, focused on the FM cleaning services delivery by either soft services only or as TFM. No literature was uncovered suggesting that soft services delivery alone will impact any level of excessive production, either reducing or increasing the operational efficiency. It was however suggested that soft services alone delivery could have an enhanced operational efficiency focus as it is not required to also deliver hard services (Atkin & Brooks, 2000; Ee, 2015), thereby utilising specific cleaning operational concepts, such as scheduling and checklists (Lynn, 2003), to increase operational efficiency. Considering this, and the varying benefits offered by each service delivery method (Moss et al., 2007; Brown, 1996, Ee, 2015), facilities management service delivery was considered in this study as an independent variable, in order to examine its effect on the level of excessive production found within FM cleaning operations within UK shopping centres.

The second hypothesis, in-house/outsource, explored the impact on excessive production of whether the FM cleaning operation is managed by the shopping centre itself, in-house, or managed by a contracted service provider, outsourced. FM is documented to be not solely delivered by outsourced service providers. The literature suggests that FM services can be delivered in-house (Sambrowski, 2016), varying from outsourcing through contracted services

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(Atkin & Brooks, 2009). Although the option for service delivery means that both in-house and outsourced options can compete for FM cleaning contracts, this study finds from the literature that both in-house and outsourced FM service delivery offer both benefit and risk. The literature however does not suggest any specific performance difference between the two sourcing options.

The debate surrounding in-house or outsource is not confined to FM service delivery, or associated support activities. A study by Bröchner et al. (2002) into outsourcing FM in the process industry, whilst comparing Swedish and UK patterns, finds that individual activities can be categorised by either a high degree, intermediate degree, or low degree of outsourcing. Considering this, and in particular the omission of any information regarding definitive reasons to choose either sourcing option, in-house/outsource was considered as an independent variable in this study, in order to examine its effect on the level of excessive production found within FM cleaning operations within UK shopping centres.

The third hypothesis, management presence, looked at whether having an onsite manager that constantly overlooks the operation achieves greater efficiency than a manager that operates remotely.

The literature highlights a realisation that the discipline of FM involves much more than costs alone, Wauters (2005) suggests that facilities managers need to add value to the organisational value chain. This understanding is challenged however by Hodges and Sekula (2013), explaining that the common driver of most facilities managers is cost, although recognise that it is not understood by upper level management. Rather, the money for operations and maintenance and capital investments, all associated with FM, is allocated using two separate funding mechanisms annually. These two budgets in turn form the basis of the annual FM budget, dictating the day-to-day operations.

To deliver FM, a facilities manager can be utilised, a role that needs to be flexible and willing to change (Tuveson, 1998). Additional requirements of a facilities manager have been identified and documented prior. A facilities manager looks after many stakeholders and shareholders of which Finch (1992) acknowledges four: shareholders, employees, customers, and community.

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FM can however de delivered without the presence of an onsite facilities manager (Ee, 2015), with some cleaning sites not large enough to financially warrant the requirement. This study recognises a similarity with the requirement of a manager and that of a facilities manager, leading to question whether more or less excessive production would be present with or without a manager at a cleaning site.

Taking into account the literature reviewed, management presence was considered in this study as an independent variable to examine its effect on the level of excessive production found within FM cleaning operations within UK shopping centres.

The fourth hypothesis, and four additional sub-hypotheses, surrounding shopping centre classification, aimed to understand whether a change in shopping centre classification, which represents different amenities, facilities, and sq. ft. among other variations, changes the level of excessive production.

Shopping centre classifications, or category, and sq. ft., differ from country to country with many to choose from. Of the numerous selection of categories available, Ibrahim et al. (2018) suggest twenty-one different categories over the world including super regional, shopping arcade and sub regional. Research by Ronse et al. (2015) presents differently, not only addressing the issue of shopping centre classification, but also offering the variable as a way to better understand the results and increase the transparency of the statistical analysis. Overall, authors provide varying suggestions for what sizes and classifications should be attributed to shopping centres, with various criteria, and sub-criteria being offered to categorise (ICSC, 2019; Banham, 2006; REVO, 2018; Ibrahim et al., 2018).

Reflecting this, shopping centre classification and sq. ft. were considered in this study as an independent variable to examine its effect on the level of excessive production found within FM cleaning operations within UK shopping centres. In addition, four sub-hypotheses were raised, namely, regional scheme, sub-regional scheme, local scheme, and neighbourhood scheme, UK shopping centre classifications.

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The fifth hypothesis, CI, sought to ascertain whether the utilisation of CI in FM operations positively impacts excessive production, as it is documented to in production and manufacturing industries.

Although the advancements, and associated benefits offered by efficiency can seem clear in the literature, not all authors are in agreement. A division between lean supporters and objectors is documented by Hasle et al. (2012), suggesting that supporters argue that it is not merely a production method, but a way of thinking that raises efficiency and rejects waste. McWhorter (2017) supports this, generalising the concept by offering CI and elimination of waste as the two activities that make up the core of lean thinking, as was originally named by Womack and Jones (1996).

Authors have documented what is required to implement lean. More than two activities are suggested for an organisation to implement lean, and maintain a competitive, responsive, and flexible position within the marketplace (Sweeney, 2017; Narusawa & Shook, 2009). Sweeney (2017) proposes continual elimination of waste, goals with a broad view, simplicity, CI, organisational visibility, and flexibility as six pillars for the lean production method. In contrast, and utilising a structured approach, five key principles of lean theory is presented by Olesen et al. (2015), as shown in Figure 2.1. Bateman et al. (2013) are in support if this, incorporating five similarly named fundamental principles into their lean thinking for conventional organisations.

Reflecting this, continuous improvement was considered in this study as an independent variable to examine its effect on the level of excessive production found within FM cleaning operations within UK shopping centres.

The sixth hypothesis, performance measurement, explored whether the use of performance measurement reduces the level of excessive production in FM cleaning operations within UK shopping centres.

Addressing some core performance measurement principles, such as FM customer base, FM internal processes, FM learning and growth, and FM financial status, Amaratunga (2001) develops new theory relating to FM performance measurement, and suggests further research

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in the performance measurement field. Amaratunga (2001) explains further a concept for integrating CI into FM, however, this is not specifically related to Muda. In consideration of the literature reviewed, performance measurement has become a popular topic with both an academic and management focus.

Taking into account the literature reviewed, performance measurement was considered in this study as an independent variable to examine its effect on the level of excessive production found within FM cleaning operations within UK shopping centres.

7.3 Research Methodology

To meet the central aim of this research, the identification and elimination of excessive production in FM cleaning operations within UK shopping centres, a research methodology was adopted, as documented in Chapter Four of this thesis. This includes an overview of the research design, data collection and data analysis methods, which were all utilised for this study.

Considering the varying views surrounding their chosen research techniques for collecting, analysing, and reaching conclusions from data (e.g. Bryman and Bell, 2015; Easterby-Smith et al., 2012; Zikmund, 2003; Fink, 1995; Kurtz, 1983; Bryman & Cramer, 2011; Gray & Kinnear, 2012; Burns & Burns, 2008; Hinton, 2004; Newbold et al., 2013; Swift and Piff, 2010; Lawley, 2000; Emory & Cooper, 1991), this study is based on a quantitative research methodology, as it aligns with the researcher's positivist research philosophical belief.

In line with the positivist paradigm, this study developed testable hypotheses based on current theory surrounding FM cleaning operations and waste elimination, specifically excessive production, in order to achieve the overall aim of the study, the identification and elimination of excessive production in FM cleaning operations within UK shopping centres. To achieve this, this study utilised the quantitative research methodology, an approach that involves the development of a theory that is subjected to a rigorous test, concluding in generalisation, based on samples of sufficient numerical size (Saunders et al., 2009), which assists in achieving a sample across a wide regional area.

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To gather the data, this study utilised questionnaires at one point in time, with the aim to generalise the findings across the wider population. This approach to quantitative data collection lines up with Bryman and Bell's (2015) explanation of the cross-sectional design, or social survey design, as they are connected with questionnaires and structured interviewing (Fink, 1995).

This study benefited from the use of a questionnaire survey regarding data collection. Through utilisation of mail or online questionnaire surveys, a research study is able to gather data from a large sample quickly, whilst not being present at questionnaire survey completion and not influencing the respondent's responses directly. Which offers greater anonymity and affording comparatively low cost compared with other data collection methods (Kumar, 2014). In addition to this, this study considered the development of the questionnaire as an important stage of the data collection process. To achieve this, the steps for the questionnaire development process offered by Peterson (2000) were utilised for this study, followed by a pilot/pretest (Bryman & Bell, 2015).

In order to ascertain the target population of UK shopping centres as front-line FM cleaning employees, this study utilised the secondary data collection phase, the Literature Review, as documented in Chapter Two in this thesis. Considering the margin of error, this study determined the required sample, and the estimated coverage required to achieve it. This was achieved through selecting a random sample (Lindsey, 2004) from the population for generalisation, UK shopping centres, of which the sizes and classifications are confirmed as regional scheme, sub-regional scheme, local scheme, and neighbourhood scheme, as detailed in Chapter Three of this study, the Theoretical Framework.

Once collected, the data was analysed through utilisation of the statistical techniques possible in SPSS. SPSS allowed the opportunity to generate basic regression information relating to the relationship of two variables (Bryman & Cramer, 2011), enabling analysis of any relationship between the six independent variables, FM service delivery, in-house/outsource, management presence, UK shopping centre classification, CI, and performance measurement, with the dependent variable, excessive production. Moreover, SPSS provided the ability to score and analyse quantitative data efficiently, eliminating the long hours spent working out scores and completing complicated calculations, which can inevitably lead to mistakes.

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7.4 Conclusions and Results

This section overviews the conclusions and results regarding the six hypotheses and four additional four sub-hypotheses, before the proceeding section, 7.5, defines the contributions to knowledge.

Hypothesis 1 – FM Service Delivery

The original assumption made in this study is contradicted by the findings. The first hypothesis of this study was that soft services only service delivery could potentially have an enhanced operational efficiency focus. An assumption that was made due to the reviewed literature suggesting that a soft service only service delivery method is not required to diversify into hard FM services, and therefore focuses purely on soft services only, the FM services category that contains cleaning (Ee, 2015). Moreover, it utilises specific cleaning operational concepts, such as scheduling and checklists (Walkiden, 1994), to achieve operational efficiency.

As documented in Chapter Five of this study, Data Analysis, hypothesis 1 was: There will be a significant relationship between facilities management service delivery and the level of excessive production within its front-line operation.

The results show a statistically insignificant relationship between the facilities management service delivery predictor variable and the excessive production dependent variable ($\beta = .034$, $t = .525$, $p = >.05$), which does not support hypothesis 1.

This study has therefore concluded that neither soft services only nor TFM has a greater, or lesser, focus on identifying and eliminating excessive production in FM cleaning operations within UK shopping centres. This conclusion does however not offer the service provider, nor the property management, useful guidance for choosing a more efficient cleaning service delivery. Furthermore, this study has concluded, through discovering no significant negative relationship between facilities management service delivery and excessive production, that efficiency levels will not be altered irrespective of the number of services that are being provided, either by soft services only, or TFM service delivery.

Hypothesis 2 – In-House/Outsource

The original assumptions surrounding in-house/outsource were that FM cleaning operations within UK shopping centres can be delivered by either in-house or outsource, and that neither

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service sourcing option has a greater focus on operational efficiency, which developed the second hypothesis. Irrelevant to the fact that both delivery options can compete for FM cleaning contracts, as uncovered in the reviewed literature, no specific performance difference between the two sourcing options has been documented.

As documented in Chapter Five of this study, Data Analysis, hypothesis 2 was: There will not be a significant relationship between in-house/outsource and the level of excessive production within its front-line operation.

The results show a statistically insignificant relationship between the in-house/outsource predictor variable and the excessive production dependent variable (β = -.028, t = -.443, p= >.05), which does support hypothesis 2.

This study has therefore concluded that irrespective of in-house or outsourced FM cleaning operations in UK shopping centres, the level of excessive production is increased. Furthermore, this study has concluded that neither in-house nor outsource has a greater, or lesser, focus on identifying and eliminating excessive production in FM cleaning operations within UK shopping centres, and that there is a near equal split of in-house and outsourced FM cleaning operations within UK shopping centres.

Hypothesis 3 – Management Presence

The assumption made by this study regarding a management presence for an FM cleaning operation within UK shopping centres was that a facilities manager is influenced by a set of specific operational objectives that could involve minimising excessive production with the aim of achieving best cost service delivery (Alexander, 2003), even if delivered sub-consciously by the facilities manager. In addition to this, an assumption was made that a manager at a shopping centre would be closer to the FM cleaning operation than a manager working remotely, and as a result, would be perfectly placed to positively influence the level of efficiency within the service, and therefore deliver a more efficient operation.

As documented in Chapter Five of this study, Data Analysis, hypothesis 3 was: There will be a significant relationship between having management presence and the level of excessive production within its front-line operation.

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The data shows a statistically insignificant relationship between the management presence predictor variable and the excessive production dependent variable (β = -.008, t = -.136, p= >.05), which does not support hypothesis 3.

This study concludes that the level of excessive production is not reduced by having an onsite facilities manager. Therefore, this study further concludes that a focus needs to be directed to the front-line service operators in order to identify and eliminate excessive production, and not purely expect the presence of a facilities manager to deliver an efficiency improvement. This is a surprising conclusion as it is the facilities managers that need to add value to the organisational value chain (Wauters, 2005).

Hypothesis 4 – UK Shopping Centre Classification

From the literature review phase of this study, it was assumed that shopping centre classification and the level of excessive production produced by different shopping centre classifications will provide varying levels of excessive production, which was represented by an overall UK shopping centre classification hypothesis and four sub-hypotheses. This was hypothesised considering the knowledge that shopping centre classifications vary by many attributes, including definition/concept, characteristics, typical numbers of anchors, size in sq. ft., and typical catchment area/travel time (REVO, 2018). Moreover, this study assumed that larger shopping centres will contain higher levels of excessive production due to providing a more complex and larger operation.

As documented in Chapter Five of this study, Data Analysis, hypothesis 4, and the four additional sub-hypotheses were: There will be a significant relationship between shopping centre classification and the level of excessive production within its front-line operation.

The data shows a statistically insignificant relationship between the shopping centre classification predictor variable and the excessive production dependent variable (β = -.053, t = -.820, p= >.05), which does not support hypothesis 4.

Sub Hypothesis 4.1: Regional Scheme - There will be a significant relationship between the regional scheme shopping centre classification and the level of excessive production within its front-line operation.

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The data shows a statistically insignificant relationship between the regional scheme shopping centre classification predictor variable and the excessive production dependent variable (β = -.053, t = -.820, p= >.05), which does not support hypothesis 4.1.

Sub Hypothesis 4.2: Sub-Regional Scheme - There will be a significant relationship between the sub-regional shopping centre classification and the level of excessive production within its front-line operation.

The data shows a statistically insignificant relationship between the sub-regional scheme shopping centre classification predictor variable and the excessive production dependent variable (β = -.053, t = -.820, p= >.05), which does not support hypothesis 4.2.

Sub Hypothesis 4.3: Local Scheme - There will be a significant relationship between the local scheme shopping centre classification and the level of excessive production within its front-line operation.

The data shows a statistically insignificant relationship between the local scheme shopping centre classification predictor variable and the excessive production dependent variable (β = -.053, t = -.820, p= >.05), which does not support hypothesis 4.3.

Sub Hypothesis 4.4: Neighbourhood Scheme - There will be a significant relationship between the neighbourhood scheme shopping centre classification and the level of excessive production within its front-line operation.

The data shows a statistically insignificant relationship between the neighbourhood scheme shopping centre classification predictor variable and the excessive production dependent variable (β = -.053, t = -.820, p= >.05), which does not support hypothesis 4.4.

This study concludes that no reduction or increase in excessive production can be expected when comparing different REVO (2018) classifications of UK shopping centres, regional scheme, sub-regional scheme, local scheme, or neighbourhood scheme.

Hypothesis 5 – Continuous Improvement

Considering all of the reviewed literature, this study assumed a positive relationship regarding continuous improvement and the level of excessive production in FM cleaning operations within UK shopping centres. From the understanding that continuous improvement is a direct

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derivative of lean, and aims to change processes and operations for the better, this study hypothesised that if a cleaning operation utilised continuous improvement it would deliver a reduced level of excessive production, as compared to a cleaning operation that did not utilise continuous improvement.

As documented in Chapter Five of this study, Data Analysis, hypothesis 5 was: There will be a significant relationship between continuous improvement and the level of excessive production within its front-line operation.

The results show a statistically significant positive relationship between the continuous improvement predictor variable and the excessive production dependent variable ($\beta = .452$, $t = 4.288$, $p = <.001$, which supports hypothesis 5.

The findings of this study supported the work by Bateman et al. (2013), Hasle et al. (2012), McWhorter (2017), Olesen et al. (2015), Sweeney (2017), Womack and Jones (1996), and concluded that a significant positive relationship between continuous improvement and the level of excessive production within its front-line operation would be found. Therefore, if CI utilised in FM cleaning operations within UK shopping centres the level of excessive production will be reduced, delivering a more efficient operation.

Hypothesis 6 – Performance Measurement

This study assumed that performance measurement would impact on the level of excessive production in FM cleaning operations within UK shopping centres. The reviewed literature highlighted that performance measurement is related to FM customer base, FM internal processes, FM learning and growth, and FM financial status, from both academic and management perspectives (Amaratunga, 2001). Therefore, it was hypothesised that the utilisation of performance improvement in FM cleaning operations within UK shopping centres would lessen the level of excessive production.

As documented in Chapter Five of this study, Data Analysis, hypothesis 6 was: There will be a significant relationship between performance measurement and the level of excessive production within its front-line operation.

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The results show a statistically significant positive relationship between the performance measurement predictor variable and the excessive production dependent variable (β = .484, t = 4.554, p= <.001), which supports hypothesis 6.

This study concludes from the findings of this study that excessive production can be reduced by implementing and utilising performance measurement in FM cleaning operations within UK shopping centres. This conclusion expands the work by Amaratunga (2001), as it is proven by this study that a focus on excessive production provides efficiency improvement and could be added to the core performance measurement principles already in place, such as FM customer base, FM internal processes, FM learning and growth, and FM financial status.

7.5 Contribution to Knowledge

This section outlines the academic conceptual contributions generated by the study. These contributions further the understanding of theories relating to Muda, lean, UK shopping centres, and FM. Two main contributions are depicted in Figure 7.1, a visual model of new theory.

The first theoretical contribution shown in Figure 7.1 is that lean is present in FM cleaning operations within UK shopping centres. This supports the suggestion by Hasle et al. (2012) that supportors exist believing that the lean methodology is possible outside of the manufacturing and production environments in which it was initially intended (McWhorter, 2017; Sayer & Williams, 2012; Lee-Mortimer, 2008; Sweeney, 2017). Not only is CI, and therefore lean, present in FM cleaning operations within UK shopping centres, but that it positively impacts the level of excessive production, thus improving efficiency.

The second theoretical contribution shown in Figure 7.1 is that the implementation and utilisation of both CI and performance measurement will reduce the level of excessive production in FM cleaning operation within UK shopping centres. This supports the five principles of lean theory from Olesen et al. (2015), from which Figure 7.1 has been developed. FM cleaning operations within UK shopping centres are flexible in trying to meet the specific needs of the customers, which confirms acknowledgement of customer value. As a result, FM cleaning operations within UK shopping centres can claim to utilise lean, if only at the initial step.

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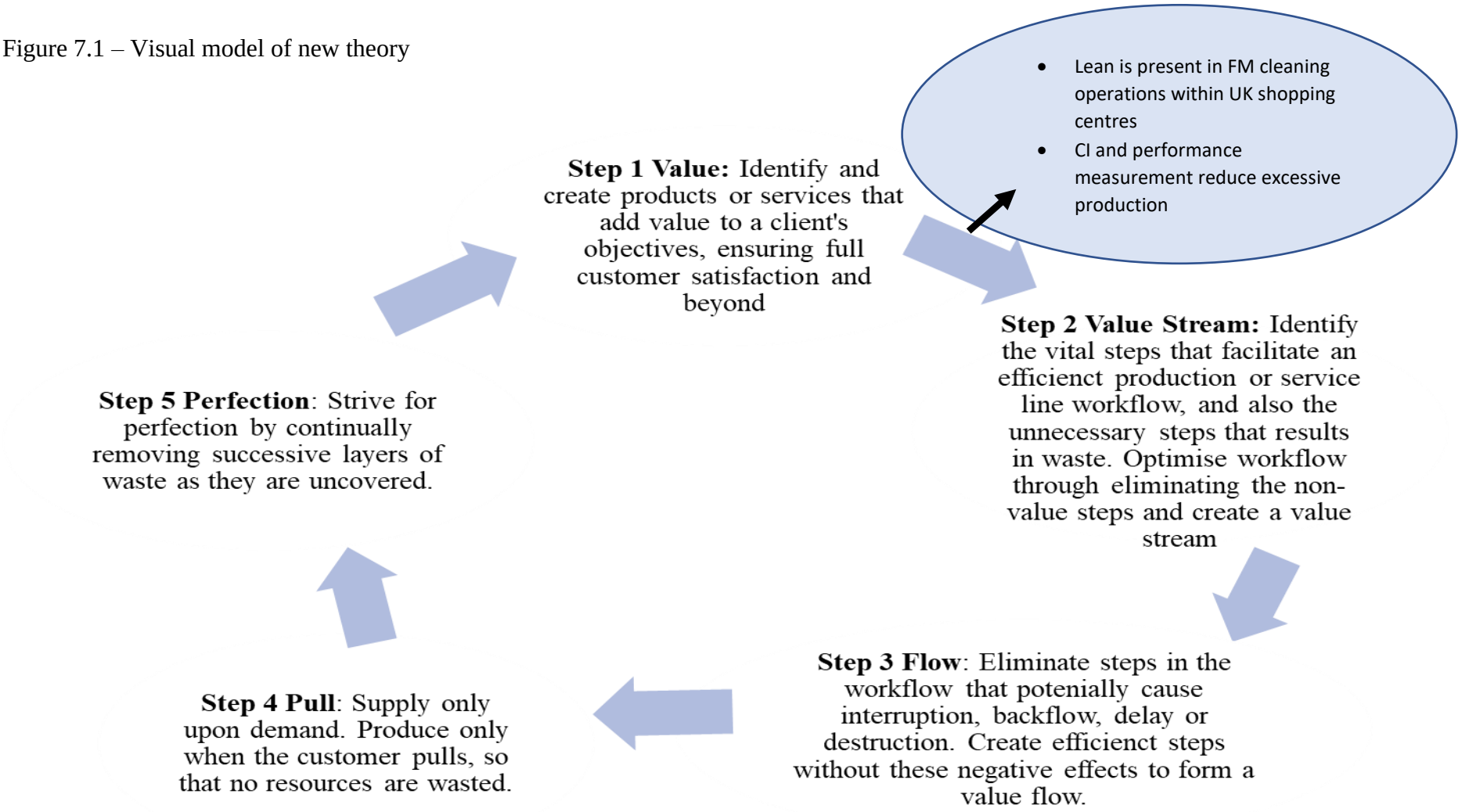
Figure 7.1 – Visual model of new theory



Source: Developed by the author

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7.5.1 Facilities Management Service Delivery

This study has concluded the level in which facilities management service delivery is provided. The findings of this study are that 62.7% of cleaning services in FM cleaning operations within UK shopping centres are delivered by soft services only. Furthermore, the FM service delivery approach is supported by the reviewed literature. The theoretical contribution of this study is that none of the reviewed literature focused specifically on FM cleaning operations within UK shopping centres, and therefore provides a further layer of understanding surrounding FM service delivery methods. Academics can now use the 62.7% finding by this study as a benchmark for their studies. No previous studies have been conducted to understand a specific breakdown of FM service delivery method in FM cleaning operations within UK shopping centres, or the FM industry in general. Although this does not provide a means for comparison with the findings of this study, the contribution to knowledge by this study that 62.7% of FM cleaning operations are delivered by soft services only, and 37.3% of FM cleaning operations are delivered as TFM, confirms the suggestion by Then (2005) that FM is delivered in different guises. In the context of this study, and explored using independent variable one, FM service delivery, the different guises of FM cleaning operations within UK shopping centres are soft services only delivery, or TFM, where a single entity takes responsibility for all facets of FM and can outsource specialist elements (Atkin & Brooks, 2000).

The literature reviewed in the area of FM service delivery by Ee (2015) surrounding the groupings of soft services only, and the theory combining all FM services in the TFM model (Atkin & Brooks, 2000), have not provided a preference for either soft services only or TFM service delivery. Although offering benefits for both options, such as the opportunity to utilise specialists for specific service delivery elements from TFM, and not having to focus on hard services from soft service only service delivery, neither option provided clear guidance for this study. The findings of this study contribute to understanding a clear preference of 62.7% for soft services only service delivery in FM cleaning operations within UK shopping centres. The 62.7% majority for soft services only FM service delivery contributes knowledge to a gap in the literature from key authors (e.g. Shine, 2018; Atkin & Brooks, 2000; Moss et al., 2007; Brown, 1996), as it confirms a preference, and specifically to the FM industry, the industry on which this study focuses.

Although this progress has been made to understand the preference of FM service delivery method, another academic question is raised. This is that finding no significant negative

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relationship between FM service delivery and the level of excessive production within its front-line employees, is operational efficiency considered when making the choice of FM service delivery method?. The determining factors for implementing solutions presented in FM process theory by Atkin and Björk (2007) is therefore not confirmed or rejected, nor is it progressed to incorporate excessive production as a determining factor. Considering this, the findings of this study imply that efficiency, specifically relating to excessive production, is not considered when property management choose FM cleaning service provider.

While no literature was found during the literature review that provided a breakdown of soft services only and TFM service delivery by which to compare the findings of this study, the importance of cleaning in the FM industry is recognised. Klungseth and Blakstad (2015) generalised that cleaning represents 38%-55% of employees within an FM organisation. This study cannot confirm the workforce ratio of cleaners to other staff within the organisations in which the respondents of this study represent, however, a demographic question does provide an academic insight regarding the perceived employment of the respondents. For example, 70% of respondents answered that they are employed by an FM company, which can be managed by either in-house or outsource. This finding provides knowledge that the majority preference for delivering FM cleaning services within UK shopping centres is through branding as an FM company. This progresses the academic understanding presented by Alexander (2003) that FM is a rapidly developing and growing discipline, vocation, and business service. Furthermore, it progresses the observation by Alexander (2003) that early developments have been made in FM, by finding that FM continues to develop, as evidenced by the 70% majority preference of an FM company being the branding used to deliver the FM cleaning operations within UK shopping centres.

However branded, whether as an FM company, cleaning company, the shopping centre, or an agency, the FM cleaning operation does not provide improved efficiency if delivered as a combination of services, TFM. The FM industry has developed TFM as a delivery method due to the multi-faceted nature of the services that it needs to manage (Then, 2005). The work by Ee (2015) furthers this academic understanding by providing categorisation and grouping of FM services, including soft services, support services, security, health and safety, and cleaning. This study has furthered this academic understanding by proving that categorisation, and grouping, of FM services does not improve efficiency, which is evidenced by finding that there

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is no significant negative relationship between facilities management service delivery and the level of excessive production within its front-line operation.

Even though no variance of excessive production was found between soft services only and TFM service delivery, this study confirms that both service options are present in FM cleaning operations within UK shopping centres. This insight into service delivery method in FM advances the theory proposed by Atkin and Brooks (2000), which presented the possibility to outsource, or subcontract, specialist elements of FM service delivery, and that since its inception, FM has emerged as its own service sector, establishing a new professional discipline operating with its own codes, standards, and technical vocabulary. The theory presented by this study shows that both soft services only and TFM can be expected in FM cleaning operations within UK shopping centres, irrespective of the requirement that facilities managers need to add value to the organisational value chain (Wauters, 2005). This proves that whether managed as soft services only or as TFM, value is a focus for the facilities manager, aligning with the first principle of lean, which is value (Olesen et al., 2015). This demonstrates further evidence that lean is present in FM cleaning operations within UK shopping centres, which supports the claim by Carreira (2005) that lean is transferrable between industries and services.

The reviewed literature provides agreement that different methods for FM service delivery is required, and for varying operational environments (e.g. Ee, 2015; Shine, 2018; Atkin & Brooks, 2000; Then, 2005). The academic understanding that FM is operationally delivered in many guises, with the approach determined by the processes required to meet the business demands (Then, 2005) is supported by this study. This study finds that both soft services only and TFM service delivery methods are present in FM cleaning operations within UK shopping centres, however, neither provides a more efficient operation. This academic contribution to the knowledge surrounding FM service delivery in FM cleaning operations within UK shopping centres is important to FM as it shows that no consensus exists of how to deliver FM cleaning services. Moreover, the choice of soft services only or TFM does not offer an operational efficiency improvement.

The study also contributes to FM service delivery from a perspective. The results of this study show that the decision of facilities management service delivery does not negatively impact the level of excessive production in FM cleaning operations within UK shopping centres. This

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finding implies that both service delivery methods, soft services only and TFM, contain similar elements of inefficiency. Considering this, neither service delivery method can claim a higher level of efficiency, from which an operational advantage could be achieved. This finding contradicts what the literature reviewed suggests (e.g. Ee, 2015; Shine, 2018; Atkin & Brooks, 2000; Moss et al., 2007; Brown, 1996), and as a result leads this study to propose that further research could be conducted into understanding whether FM companies review processes based on the chosen service delivery method. This contradiction could be attributed to this study being UK focused, considering the literature pertained to countries outside the UK. However, although varying classifications were found in the literature for countries outside the UK (ICSC, 2019), the FM literature does not suggest that the FM operation would be any different (Ee, 2015; Shine, 2018; Atkin & Brooks, 2000), and therefore would not necessarily deliver better, or worse, excessive production.

7.5.2 In-House / Outsource

To expand the current knowledge, the cleaning service outsourcing expectation of between 26% and 75% offered in the literature can be refined specifically to FM cleaning operations within UK shopping centres. The findings of this study fit within these parameters at 52% of FM cleaning services being outsourced. The outsourcing findings by Bröchner et al. (2002) suggests that outsourcing could be in the minority or majority of the service delivery method at a figure between 26% and 75%, whereas this study confirms that outsourcing is in fact in a majority at 52% in FM cleaning operations within UK shopping centres. The FM cleaning outsourcing majority within UK shopping centres found by this study adds to the knowledge and is more specific than the range of 49%, between 26% to 75%. Moreover, the majority of outsourcing in FM cleaning contributes to a gap in the current literature, as no studies were found that have previously explored this aspect of service delivery. This progresses the understanding presented by Wheatley (2010) that although outsourcing can offer cost-avoidance opportunities, it does not improve efficiency within FM operations. Furthermore, this study also confirms that neither in-house nor outsource provide a more efficient FM cleaning operation, thus contributing to a new phenomenon.

However, this finding does not confirm or reject the claim by Finch (1992) that the adoption of outsourcing was growing at a rate of 20% per annum in the UK. Any increase in FM outsourcing, or specifically within FM cleaning operations within UK shopping centres, cannot

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be confirmed as no previous known percentage was available at the literature review phase of this study. Any future studies can use the proven 52% outsourcing of FM cleaning operations within UK shopping centres as a benchmark from which to compare or measure.

As this study proves that 48% of FM cleaning operations within UK shopping centres are delivered in-house, it supports the view that the quality of FM service plays an important role in the overall service performance of a shopping mall, as nearly one in every two FM cleaning operations within UK shopping centres are delivered in-house, supporting the study by Hui et al. (2013). Although this progresses the findings by Hui et al. (2013) that the quality of FM service plays an important role in the overall service performance of a shopping mall, this is not in relation to the operation al efficiency delivered by the FM cleaning operations. This is important to FM academia as it proves that efficiency is not considered a determining quality factor when choosing the FM cleaning sourcing for FM cleaning operations within UK shopping centres.

Furthermore, this study has proven that irrespective of in-house or outsourced service delivery, no variance in excessive production can be expected. This supports Atkin and Björk (2007) that both in-house and outsourced services share the need for specifications and service level agreements, but does not provide an efficiency advantage for either sourcing option. The theoretical model for 'implementation solutions to FM needs' by Atkin and Björk (2007) shows that irrespective of in-house or outsourced services, there is a need for service needs specifications and service level agreements, demonstrating a cautious approach to choosing to outsource a service. The theory presented by this study that there is no significant negative relationship between in-house/outsource and the level of excessive production within its front-line operation challenges the cautious approach proposed by Atkin and Björk (2007), as caution is not considered regarding operational efficiency. If efficiency was considered important when choosing either in-house or outsource, the choice of sourcing would improve the operational efficiency of FM cleaning operations within UK shopping centres.

The findings of this study further confirm that operational efficiency is not a specific risk factor when considering outsourcing of FM cleaning operations within UK shopping centres. Whether delivering a cleaning service by in-house or outsourced service method, no variance in excessive production can be expected. However, operational efficiency is not considered a

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risk in relation to FM in a previous study by Ikediashi et al. (2012). The work by Ikediashi (2012) administered 146 questionnaires to registered members of the IFMA at three levels of management: top level manager, middle level manager and low-level manager. Of the 41.8% response rate, the findings ranked the 39 risk factors associated with facilities management outsourcing. Poor quality of service presented the highest risk, and natural disasters were found to present the lowest risk, however with no mention of operational efficiency. This study progresses this understanding by adding operational efficiency, and in particular excessive production, as a risk factor when considering sourcing FM services, either in-house or outsourced.

One documented determining factor in choosing the sourcing option for FM is cost (Wheatley, 2010). Wheatley (2010) theorises that outsourcing can offer cost-avoidance opportunities, claiming that direct cost savings of 8%-10% are readily available, even before considering any account improvements in service delivery. This study cannot confirm that cost savings are readily available from directly outsourcing FM cleaning services, however, with reduced excessive production, the flow of the operation and services would run more smoothly, whilst not producing more than is required for the customer (Kiff, 2000), and therefore reduce costs. This study theorises that either sourcing option, in-house or outsource, could benefit financially from a focus on excessive production, which would reduce costs. However, to date no such savings have been calculated, and therefore the 8%-10% cost saving theorised by Wheatley (2010) cannot be contested or supported.

Similarly, the theory by Sambrowski (2016) regarding cleaning improvements that are available from outsourcing cannot be supported by this study. In relation to cleaning in government and the public sector, Sambrowski (2016) considered that many in-house staff are excellent workers, proposing that with the switch from in-house to outsource comes overall cleaning improvement. As this study confirms that there is no variance between in-house and outsource FM cleaning operators regarding efficiency of service delivery, it cannot support that in-house workers are excellent workers, specifically in relation to FM efficiency service delivery. This study theorises that in-house and outsource FM cleaning operators within UK shopping centres are equally efficient in their service delivery.

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Benefits were however documented for choosing outsourcing in the reviewed literature (e.g. Knotter, 2017; Ikediashi et al., 2012; Wheatley, 2010). Wheatley (2010) theorised that outsourcing can offer cost-avoidance opportunities, claiming that direct cost savings 8%-10% are readily available, even before considering any account improvements in service delivery. This study cannot confirm whether outsourcing can offer cost-avoidance opportunities. However, it can be confirmed that 52% of FM cleaning services within UK shopping centres are outsourced. The choice of delivering through an outsourced service could be influenced by cost, but it should not be influenced by wanting better operating efficiency. This study proved that neither in-house nor outsource delivers better operating efficiency, as the level of excessive production delivered should be expected to be the same.

A further outsourcing theory found in the literature, and specific to cleaning, is that outsourcing of cleaning has allowed for recruitment of people outside the regulated labour markets, and finds that immigrants are overrepresented in the cleaning workforce, with specific attention paid to women with part-time, irregular jobs (Knotter, 2017). This study cannot confirm the nationalities, immigration status, or sex, of the respondents, and therefore the FM cleaning operators within UK shopping centres. However, this study can contribute an understanding regarding the age and length of service of the service operators in the FM cleaning operations within UK shopping centres. The FM industry can expect that the largest majority of their FM cleaning operations are 46-55 years of age, which constitutes 29% of the surveyed sample in this study, and suggests an older range of workforce. In addition, the FM industry can expect that the majority of their FM cleaning operations have 4+ years' length of service, which is 44% of the surveyed sample in this study. Which suggests a site workforce of 4+ years as the answer option with the most experience.

This study also theorises that the absence of a focus on efficiency from either in-house or outsource FM cleaning sourcing option in UK shopping centres could be due to a lack of focus from top management. As documented by Evans (2019), facilities managers are responsible to the centre management teams of shopping centres, outlining the top of the management structure as the owners: developers, investors, and local authority. The importance of the top management is explained by Evans (2019) who states that it is the owners that have the success or failure outcomes. This study provides evidence that irrespective of in-house/outsource, the level of excessive production delivered is not negatively affected. This could imply that the top

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of the management structure does not consider efficiency as important, and that success and failure targets regarding efficiency are not any more stringent for outsourced FM services.

This study also contributes to in-house/outsource from a practical viewpoint. This study proves that the choice of in-house or outsourced service delivery does not negatively impact the level of excessive production in FM cleaning operations within UK shopping centres. This finding implies that irrespective of whether the UK shopping centre delivers the cleaning operation in-house, or decides to outsource, the operation will contain excessive production, although the level cannot be predicted. Considering this, it can be assumed that both in-house and outsourced service delivery are managed and delivered in similar ways. The importance of efficiency, and specifically the elimination of excessive production, has been proven by this study as a variable that should be positively viewed, based on the benefits documented. It is from this understanding, and the results of this study that a near equal spread of in-house and outsourced service delivery is present across the surveyed UK shopping centres, that this study proposes further research into understanding the criteria for choosing the service delivery method of FM cleaning operations within UK shopping centres.

7.5.3 Management Presence

Bröchner et al. (2002), Sambrowski (2016), and Atkin and Björk (2007) suggest that management presence could provide benefit, specifically in relation to types and standards and services required in specific situations, understanding of the types of services which can be provided, and the application of the methods of work planning (Allen, 1989). This study could not find such benefit, specific to excessive production in FM cleaning operations within UK shopping centres. However, this study does develop the theoretical rationale by confirming a strong majority of management presence. This finding aligns with the suggestion by Robson (1993) that multi-service contracts require an onsite manager, and therefore a facilities manager. Although there is no reduction in excessive production from having an onsite facilities manager in FM cleaning operations within UK shopping centres, the 91.2% majority of management presence found by this study indicates that Robson's (1993) understanding remains relevant many years later.

Adding to current knowledge regarding the benefits of management presence (Bröchner et al., 2002; Sambrowski, 2016; Atkin and Björk, 2007), the finding from this study that 91.2% of

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FM cleaning operations within UK shopping centres have an onsite facilities manager indicates that irrespective of shopping centre classification (REVO, 2018) a facilities manager is required. However, whether a facilities manager is present in the operation or not, this study confirms that no change to excessive production can be expected. As a result, the theory by Wauters (2005) that facilities managers need to add value to the organisational value chain is progressed as the finding of this study contributes to the gap in literature as to what value is in FM cleaning operations within UK shopping centres. This study confirms that value to onsite facilities managers does not constitute efficiency, and in particular excessive production.

As addressed by independent variable three, management presence, and supporting the argument by Wauters (2005) that facilities managers need to add value to the organisational value chain, this study explored whether there is a significant positive relationship between having management presence and the level of excessive production within front-line operation. This study expanded on current knowledge in two ways. Firstly, this study concludes that there is no positive relationship, and therefore confirms that excessive production is not considered as value which facilities managers need to add to the organisational value chain, as per the suggestion by Wauters (2005). Secondly, this study confirms a large majority of 91.2% onsite management presence in FM cleaning operations within UK shopping centres. No literature was uncovered by which to compare this finding, and therefore it provides the initial academic understanding. It can hereby be concluded that management presence is the preference, although not due to increased efficiency within the operation.

The issue of management presence was found in the literature to be also related to cleaning practices. The cleaning work planning suggested to deliver the types of standards and services required in specific situations is theorised by Allen (1989) as the need for knowledge by a supervisor or manager, however, this theory does not specify whether site knowledge contributes as desirable knowledge. Although this study cannot confirm that site knowledge definitively assists work planning to deliver the types of standards and services required in specific situations, it can contribute to the knowledge gap. For example, 91.2% of FM cleaning operations within UK shopping centres have an onsite facilities manager, and should therefore have a more enhanced site knowledge than a facilities manager working remotely. This enhanced site knowledge by onsite facilities managers also contributes to the findings by Delane (2018) that cleaning checklists require an approximate time to complete each task.

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More accurate approximations for task completion could be achieved by site knowledge, and therefore would improve the consistency of the service. Furthermore, and specific to the central aim of this study, the identification and elimination of excessive production in FM cleaning operations within UK shopping centres, and a greater site knowledge by onsite facilities managers should reduce excessive production (Womack & Jones, 1996; Carreira, 2005; Manuele, 2007; Piercy & Rich, 2008; Sayer & Williams, 2012; McWhorter, 2017). However, this study has proven that excessive production is not reduced when a facilities manager is onsite.

FM is however a rapidly developing and growing discipline, vocation, and business service, finding that early developments have been made, including academically. The skilled facilities manager identifies processes that allow an organisation to sustain a quality operating environment and services to meet strategic needs, and at best cost (Alexander, 2003), to which the facilities manager could contribute by achieving set targets by improving efficiency by eliminating excessive production. From this understanding, this study hypothesised that there will be a significant relationship between having management presence and the level of excessive production within its front-line operation. This was however proven to be rejected as the level of excessive production in an FM cleaning operation within UK shopping centres is not positively impacted by having onsite management presence. The importance of this to the FM industry is that currently 91.2% of FM cleaning operations within UK shopping centres have onsite FM management presence, but this study has provided reason, due to no operational efficiency advantage, to reconsider the onsite requirement.

Interestingly however, the findings of this study do not support the assertion by Alexander (2003) that a skilled facilities manager identifies processes that allow an organisation to sustain a quality operating environment and services to meet strategic needs, and at best cost. This study confirms that having a facilities manager onsite does not reduce the level of excessive production, and therefore does not improve efficiency. Alexander's (2003) theory that FM is a rapidly developing and growing discipline, vocation, and business service, in that skilled facilities managers identify processes that allow an organisation to sustain a quality operating environment and services to meet strategic needs, and at best cost, is also not supported by this study. On the contrary, the findings of this study show that evidence that onsite facilities managers do not identify processes, and therefore the potential for efficiency improvement,

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any more effectively than facilities managers working remotely. The financial aspect is also contested, as a more efficient operation would provide a better cost model for FM service delivery (Manuele, 2007), and as a result would deliver enhanced value to the customer, aligning with the first lean principle of value (Olesen et al., 2015).

The stance by Manuele (2007) that there is a lack of awareness, misconception and immaturity to the limited progress that has been made to understand the interrelationships and dynamics of FM processes suggests that onsite management presence would have an advantage through having a closer relationship with the property management team. This is however not supported by the findings of this study, as having onsite management presence does not reduce excessive production, and therefore does not improve operating efficiency, indicating no enhanced understanding of the interrelationships onsite. The theory presented by this study proves that irrespective of onsite FM management presence, or remote FM management, the level of excessive production delivered will be the same. With regards to efficiency, there is no operational efficiency advantage currently from positioning a facilities manager at a UK shopping centre to deliver FM cleaning operations. The finding progresses the findings by Piercy and Rich (2008) that from lean implementation performance, expectations improve from time standards established per task, together with defined routines to effectively meet customer standards. This study confirms that time standards are established per task with defined routines to meet customer standards equally effectively onsite as well as working remotely.

A challenge to the progressed academic understanding provided by this study that facilities managers are not required onsite comes from Finch (1992). Finch (1992) documents that a facilities manager looks after four different stakeholders and shareholders: the shareholders, the employees, the customers, and the community. This, due to property managers no longer being able to assume that properties with the right location, will sustain their value, and a growing awareness that a permanent management structure for coping with change in the built environment is needed. However, although this addresses the need for facilities managers to sustain property value, in line also with Wauters (2005), it does not contribute an academic understanding regarding the impact an efficient FM operation would have on the value of the property. This study can also not confirm what impact an efficient FM operation would have on the value of a property; however, it can propose that with an efficient FM operation, achievable through excessive production identification and elimination, comes reduced cost,

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higher quality, and improved customer satisfaction, which will lead to increased profits (Chen et al., 2010). Although this does not sustain property value, it does reduce costs required to maintain the property, and therefore makes funds available which can make repairs and improvements that would help sustain property value.

In additional to these academic contributions, this study contributes to the issue of management presence from a practical perspective. This study proves that the decision of having management presence onsite does not positively impact the level of excessive production in FM cleaning operations within UK shopping centres, contrary to the hypothesis developed from the literature review. This study found a large majority of respondents answering that their cleaning operation had an onsite manager, spanning four varying shopping centre categories of regional scheme, sub-regional scheme, local scheme, and neighbourhood scheme. This study has proven a general approach to have an onsite manager for FM cleaning operations within UK shopping centres, although the findings do not signify that the approach reduces excessive production. This indicates that although objectives are key to facilities managers to manage the organisation's non-core business operations (Ee, 2015), reducing excessive production is not currently utilised. Reflecting this, this study proposes further research to explore the operational objectives set for onsite managers of FM cleaning operations within UK shopping centres, and whether a focus on efficiency is present. The results of this study would lead to hypothesise that efficiency is not of importance.

7.5.4 Shopping Centre Classification

The suggestion in the literature that from costing, and cleaning, the larger sq. ft. operations provide greater efficiency benefits (Amador, 2017), thus providing a higher level of efficiency, has been proved false in FM cleaning operations within UK shopping centres. This study contributes to the academic understanding that this is not present in FM cleaning operations within UK shopping centres, and improves the conceptual definition of the original claim that greater efficiency benefits are present in larger sq. ft. cleaning operations (Amador, 2017). Furthermore, considering the justification set by BICSc (2019) that a cleaning operation needs to achieve a set standard, the findings of this study indicate that the FM cleaning operations in all four classifications of UK shopping centres (REVO) operate similarly, producing comparable results.

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This study adds to current knowledge that irrespective of whether the BICSc (2019) standards are reached, no negative variation in excessive production can be expected when cleaning a larger sq. ft. UK shopping centre compared to a smaller sq. ft. UK shopping centre, which was not hypothesised. The theory by Wilson (1989) presenting that corporate occupiers, and property management, make decisions about their cleaning services regarding the standards and frequency of cleaning offers reasoning for this study, finding no significant negative relationship between shopping centre classification and the level of excessive production within its front-line operation. Although not confirmed by this study, cleaning requests by UK shopping centre property management potentially limit any amendments that FM cleaning operations can make, thus negating opportunity for excessive production elimination.

The findings of this study also progress the academic understanding of UK shopping centre classifications. Contrary to the hypothesis that there will be a significant relationship between shopping centre classification and the level of excessive production within front-line operations, no negative relationship was found. The classifications set by REVO (2018) utilised for this study, regional scheme, sub-regional scheme, local scheme, and neighbourhood scheme, present multiple variances between shopping centres. These are definition/concept, characteristics, typical numbers of anchors, size in sq. ft., and typical catchment area/travel time. The implications of this study add to this theoretical knowledge by confirming that irrespective of any change to shopping centre classification, and therefore different definition/concept, characteristics, typical numbers of anchors, size in sq. ft., and typical catchment area/travel time, no variance in the level of excessive production can be expected. Considering the cost and effort benefits possible from efficiency improvement (Chen et al., 2010), and specifically waste elimination (McWhorter, 2017), the finding of this study that efficiency does not change based on shopping centre characteristics challenges the theory by Alexander (2003) that FM service providers must aim to achieve best cost. Inefficient operations, for example those that contain non-value-added activities, add cost (Chen et al., 2010), and should not be paid for by the retailers that lease units in the respective shopping centres through their service charge.

The results from the continuous improvement independent variable further progress existing theory. For example, this study found that FM cleaning operations within UK shopping centres are flexible in trying to meet the needs the customers' specific needs. This finding demonstrates

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that FM cleaning operations in UK shopping centres recognise value to the customer, and as a result, align with the first principle of lean, which is value (Olesen et al., 2015). It is only when the customer value is understood that the next steps towards a lean operation can be taken, including waste elimination, and more specifically, excessive production elimination. This study therefore confirms that the first step towards lean, as per the five principles of lean theory, is being achieved in FM cleaning operations within UK shopping centres, which demonstrates that lean has been implemented in FM operations. To progress this theoretical understanding of FM excessive production in FM cleaning operations within UK shopping centres, this study suggests that further research is conducted into the second principle of the five principles of lean theory by Olesen et al. (2015), value stream, to identify the vital steps that facilitate an efficient production or service line workflow, and the unnecessary steps that result in waste.

Of further contribution to the academic understanding of UK shopping centres through proving that irrespective of other shopping centre's characteristics, such as footfall and anchor stores (REVO, 2018), the level of excessive production in FM cleaning operations within UK shopping centres will not be negatively affected. This finding adds to the conceptual definition of shopping centres provided by REVO (2018), and assists cleaning service providers when tendering for such contracts. This will enhance value provided to both the property management by knowing what level of efficiency can be expected, and the cleaning service provider by knowing what level of efficiency needs to be delivered. This understanding extends further than the classifications offered by REVO (2018). The theory presented by Ibrahim et al. (2018) contains twenty-one different categories, and although no mention is given to operating efficiency, this study can contribute to the knowledge that the level of excessive production will be the same irrespective of category. Similarly, the two categories theorised by Ronse et al. (2015), the size of the city in which the shopping centre is situated, and the location of the shopping centre relative to the city centre, are not expected to offer any variation in the level of excessive production within its FM cleaning operation, based on the findings of this study.

The advantages available to FM cleaning operations within UK shopping centres from excessive production identification and elimination are documented by Chen et al. (2010) who present that irrespective of industry, with correct identification of waste, and successful elimination of that found, can lead to reduced manufacturing cost, higher product quality,

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improved customer satisfaction and increased profits. Moreover, finding that products or features that customers do not want are considered Muda, as they do not generate revenue, but add cost. This relates to UK shopping centre classifications by FM cleaning operations delivering more than the customer is willing to pay for, and therefore excessive production (Carreira, 2005). If FM cleaning operations within UK shopping centres do not amend their cleaning scheduling and checklists (Lynn, 2003) to suit the varied sq. ft. and amenities, as per the UK shopping centre classifications (REVO, 2018), excessive production will be delivered. This supports Amador's (2017) findings that some companies charge solely by the sq. ft. to be cleaned, and use this to calculate the cost of cleaning. This is important to the FM industry, as although FM companies may charge solely by sq. ft. to be cleaned, they do not amend their service operating processes, affecting operating efficiency, and therefore do not take advantage of the cost saving opportunities available (Chen et al., 2010).

Irrelevant of cost, certain cleaning standards need to be achieved in the FM industry. Cleaning scheduling, and a subsequent breakdown of cleaning tasks, are documented as a means to not waste time and energy, and to ensure that no uncompleted tasks remain. Further requirements include legal requirements, and details of the premises to be cleaned, including floor areas, finishes, fittings and types of accommodation and schedule of tasks (Wilson, 1989). However, no focus is given to operational efficiency, and how that interacts with the cleanliness of the premises, or the floor areas, finishes, fittings and types of accommodation and schedule of tasks. There is no evidence found by this study to suggest that cleaning scheduling is treated any differently when it is applied to different UK shopping centre classifications, meaning that floor area is not considered, contrary to the suggestion by Wilson (1989). Therefore, this study theorises that cleaning operational efficiency does not change when applied to different floor areas in FM cleaning operations within UK shopping centres.

To support this current understanding, there is no indication from the findings of this study that a change to sq. ft. or amenities for cleaning changes the level of excessive production delivered. This is irrespective of technology on site, but focuses on the final outcome of the cleaning and not how the efficiency of the cleaning could be improved. This challenges the findings by Djellal (2002) that the cleaning industry, as a service industry, is undergoing major changes to scope and increasing use of information technologies, and was initially not computerised. Similar operational complexities are recognised by BICSc (2019), describing cleaning as

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scientific, and although usually judged subjectively by a given expectation, cleaning is an industry in which innovation is possible. Although the theory presented by this study, that FM cleaning operational efficiency does not change based on UK shopping centre classification, which suggests that it does not provide a technological, or computerised, advancement, it does provide innovation in the FM industry as it progresses current knowledge.

The reasoning behind FM cleaning operations within UK shopping centres not acknowledging operational efficiency when planning cleaning operations is potentially due to the complexities of shopping centres in terms of their size, and that this has led to confusion as to shopping centre identities (Pitt & Musa, 2009). Although this study contributes academically to present that UK shopping centre classification does not impact on the level of excessive production in FM cleaning operations within UK shopping centres, it does however confirm whether, or not, the REVO (2018) set of UK shopping centre classification is suitable. REVO (2018) was chosen because of its relevance to UK shopping centres in order to meet the central aim of this study, which is the identification and elimination of excessive production within UK shopping centres. However, other shopping centre classifications were available (Ronse et al., 2015; Ibrahim et al., 2018; ICSC, 2019), but not chosen. From the findings of this study, it could be hypothesised further, that these shopping centre classifications would also present no variance in excessive production when related to sq. ft. However, they could have categories that do impact the level of excessive production that were not considered for this study.

This study also contributes to the UK shopping centres understanding from a practical viewpoint. The results of this study show that the shopping centre classification does not negatively impact the level of excessive production in FM cleaning operations within UK shopping centres. Considering the variances of characteristics and sq. ft. between the four UK shopping centre classifications of regional scheme, sub-regional scheme, local scheme, and neighbourhood scheme, this study hypothesised that a negative impact of the level of excessive production would be observed, thus the level of excessive production will be higher in regional scheme shopping centres than in local scheme shopping centres. The findings of this study imply that a large cleaning operation would not contain more excessive production than a smaller cleaning operation, an increase in shopping centre sq. ft. does not increase excessive production, and that additional characteristics such as anchor stores, which potentially enhance footfall, also do not increase the level of excessive production. It is therefore found that

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irrespective of FM cleaning operation size, there is no improved utilisation of the two elements that reduce excessive production in FM cleaning operations within UK shopping centres, which are continuous improvement and performance measurement.

7.5.5 Continuous Improvement

The reviewed literature suggested a division between lean supporters and objectors, with supporters arguing that lean is not merely a production method, but a way of thinking that raises efficiency and rejects waste, and objectors arguing otherwise (Hasle et al., 2012). The findings of this study confirm that not only is CI, and therefore lean, present in FM cleaning operations within UK shopping centres, but that it positively impacts the level of excessive production, thus improving efficiency. This finding adds to the theoretical understanding of lean outside the production environment to which Hasle et al. (2012) theorised was possible. Finding elements of lean within FM cleaning operations within UK shopping centres contributes significantly to FM as an industry. The reviewed FM literature presents substantial gaps in relation to lean in FM, although literature pertaining to the benefits available from lean implementation is wide (e.g. McWhorter, 2017; Hines et al., 1998; Sayer & Williams, 2012; Sweeney, 2017). From confirming that lean is present in FM, this study contributes to the knowledge between lean and FM, and proposes future research suggestions in section seven of this chapter.

Full lean implementation has not yet been realised in FM cleaning operations within UK shopping centres. The five principles of lean theory provided by Olesen et al. (2015) has however been developed further by the findings of this study. This study found that FM cleaning operations within UK shopping centres are flexible in trying to meet the specific needs of the customers, which confirms acknowledgement of customer value. As a result, this confirms achievement of step one of the existing theories, which is the value step, whereby value is identified and products or services created that add value to the client's objectives (Olesen et al., 2015). As a result, FM cleaning operations within UK shopping centres can claim to utilise lean, if only at the initial step. The significant positive relationship between CI and excessive production also indicates that CI is specifically present in FM cleaning operations within UK shopping centres. CI and Muda, of which excessive production is one of the eight categories, are the foundation of lean thinking (Womack & Jones, 1996), which

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strengthens the finding that lean is present in FM. The work by Womack and Jones (1996) does not however transfer lean thinking into FM, unlike the findings of this study.

While this study contributes academically that lean is present in FM, it contests the suggestion presented by Narusawa and Shook (2009) that efficiency is centred around a manufacturing and production background. Although Narusawa and Shook (2009) do not state that the focus on efficiency is not transferrable into industries outside manufacturing and production, they do not propose that they have been successfully found to deliver efficiency improvements in industries outside manufacturing and production. This study progresses this academic understanding by proving that efficiency improvement has been successfully found in FM cleaning operations within UK shopping centres, in the form of reduced excessive production, achieved by the implementation and utilisation of CI. This is contrary to the suggestion by Taj and Berro (2005) that the lean approach may not be applicable to other industries. This is of significant importance to the wider FM industry as it generalises that efficiency improvements could be possible in their respective FM sectors, public or private (Nardelli et al., 2014). However, this study cannot confirm whether or not lean has been successfully applied in a public sector context, as UK shopping centres are operated in the private sector (Bateman et al., 2013).

The potential generalisation has been explored previously. CI, and therefore lean, has been documented to have been adopted in a wide range of industries beyond its origins in the motor industry (Bateman et al., 2013). This study contributes to this understanding by confirming that CI is present in FM cleaning operations within UK shopping centres, and furthermore that the utilisation results in reduced excessive production, and therefore improved operating efficiency. This finding rejects the suggestion by Taj and Berro (2005) that lean, and therefore CI, may not be transferable from an automotive assembly plant in a mass production industry to other types of industry. This study confirms otherwise that lean and CI are transferrable to other industries, and specifically FM.

Similarly, with exploration of independent variable five, CI, there was a significant positive relationship between CI and the level of excessive production within its front-line operation, and this also progresses the suggestion presented by Sweeney (2017) that companies need to adopt change in order to maintain a flexible position in its industry. The highest mean scoring

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CI questionnaire item “the cleaning operation is flexible in trying to meet customers’ specific needs” implies that FM cleaning operations within UK shopping centres are flexible to meet the needs of the customer. This adds to the theory by Sweeney (2017), as it adds a specific industry, FM, to the original generalised theory. This finding also progresses the understanding provided by Ee (2015) that in order to manage an organisation’s non-core business operation the FM objectives must be aligned with the organisation’s mission and goals. Although this alignment maybe vital to success, it does not necessarily deliver an efficient FM cleaning operation within UK shopping centres. To achieve this, flexibility is required.

Finding CI in FM cleaning operations within UK shopping centres also progresses the theory presented by Narusawa and Shook (2009) that the practice of kaizen, or CI, is learned through practice. Finding that CI has a positive impact on the level of excessive production in FM cleaning operations within UK shopping centres indicates that CI is not new to this environment and has been practised for some time. Considering this, and the suggestion by McWhorter (2017) that CI culture provides significant positive effects on a company, FM cleaning operations within UK shopping centres have been utilising CI in a positive way for a period of time. This study cannot however determine the length of time that CI has been utilised, or even if the operation is aware that CI is being positively utilised. Therefore, this study cannot confirm the level of CI that is being used, and is unable to compare or contrast with an advanced waste elimination tool related to CI, the selection matrix for the seven value stream mapping tools (Hines et al., 1998). This, with the presence of CI in FM cleaning operations within UK shopping centres, demonstrates that lean is being utilised.

This study therefore confirms that lean is present within FM cleaning operations within UK shopping centres. This has been demonstrated, as if CI, a derivative of lean and lean thinking, is in utilisation, the level of excessive production is reduced. The theory presented by this study is that if an FM cleaning operation within UK shopping centres utilises CI, the operation with have better operating efficiency than an operation that does not utilise CI. This supports the lean thinking theory presented by Womack and Jones (1996) that offered an antidote to waste, lean thinking, which was promoted as a way to specify value, line up value-creating actions in the best sequence, conduct activities without interruption when someone requests them, and perform them more effectively.

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To deliver FM, the facilities manager plays a significant role (Tuveson, 1998), irrespective of sector, public or private. Although this study cannot prove that facilities managers have identified wastes that exist within their supply chain (Hines et al., 1998), this study proves that with the implementation of CI, at least one waste, excessive production, is reduced. This theory proposed by this study supports the overall approach offered by Hines et al. (1998) that requires the manager to identify a series of wastes that exist within the supply chain and to choose, apply and analyse the output from a series from appropriately selected contingent tools. This study progresses this theory academically by confirming that an appropriate contingent tool for reducing a process waste, excessive production, in FM cleaning operations within UK shopping centres is CI. This finding also supports the suggestion by Sayer and Williams (2012) that CI is utilised to eliminate waste. This study proves that if CI is implemented and utilised in FM cleaning operations within UK shopping centres, the level of excessive production will be reduced, and therefore operating efficiency will be improved.

The efficiency improvement theorised by this study as possible in FM cleaning operations within UK shopping centres is achieved through a reduction of excessive production, one of the eight forms of Muda (Sweeney, 2017). This progresses the theory by Olesen et al. (2015) that presents the five key principles of lean theory that leads through to creating services and products that add value to a client's objectives by confirming that it is present in FM cleaning operations within UK shopping centres.

In addition to the academic contributions surrounding CI, this study also contributes from a practical perspective. The finding from this study that operational efficiency can be improved in FM cleaning operations within UK shopping centres enables facilities managers to enhance their respective operational efficiency, thus providing better cost value (Alexander, 2003). With the implementation of CI and performance measurement, facilities managers can deliver a more efficiency service, which in turn will improve the quality of FM, which is found to be an important role in the overall service performance of a shopping centre (Hui et al., 2013). However, facilities managers need to consider that the choice of FM service delivery, in-house/outsource, or shopping centre classification will need not improve the level of operational efficiency. Also, it can be argued, based on the findings of this study, that facilities managers will not deliver improved operational efficiency if based at the shopping centre, as opposed to working remotely, providing facilities managers with reason to request remote

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working. Which is contrary to the suggestion by Robson (1993) that multi-service contracts require an on-site manager responsible for services including cleaning in each respective building.

7.5.6 Performance Measurement

This study also contributes to the theory of core performance measurement principles in FM. In addition to the core performance measurement principles offered by Amaratunga (2001) - FM customer base, FM internal processes, FM learning and growth, and FM financial status - FM excessive production can be included. This can be confirmed as a direct positive showing that excessive production impact can be predicted in a FM cleaning operation within UK shopping centres that utilise performance measurement. The relationships between performance measurement and FM, and CI and FM, presented in Amaratunga's (2001) theory are supported by the findings of this study. This progresses the understanding of these relationships as they are specific to study FM cleaning operations within UK shopping centres, and are important academically to the FM industry as reasoning is provided to measure performance and thus to improve operational efficiency.

The results of this study show that performance measurement has a positive impact on the level of excessive production in FM cleaning operations within UK shopping centres. This indicates that the front-line employees are managed by performance, which is potentially achieved through checklists and scheduling, as proposed in the reviewed literature including Delane (2018), Lynn (2003) and Fenix (2002).

The suggestion by Lynn (2003) that cleaning teams should be allowed flexibility and clean in an efficient and logical way is also progressed by this finding, by confirming that FM cleaning operations within UK shopping centres are made more efficient through performance measurement utilisation. This study has proven a significant positive relationship between performance measurement and excessive production. The performance measurement of cleaning activities allows for the operation to be more efficient in its service delivery, in agreement with Lynn (2003), which can be achieved through good working practices, as presented by Fenix (2002). The findings of this study progress the theory by Fenix (2002) that management and supervision require a wide range of knowledge and skills, and that consistency and efficiency are essential components of good cleaning practices that, combined

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with specific knowledge of cleaning materials and equipment, will prevent companies from losing contracts. This study confirms that a wide range of knowledge and skills are present in FM cleaning operations within UK shopping centres, considering that performance measurement has a positive significant relationship with excessive production. Therefore, this study presents theory that performance measurement utilisation in FM cleaning operations within UK shopping centres will reduce the level of excessive production, and as a result deliver a more efficient operation.

Further good working practices have been documented that improve efficiency. Although intended for a house cleaning business and not a shopping centre, the progressed checklist concept offered by Delane (2018) provides information on how long a certain area takes to clean, guiding the employees on task completion and assisting in charging the client correctly, stating that having the right tool for the job cuts down on time and increases productivity. Although this study cannot confirm whether the FM cleaning operators have the right tool for the job for every cleaning task, the use of performance measurement is in use, and it delivers increased efficiency by removing non-value-added activities, and therefore increases productivity (McWhorter, 2017).

Interestingly, a direct relation between cleanliness and performance was found by Jiménez (2006). Jiménez (2006) theorised that cleanliness is directly tied to customer satisfaction and performance quality levels for the public transportation services, recognising that when done well, cleaning is often taken for granted, and when done poorly, it is immediately noticed. This study cannot confirm this understanding that cleanliness is directly tied to customer satisfaction and performance quality levels. However, Jiménez (2006) theorises that performance measurement positively impacts excessive production. In addition, although cleanliness is not a confirmed beneficiary of the reduction in excessive production, as found by the findings of this study, reduced manufacturing cost, higher product quality, improved customer satisfaction, and increased profits are (Chen et al., 2010). All of these assist the facilities manager in sustaining a quality operating environment and services to meet strategic needs, and at best cost (Alexander, 2003). This leads this study to theorise that implementing performance measurement in FM cleaning operations within UK shopping centres not only reduces excessive production, but also assists with achievement of the goals set for the facilities manager.

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This study can confirm that lean, and in particular a focus on efficiency, is present in FM cleaning operations within UK shopping centres. In order to achieve improved operating efficiency, through a reduction in excessive production delivered, FM cleaning operations must implement and utilise performance measurement, which will continually remove layers of waste, and supporting the theory by Olesen et al. (2015). The theory by Olesen et al. (2015) presents the five key principles of lean theory that lead through to creating services and products that add value to a client's objectives: identifying and creating products or services that add value to a client's objectives, identifying the vital steps that facilitate efficient production; eliminating steps in the workflow that potentially cause disruption; supplying on demand to ensure no resources are wasted; and striving for perfection by continually removing layers of waste as they are uncovered. This study progresses the theory by Olesen et al. (2015) by confirming performance measurement as a vital step to facilitate efficient production. This progressed theory is important academically to the FM industry as it confirms the action that should be taken in order to improve operational efficiency, performance measurement. To reach this theory, this study has proven a significant positive relationship between performance measurement and excessive production. The performance measurement of cleaning activities allows for the operation to be more efficient in its service delivery, which supports the findings by Lynn (2003) that cleaning scheduling and cleaning teams should operate in an efficient way.

7.6 Limitations of the Study

This section outlines the four main limitations identified in relation to this study, and explains how they were overcome to continue the research, concluding with the central aim, the identification and elimination of excessive production in FM cleaning operations within UK shopping centres.

The first limitation of this study was respondent sample size. The respondent sample size achieved was considered satisfactory, even though the challenges that were faced in achieving it were substantial, and did not allow for a larger sample size within a reasonable timescale. Due to unforeseen circumstances in the form of the COVID-19 global pandemic and the subsequent shopping centre closures, as detailed in the Methodology Chapter, it was decided to expand the questionnaire survey data collection methodology from postal delivery to include email delivery. This allowed for printing of the questionnaire onsite at the convenience of the

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shopping centre, and was also a means for this study to remind the shopping centre through a follow up email. Had the COVID-19 global pandemic not been a limiting factor for data collection, this study may have achieved a larger respondent sample size providing more accurate mean values. The respondent sample could also have been increased if not restricted by the second limitation, as this section proceeds to explain.

The second limitation was the limited number of shopping centres that could be surveyed in the data collection phase of this study. Although no specific time period was set for data collection, access to questionnaire respondents required agreement from shopping centre senior management. As mentioned previously, the COVID-19 global pandemic was present during the data collection period, and as a result other shopping centres had more pressing issues than this study to contend with. Considering this, it was accepted that twelve shopping centres would be a suitable sample: three from each REVO classification (2018), regional scheme, sub-regional scheme, local scheme, and neighbourhood scheme. Had access been more available to UK shopping centres without the limitations due to the COVID-19 global pandemic and the issues that were prioritised by its senior management teams, the UK shopping centre sample size could have been increased, thereby providing more accurate mean values. This increase in shopping centres could have also increased the respondent sample, again providing more accurate mean values.

The third identified limitation of this study was the lack of previous studies relating to the central aim of the research, the identification and elimination of excessive production in FM cleaning operations within UK shopping centres. Although this presented a research gap for this study to significantly contribute, the literature review phase was difficult to navigate. This literature gap was found to be because a focus on identification, and subsequent elimination, of excessive production in FM cleaning operations within UK shopping centres is a new phenomenon. Conversely, literature on excessive production in environments in which it was first intended, manufacturing and production, is widespread, and was reviewed for this study. If the literature review had provided previous studies relating to the central aim of the research, the findings of this could have confirmed or rejected theories specific to excessive production in FM operations.

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The fourth limitation of this study was that it focused solely on UK shopping centres and did not research shopping centres in other countries. The literature reviewed covered a variety of different countries, not only the those within the UK, and indicated an FM focus around the world. Although the FM literature does not suggest that the FM operation would be any different in other countries (Ee, 2015; Shine, 2018; Atkin & Brooks, 2000), the findings of this study cannot confirm either way, which could be addressed in future research. This limitation was present due to the limited literature pertaining to the central aim of this study, the identification and elimination of excessive production in FM cleaning operations within UK shopping centres.

7.7 Future Research

This section presents future research directions based on the findings of this study. Considering that neither service delivery method, soft services only or TFM, can claim a higher level of efficiency, as confirmed in the findings of this study and the reviewed literature, this study proposes that further research could be conducted into understanding whether FM companies review processes based on the chosen service delivery method.

The results of this study show that the choice of in-house or outsourced service delivery does not negatively impact the level of excessive production in FM cleaning operations within UK shopping centres. In addition, this study has not found any additional understanding of how the choice of service delivery is made. This finding, and the results of this study that a near equal spread of in-house and outsourced service delivery is present across the surveyed UK shopping centres, leads this study to propose further research into understanding the criteria for choosing the service delivery method of FM cleaning operations within UK shopping centres.

This study proves that the decision of having a management presence onsite does not positively impact the level of excessive production in FM cleaning operations within UK shopping centres, contrary to the hypothesis developed from the literature review. This study has proven that a general approach of having an onsite manager for FM cleaning operations within UK shopping centres, although the findings do not signify that the approach reduces excessive production. To this end, this study proposes further research to explore the operational objectives set for onsite managers of FM cleaning operations within UK shopping centres, and

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whether a focus on efficiency is present. The results of this study would lead to hypothesise that efficiency is not of importance.

Having confirmed that the first step towards lean, as per the five principles of lean theory by Olesen et al. (2015), is being achieved in FM cleaning operations within UK shopping centres, this study proposes that this progression in theory is continued. To progress this theoretical understanding of FM excessive production in FM cleaning operations within UK shopping centres, this study suggests that further research in conducted into the second principle of the five principles of lean theory by Olesen et al. (2015), value stream, to identify the vital steps that facilitate an efficient production or service line workflow, and also the unnecessary steps that result in waste. Following the theory by Olesen et al. (2015) and this study, this further research could aim to optimise workflow through eliminating the non-value steps and in order to create a value stream.

Considering the significant positive relationship found between CI and excessive production, this study suggests that other positive relationships between CI and the other seven Muda, defects, over-processing, waiting, non-used employee talent, transportation, inventory, and motion, could be present. The seven other Muda forms offer distinct benefits, and are different from excessive production, as set out in the Literature Review Chapter. Similarly, considering the significant positive relationship found between performance measurement and excessive production, this study suggests that any potential relationships between CI and the other seven Muda, which are defects, over-processing, waiting, non-used employee talent, transportation, inventory, and motion. These future research suggestions related to CI and performance measurement are made based on the findings of this study, which is that the first principle of lean, value (Olesen et al, 2015), is present in FM cleaning operations within UK shopping centres. This proven connection between lean and FM commences a journey to a more efficient state and will assist facilities managers in their aim to add value to the organisational value chain (Wauters, 2005).

7.8 Chapter Conclusion

This Chapter has overviewed current research and the methodology adopted for this study. Furthermore, the conclusions and results, contributions to knowledge, limitations of the study, and future research are outlined. From this, theory has been advanced with regards to all six

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hypotheses, relating to FM service delivery, in-house/outsource, management presence, shopping centre classification, CI, and performance measurement. This is all in support of the central aim of the study, which is the identification and elimination of excessive production in FM cleaning operations within UK shopping centres.

FM service delivery has been proven to prefer soft services only service delivery. The 62.7% majority for soft services only FM service delivery contributes knowledge to a gap in the literature from key authors (Shine, 2018; Atkin & Brooks, 2000; Moss et al., 2007; Brown, 1996), as it confirms a preference, and specifically to an industry, FM. However, irrespective of FM service delivery method no variance in the level of excessive production can be expected. This study finds that both soft services only and TFM service delivery methods are present in FM cleaning operations within UK shopping centres, however, neither provides a more efficient operation. This academic contribution to the knowledge surrounding FM service delivery in FM cleaning operations within UK shopping centres is important to FM as it shows that no consensus exists of how to deliver FM cleaning services. Moreover, the choice of soft services only or TFM does not offer an operational efficiency improvement.

This study has found a narrow majority of 52% outsourced FM cleaning operations within UK shopping centres. This majority in FM cleaning outsourcing contributes to a gap in the current literature, as no studies were found that have previously explored this aspect of service delivery. In addition, this study also confirms that neither in-house nor outsource provide a more efficient FM cleaning operation, contributing to a new phenomenon. This study provides evidence that irrespective of in-house/outsource, the level of excessive production delivered is not negatively affected. This could imply that the top of the management structure does not consider efficiency as important, and that success and failure targets regarding efficiency are not any more stringent for outsourced FM services.

Management presence was found to have a far higher majority at 91.2%. However, irrespective of whether a facilities manager is present in the operation or not, this study finds that no variance in excessive production can be expected. Considering this, the findings by Wauters (2005) that facilities managers need to add value to the organisational value chain is progressed as the finding of this study contributes to the gap in literature as to what value is in FM cleaning operations within UK shopping centres. This study confirms that value to onsite facilities

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managers does not constitute efficiency, and in particular excessive production. This study however confirms what impact an efficient FM operation would have on the value of a property. However, it can propose that with an efficient FM operation, achievable through excessive production identification and elimination, comes reduced cost, higher quality, and improved customer satisfaction, which will lead to increased profits (Chen et al., 2010). Although this does not sustain property value, it reduces the costs required to maintain the property, and therefore makes funds available, which can make repairs and improvements that would help sustain property value.

Furthermore, shopping centre classification does not change the level of excessive production in an FM cleaning operation within UK shopping centres. This finding adds to the conceptual definition of shopping centres provided by REVO (2018), and assists cleaning service providers when tendering for cleaning contracts. This academic contribution enhances value provided to both the property management and the cleaning service provider by knowing what level of efficiency needs to be delivered. This study contributes further to the academic understanding of UK shopping centres through proving that irrespective of other shopping centre's characteristics, such as footfall and anchor stores (REVO, 2018), the level of excessive production in FM cleaning operations within UK shopping centres will not be negatively affected.

CI utilisation in an FM cleaning operation within UK shopping centres is however found to positively impact the level of excessive production. A division was present in the reviewed literature between lean supporters and objectors (Hasle et al., 2012), with supporters arguing that lean is not merely a production method, but a way of thinking that raises efficiency and rejects waste, and objectors arguing otherwise. The findings of this study confirm that not only is CI, and therefore lean, present in FM cleaning operations within UK shopping centres, but that it reduces the level of excessive production. The theory proposed by this study supports the overall approach offered by Hines et al. (1998), which requires the manager to identify a series of wastes that exist within the supply chain and to choose, apply and analyse the output from a series of appropriately selected contingent tools. This study progresses this theory academically by confirming that an appropriate contingent tool for reducing a process waste, excessive production, in FM cleaning operations within UK shopping centres is CI. This finding also supports the suggestion by Sayer and Williams (2012) that CI is utilised to

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eliminate waste. This study proves that if CI is implemented and utilised in FM cleaning operations within UK shopping centres, the level of excessive production will be reduced, and therefore operating efficiency will be improved.

In addition, performance measurement utilisation has a positive impact on excessive production in FM cleaning operations within UK shopping centres. This improved efficiency benefit from performance measurement within a FM function aligns with Amaratunga's (2001) existing theory which focuses on the core performance measurement principles of FM customer base, FM internal processes, FM learning and growth, and FM financial status, in order to propose a varied, and enhanced, focus on performance measurement in FM. Furthermore, this study progresses the theory by Olesen et al. (2015) by confirming performance measurement as a vital step to facilitate efficient production. This progressed theory by this study is important academically to the FM industry as it confirms what action should be taken in order to improve operational efficiency, performance measurement. To reach this theory, this study has proven a significant positive relationship between performance measurement and excessive production. The performance measurement of cleaning activities allows for the operation to be more efficient in its service delivery, which supports the suggestion by Lynn (2003) that cleaning scheduling and cleaning teams should operate in an efficient way.

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References

Adams, J., Khan, H, T, A., Raeside, R., & White, D. (2007). *Research Methods for Graduate Business and Social Science Students*. New Delhi: Sage

Akdeniz, C. (2015). *Lean Manufacturing Explained*. Germany: Best Business Books

Alexander, K. (1992). An Agenda for Facilities Management Research. *Facilities*. Bradford Vol 10, (7), (July 1992): 6.

Alexander, K. (2003). A Strategy for Facilities Management. *Facilities.* Vol. 21 No. 11/12

Allen, D, M. (1989). *Accommodation and Cleaning Services: Volume 1: Operations*. Cheltenham: Stanley Thornes (Publishers) Ltd

Amador, V. (2017). *The 6 Figure Cleaning Business Master Class: Compilation of Class Materials, Previous Ebook Material, Cleaning Proposal Sample, How to Calculate Price, and more*. Great Britain: Amazon

Amador, V. (2017). *Real Stories, Lessons and Tips from Someone Who Started a Cleaning Company and Grew Revenues to Over $1m in 6 Years.* Great Britain: Amazon

Amaratunga, R, D, G. (2001). Theory Building in Facilities Management Performance Measurement: Application of Some Core Performance Measurement and Management Principles. *Research Institute for Business and Informatics School of Construction and Property Management,* The University of Salford, UK

Amaratunga, D., Sarshar, M., & Baldry, D. (2002). Process Improvement in Faciliti9ies Management: The Spice Approach. *Business Process Management Journal*, Vol. 8 No. 4

Antony, J. (2010). Sis Sigma vs Lean: Some Perspectives from Leading Academics and Practitioners. *International Journal of Productivity and Performance Management*. Vol. 60 No. 2

Atkin, B., & Björk, B, C. (2007). Understanding the Context for Best Practice Facilities Management from the Client's Perspective. *Facilities*. Vol. 25 No. 13/14

`

Atkin, B., & Brooks, A. (2009). *Total Facilities Management.* (3rd Ed.). UK: Wiley-Blackwell

Banham, R. (2006). The UK Shopping Centre Development Market. *Journal of Retail and Leisure Property*. Vol. 5 No. 3

Baronov, D. (2012). *Conceptual Foundations of Social Research* Methods (Second Edition). USA: Paradigm Publishers

Barrett, P. (1992). Facilities Management Research at Salford University. *Facilities*, Bradford Vol. 10, Iss. 7, (Jul 1992): 18.

Barrett, P. (2000). Achieving Strategic Facilities Management Through Strong Relationships. *Facilities*, Vol. 18 No. 10/11/12

Bateman, N., Hines, p., & Davidson, P. (2013). Wider Applications for Lean: An Examination of the Fundamental Principles Within Public Sector Organisations. *International Journal of Productivity and Performance Management*. Vol. 63 No. 5

Benito-López, B., Moreno-Enguix, M, D, R., & Solana-Ibañez, J. (2011). Determinants of Efficiency in the Provision of Municipal Street-Cleaning and Refuse Collection Services. *Waste Management*. 31

Bicheno, J., Holweg, M., & Niessmann, J. (2001). Constraint Batch Sizing in a Lean Environment. *International Journal of Production Economics*. 73

BICSc (The British Institute of Cleaning Science). (2019). Best Value Standards Specifications and Productivity Rates. BVR6001

Blaxter, L., & Hughes, C., & Tight, M. (2006). *How to Research* – Third Edition. England: Open University Press

Bourque, L, B., & Fielder, E, P. (1995). *How to Conduct Self-Administered and Mail Surveys.* California: Sage Publications, Inc.

`

Bröchner, J., Adolfsson, P., & Johansson, M. (2002). Outsourcing Facilities Management in the Process Industry: A Comparison of Swedish and UK Patterns. *Journal of Facilities Management.* Vol. 1 No. 3

Brown, M. (1996). *Keeping Score: Using the Right Metrics to Drive World Class Performance*. New York: Quality Resources

Bryman, A. (1995). *Quantity and Quality in Social Research.* London: Routledge

Bryman, A., & Bell, E. (2015). *Business Research Methods*. (4th Ed). United Kingdom: Oxford University Press

Bryman, A., & Cramer, D. (2011). *Quantitative Data Analysis with IBM SPSS 17, 18 & 19: A guide for Social Scientists*. East Sussex: Routledge

Bryman, A. (2016). *Social Research Methods.* (5th ed). Oxford: Oxford University Press

Burns, R, B., & Burns, R, A. (2008). *Business Research Methods and Statistics Using SPSS*. London: Sage Publications Ltd

Carreira, B. (2005). *Lean Manufacturing That Works: Powerful Tools for Dramatically Reducing Waste and Maximising Profits*. USA: Amacom

Chen, H., Lindeke, R, R., & Wyrick, D, A. (2010). Lean Automated Manufacturing: Avoiding the Pitfalls to Embrace the Opportunities. *Assembly Automation*. Vol. 30 No. 2

Collis, J., & Hussey, R. (2003). *Business Research: A Practical Guide for Undergraduate and Postgraduate Students*. (2nd Ed). Hampshire: Palgrave Macmillan

Cooney, R. (2002). Is Lean a Universal Production System? Batch Production in the Automotive Industry. *International Journal of Operations and Production Management*. Vol. 22 No. 10

Cornock, M. (2018). General Data Protection Regulation (GDPR) and Implications for Research. *Maturitas* 111 (2018) A1-A2

Creighton, J. (2007). Snapshot of the Cleaning Industry. *Showcase*. March 2007

`

Creswell, J, W. (2009). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches.* (3rd Ed). California: Sage Publications

Creswell, J, W. (2014). *Research Design: Qualitative, Quantitative & Mixed Methods Approaches*. London: Sage Publications

Crotty, M. (1998). *The foundations of Social Research*. London: Sage

Czaja, R., & Blair, J. (2005). *Designing Surveys: A Guide to Decisions and Procedures*. (2nd Ed). California: Sage Publications

Daniels, R. (1994). *New Cleaning Strategies: Environmental Issues and Technical Developments*. San Francisco: Miller Freeman Books

Datoo, A. (2018). Data in the Post-GDPR World. *Computer Fraud & Security*

Delane, J. (2018). *Clean Up Cleaning Up: Learn the Secrets to Starting, Running and Growing Your Own Professional Cleaning Business*. USA: Broad Base Publishing

Deming, W, E. (1960). *Sample Design in Business Research*. USA: John Wiley & Sons, Inc

Denscombe, M. (2010). *The Good Research Guide: For Small-Scale Social Research Projects*. (4th Ed). England: McGraw Hill Education

De Vaus, D. (2002). *Analysing Social Science Data: 50 Key Problems in Data Analysis*. London: Sage Publications Ltd

De Vaus, D. (2001). *Research Design in Social Research.* London: Sage Publications Ltd

De Vaus, D. (2002). *Surveys in Social Research. (5th Ed).* London: Routledge

Djellal, F. (2002). Innovation Trajectories and Employment in the Cleaning Industry. *New Technology, Work and Employment*. 17:2

Drotz, E., & Poksinska, B. (2014). Lean in Healthcare from Employees' Perspective. *Journal of Health Organisation and Management.* Vol. 28 No. 2

Easterby-Smith, M., Thorpe, R., & Lowe, A. (2002). *Management Research: An Introduction*. London: Sage Publications

`

Easterby-Smith, M., Thorpe, R., & Jackson, P, R. (2015). *Management & Business Research.* (5th Ed). London: Sage Publications Ltd

Ee, S. (2015). *Value-Based Facilities Management: How Facilities Practitioners Can Deliver Competitive Advantage to Organisations*. Singapore: Phoon Kok Hwa

Emory, C, W., & Cooper, D, R. (1991). *Business Research Methods*. (4th Ed). USA: Richard D. Irwin, Inc

Evans, J. (2019). Scottish Shopping Centre Goes on Sale for £1. *Financial Times*. London (UK). 18 January 2019

Farrimond, H. (2013). *Doing Ethical Research. London*: Palgrave Macmillan

Fenix, W. (2002). *Commercial and Residential Cleaning Services: A Resource Guide to Developing and Maintaining Your Own Janitorial or Home Cleaning Business*. Atlanta: The Knouen Group

Field, A. (2013). *Discovering Statistics Using IBM SPSS Statistics.* (4th Ed.). London: Sage Publications Ltd

Field, A. (2018). *Discovering Statistics Using IBM SPSS Statistics.* (5th Ed.). London: Sage Publications Ltd

Finch, E. (1992). *Facilities Management at the Crossroads*. Property Management. Vol. 10 Issue 3

Fink, A. (1995). *How to Ask Survey Questions*. California: Sage Publications Inc.

Fink, A. (1995). *How to Analyze Survey Data*. California: Sage Publications Inc.

Fink, A. (1995). *How to Ask Survey Questions*. California: Sage Publications Inc.

Fink, A. (1995). *How to Sample in Surveys*. California: Sage Publications Inc.

Fink, A. (2014). *Conducting Research Literature Reviews: From the Internet to Paper*. California: Sage Publications Inc

`

Fleming, D. (2004). Facilities Management: A Behavioural Approach. *Facilities*. Vol. 22 No 1/2

FM Green Update. (2015). Circle 113. Available on www.buildings.com/freeinfo accessed on 09/09/2019

Focus on Surfactants. (2016). Industrial Cleaning Market worth $50.24 bn by 2020. May 2016

Folwer, F, J. Jr. (2002). *Survey Research Methods*. (3rd Ed). California: Sage Publications Inc

Fornell, C., & Larcker, D. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, 18, 39-50

Frazer, L., & Lawley, M. (2000). *Questionnaire Design & Administration: A Practical Guide*. Australia: John Wiley & Sons

Fullerton, R, R., Kennedy, F, A., & Widener, S, K. (2014). Lean Manufacturing and Firm Performance: The Incremental Contribution of Lean Management Accounting Practices. *Journal of Operations Management*. 32

Ghauri, P., & Grønhaug, K. (2010). *Research Methods in Business Studies*. (4th Ed). England: Pearson Education Limited

Gillham, B. (2000). *Developing a Questionnaire.* London: Continuum

Golińska-Dawson, P., Kosacka, M., & Werner-Lewandowska, K. (2015). How to Find a Potential for Improvements? – Muda Checklist as a Lean Tool for Manufacturing Companies. *Faculty of Engineering Management*. Poznań University of Technology

Gray, C, D., & Kinnear, P, R. (2012). *IBM SPSS Statistics 19 Made Simple.* New York: Psychology Press

Grix, J. (2004). *The Foundations of Research Volume 2*. London: Palgrave Macmillan

`

Grix, J. (2010). *Palgrave Research Skills: The Foundations of Research*. England: Palgrave Macmillan

Hair, J, F. (2014). *Multivariate Data Analysis: A Global Perspective.* (7th Ed.). USA: Prentice Hall

Hall, D., & Hall, I. (1996). *Practical Social Research: Project Work in the Community*. London: Macmillan Press Ltd

Hardy, M., & Bryman, A. (2004). *Handbook of Data Analysis*. London: Sage Publications

Harrison, A. (1992). *Just-in-Time Manufacturing in Perspective.* Hemel Hempstead: Prentice Hall International (UK) Ltd

Hasle, P., Bojesen, A., Jensen, P, L., & Bramming, P. (2012). Lean and the Working Environment: A Review of the Literature. *International Journal of Operations and Production Management.* Vol. 32 No. 7

Hermes, J. (2013). Cleaning Industry Benefits from Color Coding. *Environmental Leader*. Available at https://www.environmentalleader.com/2013/11/cleaning-industry-benefits-from-color-coding/ accessed on 10/09/2019

Hessler, R, M. (1992). *Social Research Methods.* St Paul, MN: West Publishing Company

Hines, P., Rich, N., Bicheno, J., Brunt, D., & Taylor, D., Butterworth., & Sullivan, J. (1998). Value Stream Management. *International Journal of Logistics Management*; 1998; 9, 1

Hinton, P, R. (2004). Statistics Explained. (2nd Ed.). East Sussex: Routledge

Hodges, C., & Sekula, M. (2013). *Sustainable Facility Management: The Facility Manager's Guide to Optimizing Building Performance*. USA: Vision Spots Publishing

Hollis, M. (1999). *The Philosophy of Social Science*. Cambridge: Cambridge University Press

Hui, E, C, C., Zhang, P., & Zheng, X. (2013). Facilities Management Service and Customer Satisfaction in Shopping Mall Sector. *Facilities*. Vol. 31 No. 5/6

`

Human Resource Management International Digest. Understanding Increased Productivity Through Facilities Management. *Human Resource Management International Digest*. Vol. 25 No. 6

Hussain, M., & Malik, M. (2015). Prioritizing Lean Management Practices in Public and Private Hospitals. *Journal of Health Organization and Management*. Vol. 30 No. 3

Hussey, J., & Hussey, R. (1997). *Business Research: A Practical Guide for Undergraduate and Postgraduate Students*. England: Macmillan Press Ltd

Ibrahim, I., Bon, A, T., Nawawi, A, H., & Safian, E, E, M. (2018). Shopping Centre Classification Scheme: A Comparison of International Case Studies. *Proceedings of the International Conference on Industrial Engineering and Operations Management*. Bandung, Indonesia, March 6-8, 2018

ICSC. (2019). Europe Shopping Centre Classification and Typical Characteristics. https://www.icsc.com/uploads/t07-subpage/Europe-Shopping-Center-Definition-Standard.pdf, accessed on 23/08/2019

ICSC. (2019). International Council of Shopping Centres. https://www.mbaskool.com/business-concepts/marketing-and-strategy-terms/12027-international-council-of-shopping-centres-icsc.html, accessed on 23/08/2019

Ikediashi, D, I., Ogunlana, S, O., Boateng, P., & Okwuashi, O. (2012). Analysis of Risks Associated with Facilities Management Outsourcing: A Multivariate Approach. *Journal of Facilities Management*. Vol. 10 No. 4

International Facilities Management Association. (2019). Available at: www.ifma.org, accessed on 16/10/2019

Jagdish, R, J., Shankar, S, M., & Santosh, B, R. (2013). Exploring Barriers in Lean Implementation. *International Journal of Lean Six Sigma*. Vol. 5 No. 2

`

Jarrett, J., & Kraft, A. (1989). *Statistical Analysis for Decision Making*. Massachusetts: Allyn and Bacon

Jiménez, A., Mateos, A., Rios-Insua, S., & Rodriguez, L, C. (2006). Contracting Cleaning Services in a European Public Underground Transportation Company with the Aid of a DSS. *Decision Support Systems*. 43

Johnson, M. (1997). *Outsourcing: In Brief*. Oxford: Butterworth-Heinemann

Jones, C. (2002). Facilities Management in Medium-Sized UK Hotels. *International Journal of Contemporary Hospitality Management*. 14/2

Jones, D, T., Hines, P., & Rich, N. (1997). Lean Logistics. *International Journal of Physical Distribution and Logistics Management*. Vol. 27, Iss 3/4

Jones, C., Al-Shaheen, Q., & Dunse, N. (2016). Anatomy of a Successful High Street Shopping Centre. *Journal of Urban Design*. Vol. 21 No. 4

Junghans, A., & Olsson, N, O, E. (2014). Discussion of Facilities Management as an Academic Discipline. *Facilities*, Vol 32 No. 1/2, 2014. Emerald Group Publishing Limited

Kajalo, S., & Lindblom, A. (2009). The Perceived Effectiveness of Surveillance in Reducing Crime at Shopping Centres in Finland. *Property Management*. Vol. 28 No. 1

Kerwin, J, B. (1992). *Methods for Business Research*. New York: Harper Collins Publishers Inc

Kiff, J, S. (2000). The Lean Dealership: A Vision for the Future: From Hunting to Farming. *Marketing Intelligence and Planning*. 18/3

Kim, E, J., Lee, Y, C., Lee, H, U., Huh, Y, S., & Lee, M. (2016). Environment-Friendly Industrial Cleaning Agents Incorporating Plant-Oil-Based Raw Materials as Chlorofluorocarbon (CFC) Alternatives. *Chemical Engineering Journal*. 290

Kline, R, B. (2011). *Principles and Practice of Structural Equation Modelling.* (5th Ed.). New York: The Guildford Press

`

Klungseth, N, J. (2014). Organising Cleaning in Norwegian Public FM. *Journal of Facilities Management*. Vol. 12 No. 4

Klungseth, N, J., & Blakstad, S, H. (2015). Organising in-House Cleaning Services in Public FM. *Facilities*. Vol. 34 No. 13/14

Knotter, A. (2017). Justice for Janitors Goes Dutch. Precarious Labour and Trade Union Response in the Cleaning Industry (1988-2012): A Transnational History. *Internationaal Instituut voor Sociale Geschiedenis.* Doi: 10.1017/S0020859016000651

Kumar, R. (1996). *Research Methodology: A Step-by-Step Guide for Beginners*. London: Sage

Kumar, R. (2014). *Research Methodology: A Step-by-Step Guide for Beginners.* (4th Ed). London: Sage

Kupke, V. (2002). Identifying the Dimensions to Retail Centre Image. *Journal of Property Investment and Finance*. Vol. 22 No. 4

Kurtz, N, R. (1983). *Introduction to Social Statistics.* Japan: McGraw-Hill

Lang, B. (2017). Properly Following Cleaning Protocols. *PC Parts Cleaning*. Available at https://www.pfonline.com/articles/properly-following-cleaning-protocols accessed on 10/09/2019

Lee-Mortimer, A. (2008). A Continuing Lean Journey: An Electronic Manufacturer's Adopting of Kanban. *Assembly Automation*. 28/2

Lind, D, L., Marchal, W, G., & Wathen, S, A. (2015). *Statistical Techniques in Business and Economics*. (16th Ed.). United States: McGraw-Hill

Lindsey, J, K. (2004). *Introduction to Applied Statistics: A Modelling Approach*. (2nd Ed). Oxford: Oxford University Press

Litwin, M, S. (1995). *How to Measure Survey Reliability and Validity*. London: Sage Publications Ltd

`

Low, S, P., Gao, S., & Tiong, K, L. (2014). Applying Lean Production Principles to Facilities Design of Ramp-Up Factories. *Facilities*. Vol. 33 No. 5/6

Lucke, L. (2013). Real Time With: Panel Discussion Spotlight: Best Cleaning Practices. *SMT Magazine*. April 2013

Lynn, J. (2003). *Start Your Own Cleaning Service: Your Step-by-Step Guide to Success*. Canada: Entrepreneur Media Inc.

Mabbett, D. (2018). Carillion, Procurement and Industrial Policy. *The Political Quarterly*, Vol. 89, No .2

Mann, D. (2010). *Creating a Lean Culture: Tools to Sustain Lean Conversations. (2nd Ed*.). New York: Productivity Press

Manuele, F, A. (2007). Lean Concepts: Opportunities for Safety Professionals. *Professional Safety*. Aug 2007, 52, 8

Mara, M, A. (1999). *Managing Corporate Real Estate and Facilities for Competitive Advantage: Strategy and Place*. New York: The Free Press

Marketsandmarkets. (2016). PR Newswire. Available on www.prnewswire.com/ accessed on 08/09/2019

Marlowe, T. (2017). Dry Ice Cleaning: The Clean in Place Solution. *The National Provisioner: Tech Supplier's Perspective.* December, 2017

May, D. (2010). Facilities Management Help Desks. *Journal of Facilities Management*. Vol. 8 No. 3

Maylor, H., & Blackmon, K. (2005). *Researching Business and Management.* Hampshire: Palgrave Macmillan

McLennan, P., & Nutt, B. (1992). Facilities Management Research Initiatives. *Facilities*, Bradford Vol. 10, Iss. 7, (Jul 1992): 13.

McNeill, P. (1990). *Research Methods*. (2nd Ed). London: Routledge

`

McRae, H. (2004). Forces That Will Shape the Infrastructure of the Future. *Facilities Management 11*, March, University College London, London

McWhorter, B. (2017). *Introduction to Lean Manufacturing: The Road to Continuous Improvement.* USA: Dragon Slayer Publishing

Milton, J, S., & Arnold, J, C. (2003). *Introduction to Probability and Statistics: Principles and Applications for Engineering and the Computer Sciences*. (4th Ed.). New York: McGraw-Hill

Moser, C, A., & Kalton, G. (1971). *Survey Methods in Social Investigation*. Aldershot: Gower Publishing Company Limited

Moss, Q, Z., Alho, J., & Alexander, K. (2007). Performance Measurement Action Research. *Journal of Facilities Management.* Vol. 5 No. 4

Nardelli, G., Jensen, J, O., & Nielsen, S, B. (2014). Facilities Management Innovation in Public-Private Collaborations: Danish ESCO Projects. *Journal of Facilities Management*. Vol. 13 No. 2

Narusawa, T., & Shook, J. (2009). *Kaizen Express: Fundamentals for Your Lean Journey*. USA: Lean Enterprise Institute Inc.

Newbold, P., Carlson, W, L., & Thorne, B, M. (2013). *Statistics for Business and Economics*. (8th Ed). England: Pearson Education Limited

Noor, M, N, M., & Pitt, M. (2009). A Critical Review on Innovation in Facilities Management Service Delivery. *Facilities*, Vol. 27 No. 5/6

NHS111. (2007). Going Lean in the NHS. *NHS Institute for Innovation and Improvement.* Warwick

Nielsen, S, B., Sarasoja, A., & Galamba, K, R. (2016). Sustainability in Facilities Management: An Overview of Current Research. *Facilities*, Vol 34 No. 9/10, 2016. Emerald Group Publishing Limited

`

Nugent, P, G., Modi, T., McLeod, N., Bock, L, J., Smith, C., Poolman, T, M., Warburton, R., Meighan, P., Wells, P., & Sutton, J, M. (2013). Application of Rapid Read-Out Cleaning Indicators for Improved Process Control in Hospital Sterile Services Departments. *Journal of Hospital Infection*. 84

Oakshott, L. (2016). *Essential Quantitative Methods for Business, Management and Finance.* (6th Ed). London: Palgrave Macmillan

Olesen, P., Powell, D., Hvolby, H, H., & Fraser, K. (2015). Using Lean Principles to Drive Operational Improvements in Intermodal Container Facilities: A Conceptual Framework. *Journal of Facilities Management*. Vol. 13 No.3

O'Mara, M. (1999). *Managing Corporate Real Estate and Facilities for Competitive Advantage: Strategy and Place.* The Free Press: New York

Oppenheim, A, N. (1992). *Questionnaire Design, Interviewing and Attitude Measurement.* London: Pinter Publishers Ltd

Pallant, J. (2013). *SPSS: Survival Guide*. England: McGraw-Hill

Parten, M, B. (1965). *Surveys, Polls, and Samples*. New York: Harper & Row Publishers Incorporated

Pathirage, C., Haigh, R., Amaratunga, D., & Baldry, D. (2006). Knowledge Management Practices in Facilities Organisations: A Case Study. *Journal of Facilities Management*. Vol. 6 No. 1

Peterson, R, A. (2000). *Constructing Effective Questionnaires.* USA: Sage Publications, Inc

Phillips, D., & Burbules, N, C. (2000). *Post positivism and Educational Research*. Lanham, MD: Rowman & Littlefield

Piercy, N., & Rich, N. (2008). High Quality and Low Cost: The Lean Service Centre. *European Journal of Marketing.* Vol. 43 No. 11/12

`

Piercy, N., & Rich, N. (2008). Lean Transformation in the Pure Service Environment: The Case of the Call Service Centre. *International Journal of Operations and Production Management*. Vol. 29 No. 1

Pitt, M., & Musa, Z, N. (2009). Towards Defining Shopping Centres and Their Management Systems. *Journal of Retail and Leisure Property.* Vol. 8

Quinton, S., & Smallbone, T. (2006). *Postgraduate Research in Business: A Critical Guide*. London: Sage Publications Ltd

Ransome, P. (2013). *Ethics and Values in Social Research*. England: Palgrave Macmillan

Rea, L, M., & Parker, R, A. (1992). *Designing and Conducting Survey Research: A Comprehensive Guide*. California: Jossey-Bass inc. Publishers

Remenyi, D., Williams, B., Money, A., & Swartz, E. (1998). *Doing Research in Business and Management: An Introduction to Process and Method*. London: Sage Publications

REVO. (2018). UK Classification for Retail Assets. https://www.revocommunity.org/documents/get_lob?age=&id=681&field=file, accessed on 11/12/2018

Robertson, J., & Fennell, J. (2007). The Economic Effects of Regional Shopping Centres. *Journal of Retail and Leisure Property*. Vol. 6 No. 2

Robson, P. (1993). Cleaning Services: Making a Clean Sweep. *Chartered Institute of Purchasing and Supply*. No. 34

Ronse, W., Boussauw, K., & Lauwers, D. (2015). Shopping Centre Siting and Modal Choice in Belgium: A Destination-Based Analysis. *European Planning Studies*. Vol. 23 No. 11

Roos, D., Womack, J, P., & Jones, D, T. (1990). *The Machine That Changed the World: The Story of Lean Production: How Japan's Secret Weapon in the Global Auto Wars Will Revolutionize Western Industry*. New York: Rawson Associates

`

Rust, K, F., & Rao, J. (1996). Variance Estimation for Complex Surveys Using Replication Techniques. *Statistical Methods in Medical Research*. 1996;5(3):283-310

Sambrowski, T. (2016). In-House Cleaning Employees, Outstanding Cleaning Services Present Different Advantages. *The American City and County, Pittsfield*. May 23, 2016

Sapsford, R., & Jupp, V. (2006). *Data Collection and Analysis. (2nd Ed).* London: Sage Publications Ltd

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research Methods for Business Students*. (5th Ed). England: Pearson Education Limited

Saunders, M., Lewis, P., & Thornhill, A. (2012). *Research Methods for Business Students* (6th Edition). England: Pearson Education Limited

Sayer, N, J., & Williams, B. (2012). *Lean for Dummies. (2nd Ed).* New Jersey: John Wiley & Sons, Inc.

Seale, C. (2004). *Researching Society and Culture. (2nd Ed).* London: Sage Publications Ltd

Shine, B. (2018). *The Essential Guide to Maintenance and Facilities Management.* (2nd Ed.). Great Britain: Amazon

Silver, M. (1997). *Business Statistics*. (2nd Ed.). London: McGraw-Hill

Singh, J., & Singh, H. (2013). Continuous Improvement Philosophy: Literature Review and Directions. *Benchmarking: An International Journal*. Vol. 22 No. 1

Soriano-Meier, H., Forrester, P, L., Markose, S., & Garza-Reyes, J, A. (2011). The Role of the Physical Layout in the Implementation of Lean Management Initiatives. *International Journal of Lean Six Sigma*. Vol. 2 No. 3

Srinivasan, S. (2017). On-Demand Cleaning Services Startup MyDidi Folds its Regular Cleaning Business. *The Economic Times; New Delhi.* 25 April, 2017

Sweeney, B. (2017). *Lean Quick Start Guide: The Simplified Beginner's Guide to Lean. (2nd Ed).* USA: ClydeBank Media

`

Swift, L., & Piff, S. (2010). *Quantitative Methods: For Business, Management & Finance*. (3rd Ed). London: Palgrave Macmillan

Tabachnick, B, G., & Fidell, L, S. (2013). *Using Multivariate Statistics*. (6th Ed.). New Jersey: Pearson Education Inc.

Taj, S., & Berro, L. (2005). Application of Constrained Management and Lean Manufacturing in Developing Best Practices for Productivity Improvement in an Auto-Assembly Plant. *International Journal of Productivity and Performance Management*. Vol. 55 No. 3/4

Teddie, C., & Tashakkori, A. (2009). *Foundations of Mixed Methods Research: Integrating Quantitative and Qualitative Approaches in the Social and Behavioural Sciences*. California: Sage Publications Inc

Teller, C., & Alexander, A. (2014). Store Managers – The Seismographs in Shopping Centres. *European Journal of Marketing*. Vol. 48 No. 11/12

The University of Gloucestershire. (2008). *Research Ethics: A Handbook of Principles and Procedures.* https://infonet.glos.ac.uk/departments/registry/researchadmin/Research%20Ethics%20documents/Research%20Ethics%20Handbook%20final%20Nov%2010.pdf, accessed on 02/12/2018

Then, D, S, S. (2005). A Proactive Property Management Model that Integrates Real Estate Provision and Facilities Services Management. *International Journal of Strategic Property Management*: 2005; 9, 1

Thomas, A, B. (2004). *Research Skills: For Management Studies*. London: Routledge

Thomas, R, M. (2003). *Blending Qualitative & Quantitative Research Methods in These and Dissertations*. California: Corwin Press Inc

Ticehurst, G, W., & Veal, A, J. (2000). *Business Research Methods: A Managerial Approach*. Australia: Pearson Education Australia

`

Tobi, S, U, M., Amaratunga, D., & Noor, N, M. (2013). Social Enterprise Applications in an Urban Facilities Management Setting. *Facilities*. Vol. No. 5/6

Toffolutti, V., Reeves, A., McKee, M., & Stuckler, D. (2016). Outsourcing Cleaning Services Increases MRSA Incidence: Evidence from 126 English Acute Trusts. *Social Science and Medicine.* 174

Trochim, W, M, K. (2005). *Research Methods: The Concise Knowledge Base*. USA: Thomson

Tucker, M., & Pitt, M. (2009). Customer Performance Measurement in Facilities Management: A Strategic Approach. *International Journal of Productivity and Performance Management*. Vol. 58 No. 5

Tuveson, K. (1998). Facility Management in the 21st Century: Success in the Future Lies in Corporate Partnerships. *Managing Office Technology*, May, 1998

Ventovuori, T., Lehtonen, T., Salonen, A., & Nenonen, S. (2007). A Review and Classification of Academic Research in Facilities Management. *Facilities*, Vol. 25 No. 5/6, 2007. Eerald Group Publishing Limited

Vogt, W, P. (1993). *Dictionary of Statistics and Methodology*. Newbury Park: Sage

Walkiden, D. (1994). *Contract Cleaning: Starting and Running Your Own Business.* Liverpool: The Cresta Publishing Company

Walter, K. (2018). Ice Blaster Could Revolutionise Industrial Cleaning. *Advantage Business Media*. Apr 25, 2018

Warner, R, M. (2008). *Applied Statistics: From Bivariate Through Multivariate Techniques*. California: Sage Publications

Wauters, B. (2005). The Added Value of Facilities Management: Benchmarking Work Processes. *Facilities*. Vol. 23 No. ¾

`

Wegner, T. (2007). *Applied Business Statistics: Methods and Excel Based Applications*. (2nd Ed.). South Africa: Juta & Co

Wheatley, M. (2010). Outright Decision. *Site Operations and Services: Facilities Management*. March, 2010

Williams, T, A., Sweeney, D, J., & Anderson, D, R. (2012). *Essentials of Contemporary Business Statistics*. (5th Ed.). Canada: Nelson Education Ltd

Wilson, S. (1989). Specifying Cleaning Services. *Facilities.* Vol. 7 No. 2

Womack, J, P., & Jones, D, T. (1996). *Lean Thinking: Banish Waste and Create Wealth in Your Corporation*. New York: Simon and Schuster

Wong, Y, C., Wong, K, Y., & Ali, A. (2009). A Study on Lean Manufacturing Implementation in the Malaysian Electrical and Electronics Industry. *European Journal of Scientific Research.* Vol. 38 No. 4

Yiu, C, Y. (2008). A Conceptual Link Among Facilities Management, Strategic Management and Project Management. *Facilities.* Vol. 26 No. 13/14

Zikmund, W, G. (2003). *Business Research Methods*. (7th Ed). USA: South Western

Zikmund, W, G., Babin, B, J., Carr, J, C., & Griffin, M. (2010). *Business Research Methods*. (8th Ed). South Western: Cengage Learning

Zikmund, W, G., Babin, B, J., Carr, J, C., & Griffin, M. (2013). *Business Research Methods.* (9th Ed.). South Western: Cengage Learning

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Tables and Figures

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Appendix A – Research Survey Questionnaire

General Information

Please tick box as appropriate in this section:

1) What is your age group?

1.	25 and under	
2.	26-35	
3.	36-45	
4.	46-55	
5.	Over 55	

2) Who employs you at the shopping centre?

1.	A Facilities Management Company	
2.	A cleaning company	
3.	The shopping centre	
4.	An agency	

3) What is your working shift at the shopping centre?

1.	Day shift	
2.	Evening shift	
3.	Night shift	
4.	A combination	

4) How long have you worked for your company?

1.	Less than 1 year	
2.	1-2 years	
3.	2-3 years	
4.	3-4 years	
5.	4 years +	

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5) What is your experience in the cleaning industry?

1.	Less than 1 year	
2.	1-2 years	
3.	2-3 years	
4.	3-4 years	
5.	4 years +	

6) How many cleaning employees work at the shopping centre?

1.	Less than 10	
2.	10-25	
3.	26-50	
4.	51-100	
5.	Over 100	

7) Does your company provide all Facilities Management tasks, including maintenance, at the shopping centre?

1.	Yes	
0.	No	

8) Is the cleaning operation directly managed by the shopping centre?

1.	Yes	
0.	No	

9) Is your manager based at the shopping centre?

1.	Yes	
0.	No	

Facilities Management Information

A) Please tick the Scheme box under which your shopping centre is:

1. Neighbourhood Scheme		**2. Local Scheme**		**3. Sub-Regional Scheme**		**4. Regional Scheme**	
Shopping Centre A		Shopping Centre E		Shopping Centre I		Shopping Centre M	
Shopping Centre B		Shopping Centre F		Shopping Centre J		Shopping Centre N	
Shopping Centre C		Shopping Centre G		Shopping Centre K		Shopping Centre O	
Shopping Centre D		Shopping Centre H		Shopping Centre L		Shopping Centre P	

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- *Please answer the following questions with what extent you agree or disagree to each statement by ticking one box from the answers below:*

1 = Strongly Disagree 2 = Disagree 3 = Neutral 4 = Agree 5= Strongly Agree

No.	Question					
B	**Continuous Improvement**					
1	The cleaning operation uses continuous improvement.	**1**	**2**	**3**	**4**	**5**
2	Performance data is collected and communicated.	**1**	**2**	**3**	**4**	**5**
3	Cleaning operation processes are available to you.	**1**	**2**	**3**	**4**	**5**
4	Management commitment to performance evaluation is good.	**1**	**2**	**3**	**4**	**5**
5	Your cleaning operation has a system for quality improvement.	**1**	**2**	**3**	**4**	**5**
6	Cleaning customer satisfaction is measured.	**1**	**2**	**3**	**4**	**5**
7	The cleaning operation is flexible in trying to meet customers' specific needs	**1**	**2**	**3**	**4**	**5**
8	Cleaning services are available when customers need them.	**1**	**2**	**3**	**4**	**5**
9	Cleaning customer complaints are acted upon.	**1**	**2**	**3**	**4**	**5**
10	Quality is the primary organisation goal.	**1**	**2**	**3**	**4**	**5**
11	Lots of data is available for performance evaluation techniques.	**1**	**2**	**3**	**4**	**5**
12	Your cleaning operation has a recognised leader in quality improvement.	**1**	**2**	**3**	**4**	**5**
C	**Performance Measurement**					
1	The cleaning operation identifies and finds solutions to problems.	**1**	**2**	**3**	**4**	**5**
2	There has been an overall increase in effectiveness and efficiency.	**1**	**2**	**3**	**4**	**5**
3	There has been an increase in customer focus.	**1**	**2**	**3**	**4**	**5**
4	There has been an increase in employee satisfaction.	**1**	**2**	**3**	**4**	**5**
5	The relevance of cleaning to the shopping centre has increased.	**1**	**2**	**3**	**4**	**5**

- *Please answer the following questions with what extent you agree or disagree to each statement by ticking one box from the answers below:*

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1 = Strongly Disagree 2 = Disagree 3 = Neutral 4 = Agree 5= Strongly Agree

No.	Question					
D	**Excessive Production**					
1	Up-to-date cleaning operational goals and performance measures for those goals are available.	**1**	**2**	**3**	**4**	**5**
2	Cleaning work instructions and cleaning quality specifications are visible at all work areas.	**1**	**2**	**3**	**4**	**5**
3	Updated charts on cleaning productivity, quality, safety, and problem solving are visible for all teams.	**1**	**2**	**3**	**4**	**5**
4	Work teams are trained, empowered, and involved in problem solving and ongoing improvements.	**1**	**2**	**3**	**4**	**5**
5	You engage with continuous improvement.	**1**	**2**	**3**	**4**	**5**
6	There is an effective project management process, with cost and timing goals, for new cleaning initiatives.	**1**	**2**	**3**	**4**	**5**
7	You would pay for this cleaning operation as a customer.	**1**	**2**	**3**	**4**	**5**

Appendix B – Research Survey Cover Letter

Dear Participant,

I am a PhD student at the University of Gloucestershire. I am seeking your help with my research into efficiency within Facilities Management cleaning operations, by completing this questionnaire. This questionnaire is designed to gain knowledge on areas for efficiency improvement in Facilities Management cleaning operations within UK shopping centres. The questionnaire should take only between 5-10 minutes to complete.

All the information provided by you will be kept confidential and anonymous, and the overall results of the study can be shared with you upon your request (by sending an e-mail to the above corresponding address).

Thank you in advance for your participation,