Performance measurement in facility management

The continuous change in how performance is measured, controlled and perceived within facility management from its outset in 1970 to the present situation.

BSc Thesis Business and Consumer studies

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Abstract
Aim The aim of this study is to provide an overview of the development of performance measures in the field of facility management (FM) over the past fifty years. **Method** A traditional literature review conducted through the search engines Scopus and Web of Science. **Results** The usage of performance measurement (PM) in FM has expanded greatly as a field of study over the past decades. Nowadays incorporating a wide range of activities, the management of facilities has become vital to the core objectives of organisations. The measurement of performance plays a key role in maintaining high efficiency and effectiveness in FM. However, a lack of academic guidance to the incorporation of PM into practice is becoming increasingly evident in more recent years. In turn, this may indicate the difficulty in measuring performance effectively. Consequently, this has resulted in a gap between the support practitioners seek from academics and what is being provided in academical literature. **Conclusion** This study concludes that PM in FM has changed based on the preferences found in the organisations it is used in, changing organisational environments and the developing need to remain competitive to organisations. This has resulted in changes within both PM and FM, the way in which performance is determined in FM activities, and an ongoing state of change in which PM in FM develops alongside the need to match changing working environments.

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1. Introduction

This BSc-thesis aims to describe the changes in performance measurement within facility management between 1970 and the present. The description of these changes is based on a comparison of the extent and importance of facility management within organisations, the activities attributed to facility management, and the dominant indicators of performance in facility management. In this chapter background information, the relevance of the problem statement and the research objective are given.
To increase readability, the terms 'FM' and 'PM' are used to indicate facility management and performance measurement respectively throughout this report.

1.1 Background

The field of FM has experienced an evolution in the past fifty years. Around the 1970s, the discipline of FM was strongly based on practice. In the practical use of FM at that time, FM managers were foremost focused on cost reduction. At this time, the field of FM was could be characterized as the managerial process of maintaining functionality of the built facilities. This managerial process was often guided through financial accounting techniques, aimed at cost reduction and cost control (Alexander, 1996; Amaratunga et al., 2000; Brackertz, 2006).

In the years after the 1970s the influence FM has on organisational core business became more evident among FM academics and practitioners. The large scope FM has within organisations was becoming clearer to those working with or researching FM. FM nowadays is namely seen as a wide range of activities concerning built assets and the daily operations and services involving them. As such, FM is viewed as a managerial practice integrating business administration, architecture, and behavioural- and engineering sciences to ensure the effective management of built assets, thus affecting a large scope of organisational processes (Amaratunga et al., 2000; Cotts, 1998). Moreover, the significance of FM within organisations also results from the financial implications of FM. Specifically, FM practices within organisations can add up to more than a third of organisational expenditure, second only to payroll (Amaratunga et al., 2000).

Practitioners and academics in the field of FM from the 1980s onwards recognised that FM has a too large influence on organisational core business to be guided solely by financial techniques. In other words, managing solely based on financial techniques does not cover all the aspects of FM within organisations. Clearly, mere financial techniques do not consider the services, behavioural influences and social influences of FM, thus leaving them unmeasured (Hopwood, 1974). Therefore, measurement systems different from those measuring only financial aspects were needed (Drucker, 1993; Neely, 1998; Trandfield and Akhlaghi, 1995; Walters, 1997; Wilcox and Bourne, 2003).

Following the notions of the 1980s, the general idea of organisational-wide structured PM systems being able to measure both financial and non-financial contributions gained increasingly more momentum. The available knowledge on the topic of PM in FM increased due to more academic research into the field of FM and closer attention and interest into all possibilities and usages of PM by FM managers in practice. In the interaction between findings from practice and academic literature, the creation of holistic PM systems to measure the effects and usages of FM took a central role (Drucker, 1993; Neely, 1998; Trandfield and Akhlaghi, 1995; Walters, 1997; Wilcox and Bourne, 2003).

Nowadays, even despite considerable developments in the field of PM in FM, academic literature does not fully resonate into practice. Even while multi-dimensional PM systems such as the balanced scorecard, KPI's and added value methods, which will be elaborated on further in the fourth chapter, have been created to increase the alignment between practice and theory, this misalignment has yet to be overcome. The issue in the alignment lies in academic literature not sufficiently assisting

practitioners in the choice and usage of adequate holistic PM systems in their organisational operations. In other words, academic literature does not provide adequate guidelines to the practical use of PM in FM (Chotipanich, 2004; Kattner et al., 2016; Lee, 2002).

1.2 Problem statement

How FM departments measure their performance has changed throughout the past five decades.
Sink (1991) described PM as a process of high difficulty and complexity, often abused and misused, thereby indicating the general difficulty of working with PM experienced during that period.
In the same year, Fitzgerald et al. (1991) highlighted the complexity of measuring performance in a similar way. This general difficulty of working with PM remains present in more recent years. This is for example stated by Kattner et al. (2016) in their description of how the engineering sector has to 'borrow' PM systems of other branches, while lacking in own PM measures.

There are a number of reasons for the importance of PM in FM. First, academics and practitioners have become more aware of the importance and large scale of FM in recent years. To keep track of all activities under the span of FM, a PM system must be used that documents and tracks any processes. Second, a large amount of overall organisational costs is spent on FM, often exceeding a third of the overall organisational costs (Amaratunga et al., 2000). These expenses are controlled and steered through PM as well. Third, while FM to a great extent consists of non-core activities, the costs of FM processes cannot always be attributed to the final product or service of organisations. Therefore, it can prove difficult to measure the value it adds to the company's processes and bottom line. The non-core added value can be justified and controlled through multi-dimensional PM systems (Amaratunga et al., 2000; Mudrak et al., 2004). While FM is thus so present in FM operations, information on PM drivers in FM is sought for by higher management (e.g. the company's board of executives). The information generated by the PM is used to steer the FM practices (Lavy et al., 2010)

Yet, measuring FM performance still remains challenging. Holistic systems such as the balanced scorecard (BSC) have been introduced in many organisations (Harvey and Sotardi, 2018; Kaplan, 2010; Reda, 2017). De Toni et al. (2007) have even taken the first steps in creating a BSC system specific to FM operations applicable within all organisations. Thus, although these measures are important and FM research has devoted efforts into developing multi-dimensional frameworks to measure and control FM within organisations, it lacks general applicability due to differences in, for instance organisational goals. As such, a universally accepted list of all PM functions within FM has not been created either. This lack of general applicability must be overcome to bridge the gap between academic literature and FM practice (Abdeen and Sandanayake, 2018; Bititci et al., 2012).

Correspondingly, there is a lack of clear holistic academic guidelines on how to operate PM in facility practices. Thus, there is a significant gap in research to assess, compare, and evaluate the FM performances in organisations. From a practical standpoint, there is the need to adequately guide FM processes in organisations. The guidelines used in practice, are often insufficient to the full usages of FM that need to be kept track of (Neely et al., 1995).

1.3 Research objectives and questions

The central topic within this BSc thesis is the evolution of PM within FM departments between 1970 and the 50 years thereafter. Existent studies in FM literature have highlighted a multitude of developments during these five decades, but only a small range of studies provides summaries of developments of PM in FM. Rather, studies in the field of FM are often focussed on a single or small number of developments, based on the expertise of the author(s).

The research objective of this study is to provide insight in what has changed over the past 50 years in the field of PM in FM. To achieve this objective, the research findings of influential studies in the fields of PM and FM are combined to provide an oversight of the developments of PM in FM. Second, the objective is to provide insight into how PM in FM has transformed from being perceived as a measure to control a necessary burden, to being perceived as a tool to utilise the full potential of the added value of FM towards organisational core objectives. This has resulted in the following main question.

Main question:

What has changed in the application of performance measurement in facility management over the past five decades?

Four sub-questions have been formulated in support of the main question. The first sub-question describes the portfolio of FM. The portfolio of FM consists of all activities and services that can be attributed to FM. Due to this portfolio changing over time, both a historical and contemporary perspective are linked to this question. The second sub-question describes the process of measuring performance, conceptualising and defining the term PM. The third sub-question describes the dominant indicators of PM in FM. Dominant indicators of performance are linked to how PM is applied in FM. The fourth sub-question describes how the development of PM and FM has influenced those directly involved with FM practices. The first two sub-questions thus describe the key concepts present in the main question, FM and PM. The following two sub-questions respectively describe what has led to PM in FM being applied in a certain way, and how this application has influenced both PM and FM. This has resulted in the following sub-questions.

Sub-questions:

1. What is the portfolio of facility management and how does it affect the core business?
2. How can performance measurement be conceptualised?
3. What have been the dominant indicators of performance measurement in facility management over the past five decades?
4. How has the application of performance measurement in facility management developed over the past five decades?

2. Methodology

The data-collection within this research is focussed on creating an overview of existing theories and knowledge. The data has been collected from search engines such as Web of Science and Scopus.
The first explorative searches used a string based on the main concepts of the central research question in a "TITLE-ABS-KEY (TITLE (performance AND measurement) AND TITLE-ABS-KEY (facility AND management))" format. This string yielded 69 results in Scopus. A further selection was made on the basis of the title and abstracts of the articles found. The search was mainly focussed on broad descriptive articles, or articles providing a timeline, on either PM, FM, or both. This while the aim of this study is to present a descriptive timeline.

Articles supporting the sub-questions were found through the formulation of similar search strings. The wide range of articles found through these search strings was then limited and restricted by adding additional search terms to the string. These search terms were based on the key concepts in the sub-questions. As an example hereof for the key concept of 'performance measurement' from the first sub-question: 'definition', 'practice' and 'history' were added at some point to narrow the search.

A narrowing method of searching for information was a necessity considering the extensive number of publications on PM and FM. Therefore, the key articles presented in table 1 were used as a basis. Due to the selection of a basis of articles, the ability to apply boundaries to the search was increased. For instance, when using the reference lists and citations of articles to find articles relating to them (snowballing), boundaries to how far the snowballing may continue can be applied. This to prevent the search for information from becoming overly time consuming or reaching irrelevant points.

Table 1: overview of articles used as a basis to this report in order of publication date

	List of key articles used as a framework
Authors	*Main subjects*
Neely et al., 1995	Setting a research agenda on PM. Defining PM. Performance measurement systems. Individual performance measures.
Amaratunga et al., 2000	Facility management performance assessment. Definition and development of the term facility management. Timeline of the changing assessment of FM performance.
Kincaid, 2000	Sketching a basis of PM in FM. Necessity of adequate PM. Benchmarking of operational performance in FM.
Amaratunga and Baldry, 2002	The movement from PM to performance management. Characteristics of PM. Performance management in FM
Chotipanich, 2004	Characteristics of PM, organisational alignment to PM, proposal of a basic framework to position FM.
Pitt and Tucker, 2008	Linkage between innovation processes and FM. Summary of collected knowledge on PM in FM. Evolution of PM and FM.
Lavy et al., 2010	Historical development of FM, the need and drivers of FM and PM. What and how to measure in PM.
Rirantanaphong and Van der Voordt, 2015	Facility's added value to organisational performance. Innovative workplace design. Impact of workplace change on organisational performance.
Sharma et al., 2016	Employee perception of performance management systems. The link between appraisal and PM.

3. The portfolio of facility management

3.1 Introduction

This chapter is based on the first research sub-question: *what is the portfolio of facility management and how does it affect core business?* First, the term 'facility management' will be discussed to create an image of the inner workings of the field of expertise connected to the term. Second, the origin of FM will be discussed to indicate where the roots of FM lie. Thereafter, influential factors that assisted in the further development of the field of FM are presented. This to indicate the advancements made in FM since its origin. Consecutively, the width of the definition of FM as it is known nowadays is elaborated on. Through this range of definitions it is made clear how FM is seen in the present day. Third, the activities within the portfolio of FM are elaborated on to illustrate how FM activities influence organisations in practice. Fourth, an indication is given of how FM activities can affect organisational core business objectives. More specifically, an indication is given of how FM activities can contribute to the goals of an organisation.

3.2 The origin of facility management

The exact origin of FM is subjected to a large deal of speculation. Therefore, there are no unequivocal indicators to when and where FM came to be in practice (Nor, 2014). Academics in the field of FM have not agreed upon a universal point of origin to FM. An example of a highly speculative point of origin to FM dates back as far as the late 1800s. As claimed by Atkin, the American Railroad Companies may have been the first to instate managers to oversee the quality of the facilities in which their employees operated. Yet, Atkin's vision is criticized for being far-fetched and speculative (Nor, 2014). More generally agreed upon emerging points for FM can be found in more recent history. As stated by Amaratunga et al. (2000) the origin of academic and practical interest into FM can be best placed in the 1970s and the period shortly thereafter.

The statement by Amartunga et al. (2000) can particularly be explained by looking at FM activities. Previous to the 1970 period, the activities that are nowadays under the scope of FM were separate and individual activities. Hence, the underlying connection that combines loose FM activities into an array of services and activities accommodated by FM departments has only been found in more recent years. (Amaratunga et al., 2000; Neely, 1999; Kincaid, 1994). All modern-day FM activities were present in organisations, but without being connected to each other through FM management. Thus, while the integration of separate organisational activities towards what is nowadays the field of FM management began in the 1970s, it can be stated that the strongest development of the field of FM has been taking place from that point in time onwards (Amaratunga et al. 2000; Kincaid 1994).

Considering the developments of FM in the 1970s period, a more universally agreed upon point of origin to FM comes forward. This concerns the conference hosted by the Herman Miller Corporation (Anna-Liisa, 2005; Kincaid, 1994). This company hosted a conference on "Facility Influence on Productivity" in 1978. The Miller Corporation had its own practical experiences with the connection between workplace environment and employee productivity. The general aim of their conference was to create awareness on the possible connection between facilities and employees and to incite academics to further research what was experienced in practice (Alexander, 1996; Anna-Liisa, 2005; Kincaid, 1994). Consequently, the need to collaborate to organisations and facility professionals in orde to assist private industry grew until this need was catered to in 1981. In that year, a meeting of facility professionals was held in Houston. As a result of the meeting, the National Facility Management Association (NFMA) was founded in the USA. The objective of this organisation was to provide a network to facility managers through which the managers were educated, supported, and assisted in research. Furthermore, the exchange of knowledge on FM with others experts increased through the platform provided by the NFMA (Anna-liisa, 2005; Nor, 2014). The NFMA became such a success, that shortly after 1981 the name was changed to the "International Facility Management Association" (IFMA), to reflect the international character the organisation had gotten. The IFMA was

also followed up by more facility management initiatives in other countries, such as the BIFM in the UK, FMA in Australia and JFMA in Japan (Anna-liisa,2005; Linda et al., 2001). In more recent years, academic interest remains ever growing in the field of FM (Amaratunga et al, 2000).
In conclusion, there is no consensus amongst academics to the exact origin of FM. However, the 1970s period can be named as a highly influential period to the development of and rising interest in FM. In the next section (3.3), the factors that have driven academic and practical interest and developments in the field of FM are highlighted. This to present an illustration of what has brought the field of FM further in its development since its early rise in the 1970s to what it has become nowadays. Furthermore, the exact nature of the frequently-named term FM "activities" will be further elaborated on in section 3.5, where the portfolio of FM is discussed.

3.3 Influential factors to further FM development
A great number of influential factors can be named to the increased practical and academic interest into FM activities from the 1970s onwards (Amaratunga et al., 2000). This section does not name all influential factors, but rather presents a selection of influential factors to illustrate what drove the field of FM to what it has become nowadays. More specifically, this section highlights some of the factors that have influenced FM to change from a collection of separate and individual organisational activities towards integrated FM management. A more inclusive description of factors that have influenced FM will follow in the fifth chapter. The aim in this section is to present an introductive background to how the modern-day definition of FM came to be. The influential factors provided in this paragraph are either often brought forward in literature or brought forward by what are considered to be influential academics in the field of FM (Alexander, 1996; Amaratunga et al., 2000; Cotts, 1998).

First, a highly influential factor to the increased academic and practical interest in FM processes are the expenses associated with FM processes. As was stated in the introductive chapter, roughly a third of organisational expenses can be attributed to FM processes (Amaratunga et al., 2000). With this being the second greatest expense to organisations, second only to payroll, the need for managerial influence on FM processes is essential in a competitive market (Den Heijer, 2011). Accordingly, the need for effective cost management of FM processes arose. This effective cost management in turn required insight into FM processes, thus creating a drive to academics and practitioners to gain more insight into FM (Sinclair and Zairi, 1995).

Second, while FM as an academic field is so deeply rooted in practice, an interplay has arisen between FM practice and the academic side of FM (Alexander, 1996; Kincaid, 1994). Within this interplay, academics seek answers to questions that arise in FM practice. On the other hand, new findings by academics can be implemented and tested in practice. An example hereof is the Herman Miller case named in the previous paragraph (3.2). Essential herein is also that FM academics aim to support FM practitioners in their daily operations (Anna-liisa, 2005). In conclusion, the interplay between academic and practical insights has helped further develop the field of FM.

Third, the extensive scope of organisational activities that are nowadays integrated under the umbrella term of 'FM' has added to academic and practical interest as well. As will be further elaborated on in section 3.5 the field of FM covers a wide range of different activities within organisations (Abdeen and Sandanayake's, 2018). Subsequently, from an academical point of view, FM covers a variety of academic fields as well. In turn, this broad scope of practical and academic implications of FM activities has created collaboration between multiple practical and academical principles. An example hereof is the combination of architectural insights and behavioural sciences in the research on the effects of workplace environment on employee satisfaction, retention and absenteeism (Amaratunga et al, 2000; Fanger 1999; Roelofsen, 2002; Rosenfeld 1989). Consequently, collaboration between many different fields of expertise has resulted in a variety of insights that has stimulated development in the field of FM.

Fourth and final, the rise of the information era at the turn of the 21st century served as an impulse to the general understanding of FM processes. This can be explained by the increase in digitalisation within organisations giving way to more extensive and intensive management of organisational processes. Consequently, the digitalisation increased insight into FM processes within organisations due to the rise of PM systems to monitor and guide FM activities (Amaratunga et al., 2000). These PM systems will be further elaborated on in the fourth chapter.

In conclusion, FM has changed from a set of separate organisational activities towards an integrated field of expertise in both practice and to academics during the period between 1970 and the present. Numerous factors have contributed to this integration in this period. Some especially influential factors have been named in this section, being the high expenditure connected to FM, FM being deeply rooted in practice, the extensive scope of FM and the rise of the information era at the turn of the century. Combined, these factors have shaped FM as it is known today. In the next section (3.4) definitions of FM will be given to further illustrate how exactly FM is known today.

3.4 The definition of facility management

Within this chapter, the origin of FM (section 3.2) and influential factors to the development of the field of FM (section 3.3) have been discussed. In this section, a range of possible definitions to FM is given. In turn, these definitions provide an illustration of what the field of FM has become nowadays. Important within this chapter is that only a selection of all possible definitions to FM is given. However, these definitions are presented by influential FM academics or institutions, to ensure representability of the definitions in the field of FM (Alexander, 1996; Cotts, 1998; International Facility Management Association, 2014; Nutt, 1999; Then, 1999).

An overview of influential definitions to the term FM has already been presented by Nor et al. (2014) (see figure 1). This collection of definitions presents an indication of how many activities can be attributed to the term FM. A number of these definitions will now be elaborated on in depth, alongside some definitions by influential FM academics not included in figure 1.

Author	Definition of FM
Becker (1990)	FM is responsible for coordinating all efforts related to planning, designing and managing buildings and their systems, equipment and furniture to enhance the organization's ability to compete successfully in a rapidly changing world.
Nourse (1990)	FM unit is seldom aware of the overall corporate strategic planning, and does not have bottom line emphasis.
NHS Estates (1996)	The practice of coordinating the physical workplace with the people and work of an organization; integrates the principles of business administration, architecture, and the behavioral and engineering science.
Alexander (1999)	The scope of the discipline covers all aspects of property, space and environmental control, health and safety, and support services.
Then (1999)	The practice of FM is concerned with delivery of the enabling workplace environment – the optimum functional space that supports the business process and human resources.
Hinks and McNay (1999)	… common interpretations of FM remit: maintenance management; space management and accommodation standards; project management for new-builds and alterations; the general premises management of the building stock; and the administration of associated support services.
Varcoe (2000)	… a focus on the management and delivery of the business "outputs" of both these entities (the real estate and construction industry); namely the productive use of building assets as workplace.
Nutt (2000)	The primary function of FM is resource management, at strategic and operational levels of support. Generic types of resource management central to the FM function are the management of financial resources, physical resources, human resources, and the management of resources of information and knowledge.
IFMA (2003)	The practice of coordinating the physical workplace with the people and work of the organization; integrates the principles of business administration, architecture, and the behavioral and engineering sciences.
BIFM (2006)	"Facilities management is the integration of processes within an organization to maintain and develop the agreed services which es".

Figure 1: overview of definitions to FM. Reprinted from "Facility Management History and Evolution", by Nor, N.A.M., 2014, International Journal of Facility Management, 5(1), pp. 5

An early definition of FM was presented by the IFMA. The IFMA defined FM as *a profession that encompasses multiple disciplines to ensure functionality of the built environment by integrating people, places, processes and technologies* (Nor, 2014). Even though this definition was accepted by prominent academics and practitioners in the field of FM when it was publicized, it is not a universally accepted definition of FM (Nor, 2014). This can be explained by the nature of FM. Specifically, the exact definition of and activities placed under FM remains unclear. This while the

definition and activities depend on the interests of the organisations at a given time (Anna-liisa, 2005). Moreover, FM is a generic discipline that only acquires meaning to organisations in particular social-economic circumstances (Kok, 2015). Correspondingly, while organisational goals and social-economic settings often differ between organisations, the definition FM professionals give to FM often differs as well (Abdeen and Sandanayake, 2018; Bititci et al., 2012).

Most influential FM academics make use of their own definition of FM. For instance, Cotts (1998) stated *FM is an umbrella term including a wide range of activities concerning the built assets of an organisation and the daily operations involving them. It is a managerial practice which integrates business administration, architecture, behavioural and engineering sciences to ensure that built assets are managed effectively.* Even while this definition highlights the broad nature of FM, and the central role of the built assets/environment similar to how the IFMA described it, Cotts (1998) is far more specific on which fields of expertise are combined in FM management.

As a further example, Alexander (1996) defined FM as *the enabling function through which an organisation delivers and sustains a quality working environment for its human and physical resources in such a manner that managers can meet core business objectives.* This definition yet again names the central role of built assets similarly to the previous definitions given. However, this definition is far more focussed on the services provided by FM. Thus, it emphasizes yet another aspect of FM than the other definitions. Definitions of FM accentuating yet other aspects of FM are for instance those by Then (1999) and Nutt (1999). Then (1999) proposed the definition of FM *as the delivery of the enabling workplace environment, thus creating the optimum functional space that supports the business process and human resources.* Herein, the definition proposed by Then (1999) differs from the previously named definition through its focus on the architectural aspects of FM. Furthermore, Nutt (1999) described *resource management, at a strategic and operational level of support as the primary function of FM. This resource management consists of financial, physical, human, management and information resources*. In this definition, Nutt (1998) focusses on what is managed through FM in a more specific manner than the previously named definitions do.

In order to create more consensus in the general definition of FM, a European standard has been developed to define FM in a holistic unambiguous way. In this definition FM is expressed as *the integration of processes within an organisation to maintain and develop the agreed services which support and improve the effectiveness of its primary activities* (Comité Européen de Normalisation 2006). This is the most broad and inclusive definition of FM presented in this section, while it mentions ‘processes’, ‘services’ and ‘activities’ without specifying what any of these terms entail. Consequently, the hypothetical range of these three terms remains debatable. Therefore, this definition of FM will be discussed yet again after the portfolio of FM activities, processes and services has been elaborated on in section 3.5.

In conclusion, the definition of FM is largely influenced by the specific objective FM has in a certain setting. In turn, this has created a large variety of different definitions to FM. However, most definitions agree upon a central focus within FM on the functionality of facilities and the general aim of FM to support organisational objectives. On the other hand, most definitions prioritise different aspects or aims of FM, depending on the priorities or expertise of the one introducing the definition.

3.5 The portfolio of facility management

In the previous section (3.4), the definitions of FM were given. However, these definitions did not specifically name the activities and services that can be placed under FM. Therefore, the portfolio of FM is elaborated on in this section. Herein, the portfolio of FM is defined as the practical operations, activities and services concerning FM within organisations. Therefore, by describing the portfolio of FM, an image is created of what FM operations can be found within organisations in practice. A general tendency to divide the portfolio of FM up into categories can often be found in literature on FM. This tendency can be found in the management concerning FM, the facilities FM operates in, and the activities attributed to FM. To illustrate the occurrence of these classifications, an example will be given for all of these three different proposed categorisations. Three different methods have been chosen to illustrate the differences in categorisations of FM, while they all approach FM from different viewpoints and can therefore complement and extend one another.

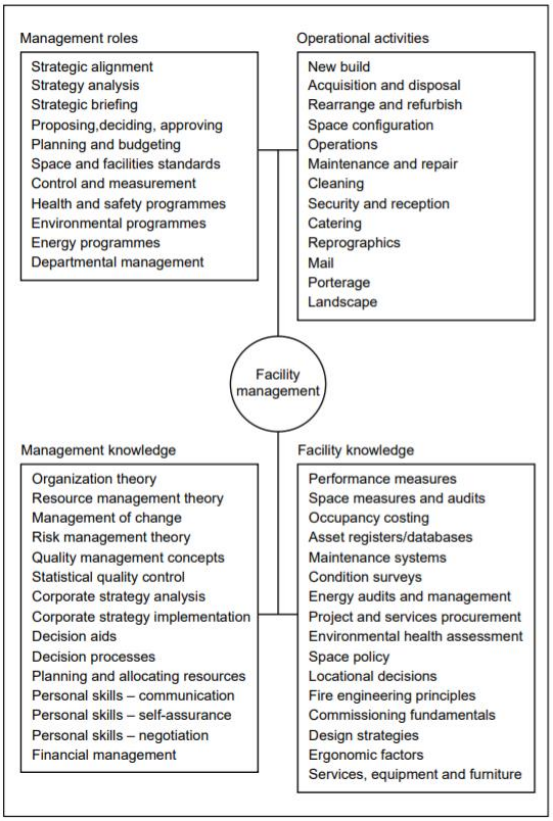

Figure 2: overview of the integration of FM. Reprinted from "Integrated Facility Management", by Kincaid, D., 1994, Facilities, 12(8), pp. 23

First, from a managerial perspective, Kincaid (1994) based FM within organisations on four pillars. These pillars are operational activities, management roles, facility knowledge and management knowledge. These pillars, or "the major parts to integrated FM" as Kincaid (1994) named them, are shown in figure 2. In this figure, the different roles of FM management and topics on which FM managers require knowledge are expressed. Furthermore, the topics on which knowledge is needed to take care of the facilities are also indicated. Finally, the operational activities required within FM are named. Hence, by combining the knowledge, roles and activities emphasized in figure 2, Kincaid (1994) claimed that FM would contribute to organisational objectives as optimal as possible.

Second, from a yet different perspective Bitner (1992) focussed on the space FM operates in. Bitner (1992) coined the term 'servicescape' to describe the workspace environment in which people are affected by FM services. Consequently, the servicescape is constituted by different environmental elements that are divided up into three dimensions. These dimensions are "ambient conditions", "space and function" and "signs, symbols and artefacts". "Ambient conditions" are all elements that have an effect on the five senses. Examples hereof are temperature and noise. "Space and function" relates to the spatial layout, arrangement of furniture and the spatial relations within workplaces. An example hereof is how flexible workspaces are arranged within a workspace. "Signs, symbols and artefacts" indicate all explicit or implicit signals that communicate about the workplace to its users (Bitner, 1992). Examples of this are personal belongings, photographs and artwork within workspaces.

Third, from the perspective of the activities that can be placed under FM, Williams (1996) proposed an illustrative model of FM activities. This is a highly accessible and basic model, that still manages to name the main headings of all activities attributed to FM in practice. Within William's model (figure 3), three main headings to facility activities are given. Specifically, these headings are premises, support services and information technology. Additionally, while information technology is often (partially) outsourced, a dotted line is added to the model.

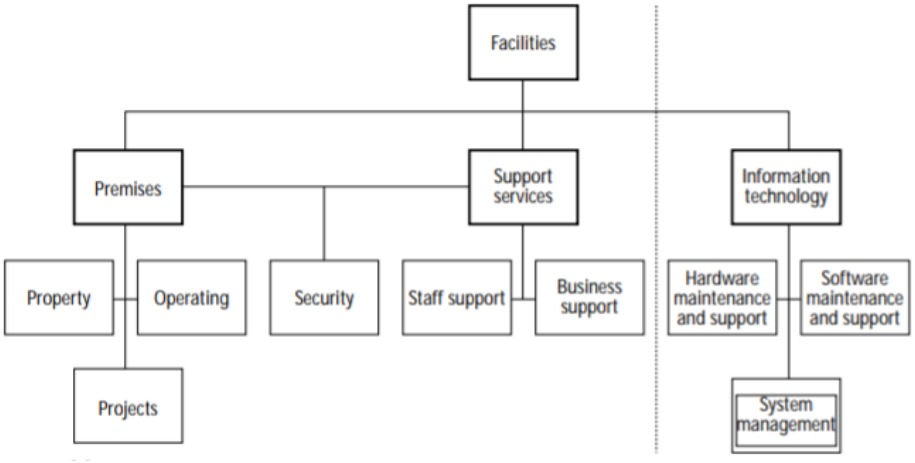

Figure 3: overview of FM activities. Reprinted from "Cost-effective facilities management: a practical approach", by Williams, B., 1996, Facilities, 14(3), pp. 27

Moreover, the three headings in figure 3 all contribute to the functionality of the facility. These headings are comparable to the categorisation of FM into “user-related” and “facility-related” aspects proposed by Amaratunga et al. (2000). This while the user-related aspects are comparable to what figure 3 shows as support services. These are the services provided by FM personnel that support both employees and business processes. Furthermore, “the facility-related” aspects are named premises in figure 3. These premises are all properties and buildings that need to be maintained and kept operational. The information technology is not specifically named by Amaratunga et al. (2000), but can be defined as to be both user- and facility-related. This while information technology supports users through hardware and software. Furthermore, if kept in-house the hardware and systems need to be maintained as part of the facilities.

In conclusion, the portfolio of FM to organisations includes managerial and facility knowledge on FM, a broad scope of activities, and consideration of facilities from different perspectives. FM is not limited to the maintenance and functionality of facilities. On the contrary, FM requires careful consideration of workplace environments (servicescapes), integration processes of knowledge, management roles and activities and a wide array of activities that indirectly affect facility functionality.

3.6 Role of facility management in organisational core business

FM can be described as the act of keeping facilities and all services concerning these facilities suited to organisational operational practices (Alexander, 1993). This indicates a connection between what management is aiming to achieve within organisations and FM operations. Namely, FM provides the means to assist in business processes. An example hereof in a physical workspace is the regulation of health- and safety issues, temperature, the workspace being neat and clean and the lay-out of the office space, coming together as a whole to serve those working in it (Barret and Baldry, 2003; Carnevale, 1992). Thus, FM is contributing to core business objectives through its facilitation of working environments suitable to organisational objectives.

To create a contribution to core business objectives, the maintenance of support systems and close attention to organisational culture are crucial. However, the exact nature of organisational culture and therefore the support systems and practical FM applications differ greatly between organisations. While some organisations tend to focus more on business strategic issues, others focus more on operational processes and short term outputs. Additionally, FM differs between stages in the organisational life cycle depending on what the organisation is in the need of.

Furthermore, in stable times within an organisation FM serves as a building block to routine operations focussed on operational management and maintenance works. On the contrary, in unstable times FM is focussed on reducing risks and gaining advantages for the organisation on facility resource issues. Therefore, the business environment influences FM needs as well. Accordingly, the objectives to which FM is subjected within an organisation are directly linked to organisational objectives and the local business environment (Chotipanich, 2004; Lee, 2002; Nutt, 2002).

Due to the differences between individual organisations the choice of FM contributions to organisational core business within this report is limited to generalisable salient core objectives that can be found in every organisation. Thus, the core objectives discussed here are the financial influence of FM, employee productivity, employee satisfaction, employee retention and spatial implications of organisational operations (Loosemore and Hsin, 2001; Valins and Salter, 1996).

The discussed core objectives can also be placed in the workspace comfort pyramid proposed by Vischer (2016). The workplace comfort pyramid (figure 4) compromises of, in ascending order; physical comfort, functional comfort and psychological comfort. More specifically, physical comfort consists of the minimum standard for workplace habitability, thus including safety and employee health. Functional comfort consists of somewhat more advanced workplace conditions, such as acoustic comfort and workstation dimensions. This part of the pyramid is named functional comfort, as it provides the basics of maintaining functional operations in a workplace. Finally, psychological comfort consists of the psychological effects the workplace environment has on employees, thus the effect of the environment on the mental state of the employee (Vischer, 2016). The aim of the use of this pyramid is to indicate to what degree of workspace comfort the core objectives cater, from which can be derived how essential the core objective is to an organisation. Physical comfort is the basis, functional comfort is one step further in providing quality workspace comfort and psychological comfort is the highest step of the workspace quality in the pyramid. Not all core objectives named in this section are placed in Vischer's (2016) pyramid, as for instance the profitability of organisations is not applicable to the pyramid.

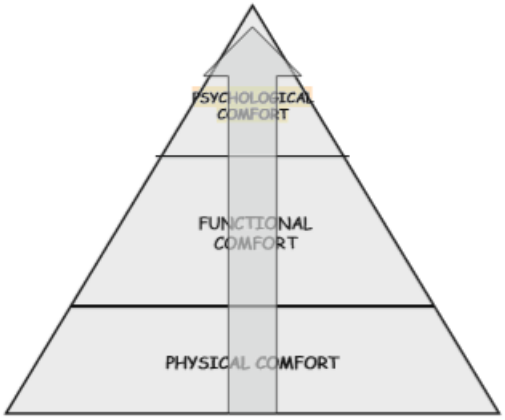

Figure 4: workspace comfort pyramid. Reprinted from "The Effect of Workplace Design on Quality of Life at Work", by Vischer, J.C. and Wifi, M., 2017, International Handbooks of Quality-of-life, pp. 393

A core objective applicable to all competitive organisations is the aim to operate as profitable as possible. Highly connected to the aim for profit is the management and reduction of expenditure. FM can account for 30 to 40 percent of total organisational expenditure, thus taking up a considerable amount of the expenditure (Amaratunga et al., 2000). There a two issues resulting from the large **expenditure** connected to FM. The first issue is the management of these expenditures. A consideration often found in practice is the choice between outsourcing or keeping FM departments on premise. Outsourcing has an effect on core business while it affects the in-house knowledge on FM. When FM processes are outsourced, expertise leaves the company. This has an effect on organisational dependencies (Greer et al., 1999).

The second issue lies in the communication of the expenditures towards all management layers. As stated in paragraph 3.2, not all aspects of FM are tangible. Thus, FM contains services and processes that need to be justified. This justification lies in the connection between these processes and core business objectives. Namely, the FM management needs to convince all others involved with FM

operations of the positive contribution of intangible FM operations and services (Sinclair and Zairi, 2000).

An overlapping factor to core business operations present in all organisations is employee productivity. FM's influence on employee **productivity** is essential, while high productivity is beneficial to organisations. This is the case while, employee productivity consists of the added value of an employee to the processes within an organisation. As stated earlier climate and air control have an influence on productivity (Roelofsen, 2002). These, however, are only part of a bigger picture. A multitude of other factors influences the indoor environment. Amongst the most influential are lighting (Katzev, 1992), the presence of plants and other greenery (Lohr et al, 1996) and in more extreme cases the so called 'sick buildings' that do not comply to basic safety and health principles (Carnevale, 1992). When placed in the workspace comfort pyramid, climate and air control, lighting and the presence of plants and other greenery fall under functional comfort. However, the 'sick buildings' involve physical comfort as they are basics to habituality (Vischer, 2016).

Another often used core business objective is achieving employee **satisfaction**. Employee satisfaction is the degree to which employees are pleased with their profession. Miller et al. (2001) accentuated the importance to employees, and human beings in general, to have an effect on their surroundings. In their research the relationship between bringing personal objects and job satisfaction is elaborated on. This relationship also exemplifies the meaning employees give to their workplace (Miller et al., 2001; Van der Voordt, 2004; Maarleveld et al., 2009). Placed in the workspace pyramid, employee satisfaction is a form of psychological comfort within the workspace. While psychological comfort lies at the top of the pyramid, it can only be reached when physical- and functional comfort have already been satisfied (Vischer, 2016).

A third business objective under the influence of FM is the thought of '**top talent retention'** as Earle (2003) explained it. With this term, Earle meant the retention of highly valued and often highly educated personnel within an organisation. In her description of the role of FM in the unprecedented, highly competitive seller's market, she describes how the competition for both talented new employees and the retention of valued employees depends not only on factors as salary, stock options and perks. Employees may as well be convinced by the physical environment and the office design. As human capital is inherently connected to organisational performance 'top talent retention' contributes to core business objectives (Earle, 2003; Maslow and Mintz, 1956). When placed in Vischer's pyramid, top talent retention lies as high atop as employee satisfaction. Only achieved when physical- and functional comfort are satisfied, top talent retention is a product of comfortable quality workplaces (Vischer, 2016).

A final example of FM's alignment to core business processes can be found in the relationship between spatial and organisational issues (Lindahl, 2004). Within Lindahl's (2004) research, it is explained how modern organisations are becoming more and more like networks of personal interaction, highly supported by their informal structures. This makes workspace interactions essential to organisational performance. The architecture and placing of workspaces, the workplace connection to health and safety, metaphoric and symbolic meaning to space, dynamic and contextual interdependence between workspaces and the quality and degree of participation in processes of change are highlighted as cornerstones to the discussion on the connection between workspaces and organisational performance (Lindahl, 2004; Roelofsen, 2002; Rosenfeld, 1989). The connection between spatial and organisational issues covers Vischer's (2016) entire pyramid. This while health and safety issues belong to physical comfort. Second, the architecture, dynamic and contextual interdependence of workplaces can be placed under functional comfort. Third, metaphoric and symbolic meaning to space falls under physiological comfort.

3.7 Conclusion

Central to this chapter was the first research sub-question: "*what is the portfolio of facility management and how does it affect core business?* Throughout this chapter, the 'portfolio' of FM has been defined as the practical operations, activities and services that can be attributed to FM within organisations. During the past five decades the portfolio of FM has expanded greatly, both by the addition of new activities and the adoption of already existing activities into the portfolio of FM. Due to the broad range of activities that FM encompasses, the activities are often divided into sub-categories such as the four pillars suggested by Kincaid (1994). The exact scope of FM, its definition, and thus the portfolio of FM remain topics of ongoing discussion. An universally agreed upon definition to FM has yet to be presented, leading to academics often using different definitions to it.

The connection between FM and core business operations is highly present. This can be derived from a multitude of factors. First, FM activities and services can be found throughout the entirety of organisations, thus influencing a broad range of organisational activities. Second, FM activities are essential to the (long term) continuation of core process to organisations. As an example, organisations may become unable to produce anything if their facilities are not managed properly. Third, FM activities influence all aspects of workspace environments. The workspace comfort pyramid proposed by Vischer (2016) is a clear example of how FM actively contributes to the stimulation of an employee-focussed and productive working environment.

4. Conceptualisation of performance measurement

4.1 Introduction

This chapter is based on the second research sub-question: *how can performance measurement be conceptualised?* Consequently, this question introduces the measurement of performance and its usage in organisations. The act of measuring the performance of processes comes natural to organisations due to its competitive implications. To effectively measure organisational competitiveness, organisational performance must become clear to those striving to be competitive. To do so, performance measurement (PM) systems able to dissect organisational performance effectively have to be used. In the specific case of FM, PM systems are used to measure both physical and intangible performance, namely in both facilities and any services provided. The effective measurement of both these parts of FM remains of high difficulty to FM managers, while the questions of what and how to measure are not universally agreed upon. More specifically, the subject is not covered effectively enough in FM literature, leaving FM practitioners to their own devices.

In this chapter, the growing importance and usage of PM in FM are discussed in chronological order. First, the early development and usages of PM in FM are elaborated on. Second, the contemporary definition of PM is given, to illustrate what PM has grown out to be in the present. Third, the key role of PM in organisations is discussed, to indicate why PM has become such a vital part of FM. Finally, some highly common methods and uses of PM in organisational practice are introduced. The illustration of the practical applications of PM serves to further indicate the value PM has in daily organisational practice.

4.2 The development of performance measurement in facility management

The measurement of performance in FM previous to the 1970 period was characterised by the use of financial techniques only. In practice, this meant a focus on cost-reduction in FM activities, wherein FM activities were seen as financial burden within organisations, required for the functionality of the organisation. This financial outlook failed to take FM activities not directly measurable in monetary values into account (Hopwood, 1974). Therefore, key aspects such as the contribution of FM to organisational core objectives as described in section 3.6 were left overlooked in this time period.

Consequently, new conceptions on the importance of the measurement of non-financial (implications of) FM activities drove the development of PM in FM from the 1980s onward. Primarily, the conception that FM has a too large influence on organisational core business to be guided by mere financial techniques gained momentum to both FM practitioners and FM academics. This while it became clearer to FM professionals how the services, behavioural influences and social influences that can be attributed to FM can contribute to organisations. Accordingly, the need arose for measurement systems different than those measuring only financial aspects (Drucker, 1993; Neely, 1998; Trandfield and Akhlaghi, 1995; Walters, 1997; Wilcox and Bourne, 2003).

From the 1980s onwards, the demand for organisational-wide structured PM systems able to measure both financial and non-financial contributions of FM to organisations kept rising. In a response to this growing demand, academics and practitioners engaged in more intense cooperation. The central aspect of this cooperation, to conclude, was thus the creation of PM systems to measure all possible implications of FM activities within organisations (Drucker, 1993; Neely, 1998; Trandfield and Akhlaghi, 1995; Walters, 1997; Wilcox and Bourne, 2003).

As a result, so called ‘multi-dimensional’ frameworks were developed to create more insight into the non-financial aspects of FM. As the term ‘multi-dimensional’ already implicates, these frameworks operate through a number of different perspectives to make the measurement of performance as holistic as possible (Amaratunga et al., 2000; Mudrak et al., 2004). Examples of multi-dimensional

frameworks to measure FM activities that often used in practice are the added value model, KPIs and the Balanced Scorecard. One step further in the development of multi-dimensional frameworks are the performance measurement systems. These systems will be further elaborated on in section 4.5.

However, even while multi-dimensional frameworks have made PM in FM more accurate in its description of the effects of FM activities to organisations, these frameworks still have their limitations. A major limitation comes from the large differences between organisations when it comes to individual goals and objectives. Namely, while the measurement of performance is directly linked to what one is willing to achieve, what is rated to be 'good' performance is specific to each organisation (Abdeen and Sandanayake, 2018; Bititci et al., 2012). De Toni et al. (2007) have tried to develop a Balanced Scorecard, specific to FM activities, applicable within all organisations. However, this framework is affected by another limitation of the PM frameworks currently used in PM in FM. This limitation is that an universally accepted list of all FM functions and the PM connected to it has not been created yet (Abdeen and Sandanayake, 2018; Bititci et al., 2012). Due to the differences in specifications of FM activities, as was named in the third chapter, PM frameworks tend to under- or over-represent FM activities in organisations. This may create distorted images of the measure of performance of FM activities.

Moreover, the difficulties in the adoption of PM frameworks into practice is only a part of a larger problem concerning PM in FM. Academic literature on PM in FM is often experienced by practitioners as not fully resonating into practice. More specifically, practitioners do not experience sufficient assistance from literature in the choice and usage of PM systems in their organisational operations. This has created a significant gap in the alignment between what knowledge and guidelines practitioners require for their operations and what is provided in the literature by academics in the field of FM (Chotipanich, 2004; Kattner et al., 2016; Lee, 2002). Furthermore, the existing guidelines that were meant to bridge this gap, remain unable to measure the full usages of FM that should be kept track of. The cause for this can be traced back to the large scope of FM, as described in the third chapter (Neely et al., 1995). Additionally, due to the sub-optimal fit between organisations and PM frameworks, organisations often fail to implement PM frameworks successfully. In turn, this may lead to faulty conclusions being connected to the outcomes of the PM.

In conclusion, the measurement of performance in FM has developed considerably since the 1970s. An interplay between practical findings and academic research has led to the creation of a variety of frameworks such as the added value model, KPIs and the Balanced Scorecard, that in turn have led to more specialised measurement of the effectiveness of FM activities. However, the frameworks that are currently being used in organisations often still lack scope, detail, or applicability to the FM activities. The fit between guidelines presented by academic literature and the practice within organisations is not always a matching one.

An implication for the future development of PM frameworks in FM is that through cycles of academic research followed up by practical applications of the frameworks, the gap between literature and practice can be bridged. By bringing practice and academic research closer together through higher cooperation, PM frameworks can become more generally applicable to organisations.

4.3 Definition of performance measurement

The most important aspect of the term 'performance measurement' is the definition of 'performance' within the term. The central question herein is the exact nature of the performance being measured. However, providing a clear definition of performance remains a challenge to researchers. This is due to organisational environments being ever changing, and the need for organisations to change their performance to adapt along with their environment (Otley, 1999). This creates and ever developing and changing definition to the term performance.

However, at any given time in its process of development and change, there are some general definitions that can be given to term performance. A very basic explanation to performance is it being the degree of quality of functioning of management (B.W. Associates, 1994). Moreover, this holds that the higher the quality of the processes managed is, the higher the performance is. In a similar fashion, Otley (1999) argued that performance is dependent on organisational goals, wherein performance is a representation of how well organisational goals are being achieved. Furthermore, Otley (1999) stated that to understand what performance is to organisations, one must gain insight into the core objectives central to the organisation as well as the evaluation of the achievement of these objectives. In conclusion, performance can be seen as an organisation specific indication of how successful activities are being carried out.

The definition of 'performance measurement' comes as an extension to the key concept 'performance'. Hence, PM is an organisation-specific evaluation of core objectives, through (preferably) structured means of measurement (Neely et al., 1995; Sink, 1991). These means of measurement will be further specified in section 4.4. Neely (1995) explained PM to be an ongoing process in which the effectiveness and efficiency of actions are quantified. When Neely's definition is applied to FM, PM in FM holds that the effectiveness and efficiency of FM activities in their alignment to core business objectives is measured. Bititci et al. (2000) created characteristics to describe PM within organisations. These characteristic include reviewing and reprioritising internal objectives, making changes to internal objectives and priorities to critical parts of the organisation and ensuring that gains through improvement programmes are maintained.

4.4 The importance of PM to organisations

The core of the importance of the measurement of performance lies in the possibilities offered to organisations if the measurement is carried out properly. PM can be described as a tool to not only retain a certain level of quality, but to improve quality where possible as well. In this, PM is not only being used in organisations. In fact, PM is being used in numerous fields of expertise, such as politics, economics, education and sports (Kincaid, 1994). Within all of these fields, PM is being used to optimize the performance of all ongoing processes in a manner specific to the field in question. The widespread of different performance measurement systems throughout different sectors, creates the possibility of spill-over effects (Acs et al., 2008). The spill-over effects in this case mean that knowledge and expertise on PM systems is shared between different sectors. To organisations, it is therefore not only of interest to consider their own PM systems, but to look into different sectors as well.

The presence of PM in such a high number of different fields of expertise is a testament to the importance of PM in general. More specifically, the importance of PM to organisations can be divided up into two categories; the internal and the external organisational environment. Within the internal environment, PM assists managers in the monitoring, continuity and improvement of business processes. In particular, the monitoring part includes the assessment of how well business processes are faring. In the continuity part it is assessed whether processes will still be as effective and efficient in the future. Finally, the improvement part consist of the assessment of whether processes could be optimised beyond their current scope (Nudurupati et al., 2011; Lebas, 1995).

The external environment of organisations has many uses for PM systems as well. The process of benchmarking, in which organisations compare their performance to the top performing organisations in their sector is an example hereof (Neely, 1998). This is an example of using PM to remain competitive in competitive markets. Another aspect of this competitivity is the accurate and up-to-date information on performance that can be provided through PM systems. In particular, this ongoing stream of information leads to more well-informed strategical decisions. In turn, these strategical decisions enable organisations to remain competitive in competitive markets (Nudurupati et al., 2011; Lebas, 1995; Rirantanaphong and Van der Voordt, 2015).

The importance of PM to organisations is further illustrated in table 2. The contribution of PM to organisations is elaborated on within the table as well. However, it must be noted that the topics taken up in table 2 are mere proposals, and no definitive list of the topics on which PM has an influence. The topics are suggested by Sinclair and Zairi (1995) and Parker (2000).

Table 2: Usages of PM in organisational practice

Topics/issues	Contribution of the use of performance measurement
Enhancing improvement	When striving for internal improvements within a company PM provides additional diagnostic insights from which to expand the improvement beyond the scope of projects operating without the usage of PM.
Adopting long term perspectives	Both historical and present data on the operations of an organisation can assist management in making predictions and choices for the future.
Improving communication	The results and data created by PM presents the user with the means to express topics in numbers. This increases the precision and the ease in which there is being communicated.
Resource allocation	PM creates insight into most efficient use of (scarce) resources. Whether resources are tied to the most rewarding operation can be shown through PM.
Planning, control and evaluation	The data generated by PM can be used to plan the future and to evaluate and control the current results within an organisation.
Motivating personnel towards organisational goals	PM results assist in setting realistic and achievable goals to employees. Accomplishing organisational goals motivates personnel.
Supporting management towards managing change	Adequately used PM's show the bottlenecks and needs for improvement in departments, products, or processes that are performing below the standard. This creates the drive to induce and push for change. (Sinclair and Zairi, 1995).
Identifying success	PM provides insight in the performance of different departments and processes assists in identifying successful assets of an organisation.
Meeting customer requirements	The performance of goods and/or services can be put to PM tests on the basis of customer requirements.
Understanding organisational processes	Checking whether the results of the PM are in line with what was to be expected from managerial predictions.
Ensuring factual decisions	The data generated through PM provides solid numerical data to base decisions on.
Providing feedback on improvements	On the basis of PM generated data, comparisons can be made between the situations before and after an improvement or change. Therefore, insight is created on how well the improvement or change was carried out and whether it had an effect on organisational processes (Parker, 2000).

As indicated in table 2, PM stimulates successful business practice throughout the entire organisation, thus contributing to both internal and external processes. Moreover, it is worth mentioning that the topics discussed in table 2 are sufficiently broad that they are not limited to a certain department of an organisation. For instance, ensuring factual decisions, the adaption of long term decision making, and the adherence to customer requirements should be a (primary) focus to every and any department (Sinclair and Zairi, 1995). Consequently, this is yet another testament of how PM is essential to every part of organisational operations.

4.5 Performance measurement methods and practice

The choice of which method organisations use to measure performance is often organisation-specific. At the same time, organisations are not limited to the use of 'only' one method of PM. Therefore, a clear overview of the PM methods used by organisations is difficult to provide. This section therefore discusses three PM methods that are both often used and have a direct linkage to each other. This direct linkage comes from the methods being similar and able to complement and supplement one another. The methods are, in the order in which they will be discussed, the Balanced Scorecard (BSc), Key Performance Indicators (KPIs) and the added-value framework.

The balanced scorecard (BSC) is the most common method of measuring performance in organisational practice. The BSc is a PM and strategic planning methodology that combines a number of Key Performance Indicators (KPIs) into a holistic indication of the health of an organisation. It originated as a PM tool that counter-reacted the conventional financial focussed PM, but is nowadays being used for planning, communicating and implementing strategic plans as well (Harvey and Sotardi, 2018; Kaplan, 2010; Reda, 2017; Sinclair and Zairi, 1995). The BSc combines financial KPIs and KPIs that describe the organisational health to adjust to problems and plan for the future. It does so on the basis of four perspectives, shown in table 3.

Table 3: the basis of the BSC in four perspectives

Perspective of the BSC	Description of the perspective.
Customer perspective	Responding to and addressing the satisfaction of customer's needs.
Internal business processes	Examining the processes at which the organisation must excel.
Learning and growth perspective	Sustaining continuous improvement and value creation.
Finance	How the organisational finances look in the eyes of the organisational shareholders.

Note. Adapted from "Conceptual foundations of the balanced scorecard" by Kaplan, R.S., 2010, *Harvard Business Review,* 1(70), pp. 71-79.

The four perspectives of the BSc are meant to capture every aspect of organisational performance that is to be measured. Therefore, the four perspectives overlap greatly with the topics discussed in table 2 in section 4.3. Furthermore, catering to the needs expressed in the introduction of this chapter, the BSc is able to measure both financial and non-financial performance, as can be deducted from the perspectives the BSc focusses on.

As mentioned earlier, the BSc operates on the basis of Key Performance Indicators (KPIs) to measure performance. KPIs are aspects of the business operations an organisation evaluates itself on. The choice of KPIs lies within the organisation itself, while organisations evaluate themselves on the basis of their objectives (Otley,1999). In this choice, the management treads a fine line in the choice of KPIs. A too large number of KPIs results in distraction from the core objectives to be measured. It may also lead to clutter and less transparency. On the other hand, a too limited number of KPIs results in blind spots in the coverage of the core objectives measured (Harvey and Sotardi, 2018). Essentially, the number of possible KPIs is unlimited. As mentioned before, KPIs depend on organisational goals and priorities. Therefore, the possible number of KPIs is as great as the possible differences between organisational objectives. However, there are a number of possible ways to divide KPIs up into categories. A possible division, as suggested by Harvey and Sotardi (2018), places the KPIs under the four over-arching headings shown in table 4.

Table 4: Over-arching headings of KPI topics

Over-arching headings of KPIs	Examples of methods to the KPI performance assessment
Clinical performance	Peer reviews, complication rates, false-positive rates.
Service-level performance	Missed appointment rates, customer waiting times, recall rates, report turnaround time, consumer or customer satisfaction.
Productivity and utilisation	Equipment idle time, repeat sequence rate, downtime on systems.
Financial performance	Net income, variance from budget, preauthorization effectiveness, claim rejection rates.

Note. Adapted from "Key Performance Indicators and the Balanced Scorecard" by Harvey B.H., 2018, *American College of Radiology,* 15(7), pp. 1000-1001.

Table 4 shows the headings and examples of KPI performance assessment used in practice. A side note worth mentioning in the headings classification is that the 'clinical performance' heading is specified to the health sector in this case. However, this term in its use within the model is interchangeable with 'operational performance' which is applied to other organisations as well (Harvey and Sotardi, 2018).

At this point, it can be concluded that the BSc is a broad measure of organisational performance in both financial and non-financial terms. Consequently, at the basis of the BSc model lies the KPI model, which is an even more extensive model. The KPI model has the same use as the BSc model, albeit less structured. There is, however, a next step in this widening of the BSc model, while the KPI model has a basis of itself as well. The foundation of the KPI model lies in the most commonly used basis form of PM, namely the added value model. Within the added value model, performance is measured in terms of what a certain process or action 'adds' to organisational operations (Rirantanaphong and Van der Voordt, 2015). More specifically, De Vries et al. (2008) defined added value as "the contribution to organisational performance and the attainment of organisational goals from the perspective of various stakeholders."

Similar to the BSc and KPI model, the added value model can be divided into categories. In this, Jensen et al. (2012) have distinguished six different categories of added value. To this distinction one can add the categories productivity, profitability and competitive advantage as suggested by De Vries et al. (2008) and the category sustainability as suggested by Den Heijer (2011). The list of terms and their short explanations are presented below (see table 5).

Table 5: Examples of different forms of added value

Added value	Short explanation
Use value	How the added value influences the quality related to the end user's needs and preferences.
Customer value	How the benefits to the company versus costs to consumers and customers are balanced.
Economic, financial or exchange value	The balance between the economic costs and benefits of adding the value.
Social value	Connecting people by investing in social interactions, company and personal identity, and civic pride.

Environmental or green value	The environmental impact created or decreased by the added value.
Relationship value	Providing high-quality services or experiencing special relations through a process that adds value. (Jensen et al., 2012)
Productivity	How the production of goods and services is influenced by the added value.
Profitability	How the added value translates itself to monetary terms.
Competitive advantage	The way in which the added value distinguished itself or the organisation from competitor organisations. (De Vries et al., 2008)
Sustainability	How the added value influences the ecological footprint of the organisation. (Den Heijer, 2012)

It can be derived from table 5 that the added value model can be applied to a broad variety of operational processes within organisations. However, added value is not viewed as an integrated system within the literature concerning FM. The theories on which the added value model is based focus on the variety of operational processes as if they are to be treated as separate events, even while there is significant overlap between both the processes and their performance (Kok, 2015). In this, the added value is less of an integrated system than the BSc, which is able to provide an indication of the overall health of the entire organisation instead of singular processes. An additional drawback of the added value theory is that there is no theoretical framework to guide organisations in the usage of the theory. More specifically, a framework to measure added value that is adequate to every organisation has not been developed yet, leaving it up to the organisations and their (often lacking) expertise to decide upon what points of value to measure (Rirantanaphong and Van der Voordt, 2015; Bititci et al., 2012).

As mentioned earlier, the BSc, KPI, and added value models are only part of the entire range of possible PM systems. Even more so, it is very common for organisations to make use of multiple PM systems at once, thus combining them. Such a combination of different PM's is called a *performance management system (PMS).* PMS's were introduced by Anthony (1965) as the successors to *management control systems* (MCS's). MCS's could be characterised as formal (accounting) measures, that failed to take the non-financial performance, as elaborated earlier in this chapter, into account. Contrarily, non-financial performance is taken up in PMS's. In this, PMS's are more holistic and generally descriptive than the MCS's. To illustrate, some common examples of PMS's are benchmarking (Neely, 1998), total quality management (Sinclair and Zairi, 2000), balanced scorecards (Aly and Mansour, 2017), world class manufacturing and the Smart Pyramid (Ghalayini and Noble, 1996).

4.6 Conclusion

This chapter was based on the second sub-question: *how can performance measurement be conceptualised?* In order to conceptualise PM an introduction and definition to PM, the connection between PM and FM, the importance of PM to organisations, and an overview of common PM systems used in organisations were presented in this chapter. First, PM consists of the measurement of performance to enable managers to monitor and steer organisational processes. The exact definition of performance remains ambiguous, as it depends on ever changing organisational environments. Second, the connection between PM and FM lies in the broad range of FM activities (described in section 3.5) being managed through the use of PM. Managers require tangible results of how FM activities are performing, which they generate using PM systems. Third, PM is essential to organisations as it provides a measure to control the processes within the organisation. Without timely and accurate diagnostics of how an organisation is performing, organisations are unable to keep up with the competition in competitive markets. Fourth, this chapter described three models used for PM within organisations. These three models were the balanced scorecard, key performance indicators, and the model of added value.

5. Five decades of dominant indicators of facility management performance

5.1 Introduction

This chapter is based on the third research sub-question: *what have been the dominant indicators of performance measurement in facility management over the past five decades?* FM has gotten increasing attention and function within organisations over the past decades. In turn, this raises the question of exactly what progress has been made over this period. This chapter looks into the differences in management conceptions within the field of FM. In line with the previous chapters, this description highlights the period from the 1970's, thus the years in which FM gained momentum as more than a mere field of management expenses, up till the broad definition FM carries nowadays.

As elaborated on in chapter 3, the performance of FM is directly linked to what is being valued within an organisation at certain points in time. Therefore, the dominant indicators of what defines high FM performance, can be observed to develop parallel to the goals of organisational senior management (Amaratunga et al., 2000). Due to this parallel, the development of dominant FM performance indicators can be (partly) described by describing the trends that have been the most influential to the development of FM. These trends are discussed in order of prevalence in FM literature (Bröchner, 2017; Lavy et al., 2014; Li et al., 2018; Oyeyoade and Araloyin, 2019). Consequently, this results in the discussion of; the changing economic outlook on FM, the influence of sustainability on FM, the changing functionality and environments in FM, and the changing view on innovation and change management.

Section 5.2 presents a short description of performance in FM around 1970, to be able to indicate the progress that has been made from then onwards. Next, on the basis of the previously named trends in FM literature mentioned by Li et al. (2019) four influential trends are identified and elaborated on. Thereafter, in section 5.7, a short description of modern day performance indicators in FM is given. By doing so, a timeline of the most salient influences on FM indications of performance is presented.

5.2 Performance in facility management around 1970

In the period prior to 1970, facilities were seen as a burden and an expense. A necessity to business processes, that accumulates to a high share of the organisational costs, opposed to a field that can contribute greatly to core businesses (Transfield and Akhlaghi, 1995; Walters 1997). Therefore, FM was mostly managed through accounting techniques. In practice, this meant that performance in FM was assessed on the basis of the expenditures needed to keep the facilities operational (Amaratunga et al., 2000).

Nevertheless, even while this financial outlook hindered development in the FM sector, it cannot be said that there was no development in FM during this period. Very visible within the developments that did exist at that time are the architectural changes in the early 1970s. Architectural research, focussing on the relationship between employees and employers took hold of the field of FM. Within this research, the perspective of the employee took a central role. The work environment was reviewed on the basis of utilisation of office space, looking mainly at usage and users. Among the architectural interests were the designs of flexible and innovative offices, as well as the creation of facilities that can house multiple organisations at the same time. This resulted in a slight alteration to the way in which performance was assed, turning more towards employee performance and practical uses of facilities (Granath,1991; Granath et al.,1996; Horgen et al., 1999; Lindahl, 1996; Lindahl, 2004).

The increasing architectural interest in FM was far from the only development crucial to the development of the field of FM. It did however, assist in the catalytic role of the overall

developments in FM increasing practical and academic interest in the field of research. These developments laid at the base of the long road towards where FM is nowadays. To characterise this road; even decades later Nutt (2000) defined the field of FM as still under researched, supported by too little of an adequate knowledge base, and lacking in indicators of best practice performance. Nutt's remarks are illustrative to the multitude of factors, developments, and insights influential to the development of FM. In the following sections, four major salient developments highly present in FM literature are highlighted, starting off with the economic drivers to FM performance.

5.3 Economic drivers to facility management performance

First of the four major salient FM developments, as stated in section 5.2 and illustrated by Mudrak et al. (2015), cost-cutting is the base outlook in any and every competitive organisation. Before and during the 1970s period, this cost-cutting could be characterised as detrimental to the intensity of developments in FM. In the years hereafter, this attitude has completely changed. Once the entire financial impact of FM on organisations became clear to (FM-)managers, a turnaround followed in how FM was treated. As Shohet and Lavy (2017) illustrated, the main reason to many changes in the field of FM is increasing economic pressure on building operations and the maintenance of facilities. This economic pressure originates from the intensification of competitive pressure on organisations to be as efficient and effective as possible (Myeda et al., 2013).

More generally, developed countries have been increasing the service sectors of their economies over the past decades. Due to these service sectors growing in ongoing processes, service productivity development has gained a crucial role in reaching economic growth. To remain productive in service sectors, organisations have to be agile, efficient and customer-focussed, as well as aware of the strategic role of FM in business management (Bröchner, 2017; Douglas, 2016). Raising and maintaining productivity in FM has therefore gained a strong financial position within organisations.

Additionally, the competitiveness in service sectors comes along with limitations in resources. Even if a resource is not traditionally scarce, say through natural availability, competitive costs limit the use of any resource. Within this scarcity lies the challenge for FM managers to prioritise and select resources and direct them towards the most effective maintenance and capital renewal uses. Consequently, wrongful prioritisation in the allocation of resources may lead to unwanted repairs or component failures (Lavy et al., 2014). In turn, such failures to optimise FM processes can become costly affairs. As an illustration hereof, Rundell (2006) highlighted a research by the National institute of Standards and Technology, which had found that two-thirds of all losses in the USA capital facilities industry come from inefficient processes in the operations and maintenance phase of FM activities.

Specific to the field of FM, building maintenance has gained a critical role in effective and efficient management. With high and ever increasing economic rents on buildings, the clients to and owners of these buildings require proactive financially-feasible approaches to the management of maintenance (Fraser et al., 2013; Myeda et al., 2013). The pressure to gain high investment returns has changed the operational management system in FM, towards a system driven by innovative, cost reductive, green, personal working environments, required for the (financial) continuity of organisations (Li et al., 2019).

5.4 Sustainability driving facility management performance

Second out of the four major salient FM developments, is the effect the concept of sustainability has on FM development. In this case of FM, sustainability can be explained to be both the resilience of buildings and the impact buildings and their maintenance have on nature. More specifically, building resilience refers to how well buildings survive the passing of time and natural effects such as heat

(waves) and strong winds. The impact on nature refers to the ecological footprint and environmental impact a building and its maintenance has (Andrasiunaite et al., 2015).

Sustainability becoming a management priority comes from the rising general awareness amongst customers on the topic of sustainability. Customer environmental awareness has increased due to globalisation, the development and intensification of information technology use, and higher demands for quality of life due to higher welfare rates (Li et al., 2019). In turn, this has left customers increasingly interested in how services (and products) are provided instead of simply focussing on the service itself. Consequently, the environmental and social implications of buildings and their maintenance have to be carefully kept in mind to remain attractive to customers (Andrasiunaite et al., 2015; Subhadra, 2012). This specific customer demand has provided FM managers with the task of matching their financial aims with sustainable requirements. Accordingly, the customer demand has sparked a trend in global infrastructure development based on preserving the ecosystem, thus incorporating green features within organisational environments. In this development, the social impact of facilities has become more prevalent (Oyeyoade and Araloyin, 2019). Even more so, the social impact of facilities has become such an issue that Meng (2015) names it to be the second most important factor of change in FM. Organisations are not only bound to governmental policies concerning sustainability, environment protection, energy performance and waste management, they are bound by customer expectations as well (Meng, 2015) Due to this development, sustainable facility management has become one of the primary research themes in FM literature as well (Li et al., 2019).

The pressure for organisations to incorporate sustainable processes has led to increasing organisational interest in environmental performance indicators. Organisations have often set public goals associated to sustainable development, alongside the (voluntary) environmental standards such as the ISO 14CKKI being developed by entire industries (Eagan and Joeres, 1997).The standards and expectations translated from customers onto organisational management eventually reach practice in a multitude of ways. Herein, the most influential subjects affecting practice are energy efficiency, waste management and active reporting and supporting services for environmental management in FM (Meng, 2015). Yet, when considering sustainable development in FM it must be kept in mind that environmental effort remains often overshadowed by financial aspects. Facility managers do not often prioritise sustainability, nor do they perceive sustainability as a high priority. In particular, this can be explained by a multitude of factors such as time constraints, lacking knowledge on the subject, and a lack of commitment in senior management (Mari and Poggesi, 2014).

5.5 Changing functionality and FM environments

Third out of the four major salient developments, the function FM fulfils within organisations has changed as well. Once the notion of FM being a key business function had settled, (FM-)management began to approach FM differently. Hence, it was not only the physical FM environment influencing the building, the structure of organisations began being influenced as well (Amaratunga et al., 2000; Ventovuori et al., 2007). Consequently, FM as a key business function does not only affect the income and cost of an organisation. On the contrary, social- and brand image, the physical production of goods or services, the quality of life of employees and health and safety are all influenced by FM practices (Ventovuori et al., 2007). Even more so, FM has a highly noticeable function in value management able to improve the quality of projects, products and overall service value, making effective FM operations crucial to organisational performance (Ali et al., 2019).

In order to become aware of the key role of FM to organisations, the field of FM and the research into it had to grow into its own size. As remarked at the start of this chapter, FM in the 1970s was characterised by financial considerations holding back the further development of FM. However, due to FM growing as a business- and scientific discipline, it began to find and anchor its position into

organisations. In turn, the strengthened position of FM increased awareness on the extent of the field of FM itself (Mudrak et al., 2005).
The position of FM has also been strengthened by the dire consequences of inadequate support to facilities. Ineffective FM practices, such as failing support to facilities, facilities not contributing to the organisational goals and insufficient facilities for future needs are often harshly penalised in financial terms. On the other hand, strong FM approaches support the organisation's mission, future needs and the ability to anticipate results of management decisions (Cable and Davis, 2004; Lavy et al., 2010). As Price and Akhlaghi (1999) described it, FM can contribute to support and improve the effectiveness of an organisation's primary activities. By doing so, FM leads to the integration of people, processes and places, creating a direct relation between people, activities, and the physical environment.

The realisation of the crucial role of FM to organisations led to a growth of FM as a professional discipline, accelerating the growth and maturing of the FM industry sector. The establishment of FM departments became common practice, attracting management talent and raising overall competency and qualifications in the field of FM (Meng, 2015). In practice, this has led to the higher expertise and efficiency in numerous FM occupations, such as maintenance, catering, estate management, spatial planning and so on (Price and Akhlaghi, 1999). The growth in practical and academical expertise to FM professionals, has enabled a growth in their career paths. Even while the career path of FM professionals is often argued to be rather undefined, the width of the competency areas provides for rich and extensive career options (Roper, 2017).

The physical environment of organisations has changed alongside the developments in FM expertise and awareness. As elaborated on in section 5.2, architectural changes were among the first changes to affect FM practice. In addition, some architectural influences have been discussed in the third chapter. Among the architectural influences was the incorporation of the workspace comfort pyramid mentioned by (Vischer, 2016). The attention paid to psychological, functional and physical comfort in this pyramid are prime examples of building maintenance considering the (end-)users instead of focussing on the financial picture. The focus on (end-)users has also resulted in entire new viewpoints. For example, the focus on the indoor environment in terms of lighting and greenery (Katzev, 1992; Lohr et al, 1996) changed the way in which facilities were managed by resulting in physical changes in the working environment. Thus, as FM insights alter, so do the physical environments in organisations.

A final factor influencing the position of FM in organisations over the past decades has been the rapid technological advances in this period (Meng, 2015). The wider use of information technology has given rise to new uses and understanding of FM. As highlighted in chapter four, the measurement of performance in FM is highly linked to the development of technological systems. Systems such as building automation systems, energy management systems, and remote control systems have changed the way FM is being used in daily business. In turn, this has led to cost savings, faster and more efficient communication, higher productivity and health and safety benefits (Meng, 2015). Technological advances have also aided in FM's alignment to organisational goals (Nazali et al.,2009).

5.6 Changing view on innovation and change management
The four major salient development in FM is the position of FM within organisations increasingly contributing to organisational goals. Innovation and change management, both crucial to organisations in competitive markets, can be (positively) influenced by FM operations (Nazali et al.,2009). In particular, the measurement and integration of business goals in innovative activities is intertwined with the use of FM. Even more so, to FM innovation is a double edged sword. FM departments require innovation to remain competitive, and in turn, are able to assist in innovation throughout the entire organisation (Alexander, 1999; Nutt, 2000; Price and Akhlaghi, 1999). This can

be explained by the increasing incorporation of high-tech systems, products and materials in becoming part of the built environment. Machine learning, the internet of things and wide arrays of sensors able to capture almost anything are some technological advances impacting the efficiency and innovation in FM (Roper, 2017).

Furthermore, due to the rise of technology in FM, information technology has made it possible to make use of FM in a strategic way. This while change management is often affected by facilities and the planning involved in these facilities. Herein, FM can serve as an operational discipline able to analyse and respond to changing organisational needs (Okoroh et al., 2003). To illustrate, sudden surges in customer demand can be countered by facility managers anticipating change and leaving additional production space open. Organisations thus require long-term sustainable strategies to align their objectives with future commitments (Douglas, 2016).
The continuous innovative processes in FM do, however, not often come in logical or predictable order. Service innovations are frequently found to be based on a reactive culture, opposed to constructive continuous change (Douglas, 2016). As Cardellino and Finch (2006) illustrated, service innovations are often “one-shot commitments”. This single-issue approach is hindering the further development of FM innovations, while the approach is neither structural nor long-term applicable. A further hinderance to FM innovation lies in the attitudes of the FM professionals. FM practitioners often perceive themselves to be innovative when this is not the case. On the other hand, under-valuing their own innovativeness is a common issue as well (Scupola, 2012). This may lead to a distorted image of the strategical position of the FM department. In turn, this can be detrimental to the growth in facilitative innovation processes. In more recent years, however, FM professionals are becoming more structurally innovative. Innovative FM measures are being put on the agenda, innovative long-term strategies are being developed and some organisations even establish their own development departments (Mari and Poggesi, 2014).This comes as a response to market pressure in a bid to remain in business, match or even exceed customer expectations, and add core value to the organisation (Mudrak et al., 2005).

5.7 Present state of performance in facility management
The previous sections of this chapter have introduced four major developments to PM in FM. Considering the present situation, the development of FM is still a long way from being completed (Roper, 2017). Even more so, due to ever changing business objectives and competitive advantages, the development of FM is not necessarily ever completed (Mudrak et al., 2005). However, it can nevertheless be stated that the profession of FM is reaching its maturity. This while both practice and research have developed greatly over the past decades, with the last constructive issue remaining in the field being the adoption of theory into practice (Roper, 2017).

The FM sector thus remains ever developing, based on socio-economic demand both internal and external to the organisation. On an organisational level, the development and evaluation of FM performance is linked to the rise or decline of the prosperity of the organisation involved. More specifically, stable and favourable socio-economic conditions to the organisation, give rise to higher development rates in FM. On the contrary, in harsher times, organisations tend to allocate less resources to FM development (Li et al., 2019). Nevertheless, FM currently finds itself in a central role to many organisations while it is now structured by formalised, integrated and holistic performance measures (Amaratunga and Baldry, 2002a; Bititci, 1994; Bourne et al., 2000; Hayes and Abernathy, 1980; Pitt and Tucker, 2008; Kaplan and Norton, 1992).

The central role of FM can be illustrated by how much the scope of FM has branched out. Van der Voordt (2012) mentioned the focus on efficiency in FM departments influencing the entire organisation through lower use of floor space and overall cost reductions. Furthermore, FM integration has influenced the collaboration between different departments, increased flexibility in workspaces and working hours, and has provided methods to reduce the difficulty in maintaining

high productivity and effective use of office spaces (Becker et al., 1993; Bishop et al., 1996; Clipson and Kornbluh, 1993; Lautier, 1993; Penn et al., 1997). Consequently, influences such as flexibility, effectiveness and high productivity in the FM environment have become structurally incorporated in the measurement of FM performance, thus becoming valued indications of FM performance (Gilleard and Yat-Lung, 2004).

The architectural innovations in FM, as named to be one of the first major changes to FM processes, have fortified their position within organisations as well. The contemporary organisational environment is being built and maintained with consideration of more components than ever (Lindahl, 1996; Lindahl, 2004). Extensive health, cleaning, organisational planning and learning, and facilitative spatial efficiency goals have provided an employee focussed working environment (Lindahl, 2004). Consequently, to achieve optimal office environments catering to employee productivity, FM operations have adopted and begun monitoring a range of new functions, as named in the third chapter. These activities, as Williams (1996) described them, can be put under the umbrella terms of 'premise services' and 'support services'. Although the contemporary definition of FM is linked to an impressive broad scope of activities, most FM activities can be caught under these two umbrella terms. Consequently, this division in two umbrella terms is yet another indication of how FM has gained new meaning besides the 'facility (premises) cost based' outlook of the past, in terms of the 'service support services' that have now found their way into FM professions.

5.8 Conclusion

This chapter was based on the third sub-question: *what have been the dominant indicators of performance measurement in facility management over the past five decades?* This question was answered on the basis of four major salient developments of the PM in FM, preceded by an introduction of the situation five decades ago, and followed-up by a description of the contemporary situation. The four major salient developments driving the progress of PM in FM are economic drivers, sustainable considerations, a changing FM functionality and environments, and changing views on innovation and change management. In turn, developments in these four areas have assisted in leading PM in FM from its position of five decades ago to its current position.

The four major developments named within this chapter are far from the only developments that have influenced the development of PM in FM. However, due to the extensive range of developments that have influenced PM in FM, and the absence of general consensus on factors influencing PM, four major developments often named by (influential) academics have been chosen in this chapter. These four developments serve to present an indication of how PM in FM has grown from being perceived as an necessary burden to becoming an indispensable tool to the effective management of organisations.

6. Changing application of performance measurement in facility management

6.1 Introduction

This chapter is based on the fourth research sub-question: *how has the application of performance measurement in facility management developed over the past five decades.* This question further illustrates the developments PM in FM has gone through discussed in chapter five. However, opposed to the fifth chapter, this chapter considers different perspectives to PM in FM rather than a set timeline of developments. This to illustrate what has changed for the most prominent actors working on FM development. First, an academic's perspective is considered to highlight the theoretical contributions that have changed FM. Second, a managerial perspective is discussed to illustrate the different courses organisations have set out considering their FM operations. Third, a practical perspective is discussed to indicate what has changed in FM daily operations. Subsequently, this distinction has been made while many FM developments have not followed a distinct chronological path, making it difficult to link them to certain periods of time. Fourth and final, some predictions as to how FM will develop in the nearby future are provided, based on common academic assumptions of oncoming FM trends. Similar to the previous chapter, the topic of PM in FM remains too extensive to discuss in full. Therefore, common and salient developments are taken up to provide an indication of the development of PM in FM.

6.2 Changes in facility management practices from an academical perspective

The most salient recurring theme in the field of FM remains the shift from a focus on financial accounting towards a widespread field of expertise. Academic research into PM in FM has also followed along this path (Amaratunga et al., 2000). Examples of the changing focus are Hopwood's (1974) research into the behavioural implications of financial management accounting and Seybolt's (1976) research analysing the connection between person-environment interactions and job satisfaction. Nowadays, the reduction of facility related costs remains a central theme in FM literature. The amount of academic contributions to this topic lies high and is developing at a constant pace, thus continuously providing new insights (Atkin and Bildsten, 2017). Contrarily, this is not the case when considering other FM topics and publications. Only few publications transcend management areas or their respective industry sectors. As a consequence of how scattered most of FM literature remains, it is close to impossible to create a holistic guiding picture of FM literature (Meng, 2015).

On the other hand, some recurring research themes can be found in FM literature. Mostly concerning operational improvement, topics such as energy efficiency and environmental considerations, internal environments and workplace productivity, end-user experiences, performance measurement, and outsourcing activities are often found in FM literature (Atkin and Bildsten, 2017). While these are only examples and partial to the entire landscape of FM research topics, they do represent the width and intensity of FM research. Furthermore, in chapter 5 it was discussed how FM literature is often based on the trends important to FM managers at a certain point in time. Remarkably, in more recent years, FM literature and the influential trends found in practice have only become more estranged from one another. More specifically, the most cited papers stem from 10 to 15 years ago, whereas newer papers are often less cited. Consequently, this may be explained by the historical focus FM academics sometimes hold, and their tendency to specialise in only a distinct part of FM operations (Atkin and Bildsten, 2017; Meng, 2015). Furthermore, the strategic role of FM to organisations often remains a foreign concept to both academics and practitioners, leaving both with difficulty in appreciating the added value that can be found in this role (Fraser, 2014). An additional obstacle to the academic appreciation of FM is how practitioner-focussed the field is. This has led to rather few journals being focussed on FM, leading to FM being less visible in general academic literature (Fraser, 2014).

Additionally, the strong rise of PM usage in FM remains inadequately supported by FM literature. Overall research into PM has greatly increased, whereas FM specific PM has not followed suit (Amaratunga and Baldry, 2002). Toni et al. (2007), observed PM as to be rather new to FM, providing the literature on it to be often limited and failing in integrating indicators of performance to assist in holistic management. The continuation and even possible intensification of the gap between what academics provide and practitioner demand remains unfortunate, considering that optimal performance of PM in FM can be achieved by aligning literature and practice to assist one another (Pitt and Tucker, 2008; Myeda 2013).

The alignment of literature and practice remains a primary topic in FM operations. FM academics often collaborate with practitioners in a bid to bridge the gap between both. However, even while being an strong initiative, it has its pitfalls. The collaboration between academics and practitioners is often influenced by personal interests. Academics tend to present research appealing to the facility owners in question, while in turn the facility owners support those academics that operate within their field of interest. This often leads to a lack of larger incremental operational changes within organisations, due to risk-aversion in FM practitioners and the academics supporting them (Atkin and Bildsten, 2017). Consequently, it may become doubtful whether the increased collaboration between FM academics and practitioners is ever beneficial to the field of FM.

Finally, another obstacle yet to overcome in the alignment of literature and practice lies in the difficulty in moving research findings into practice. The mere passive provision of academic findings by FM academics yields too little response in practice. Consequently, the active encouragement of case-specific strategies towards implementation of academic findings is needed to achieve change within FM practice (Roper, 2017). Unfortunately, such an organisation-specific approach to FM research is highly consuming in both time and resources, making it less common in practice.

6.3 Changes in facility management practices from a managerial perspective

The largest part of the working environments FM-managers find themselves in, is being shaped by business demands. This has resulted in many new challenges to FM managers, including the continuous adaptation of current skills and expertise (Pilanawithana & Sandanayake, 2017). Any advances in technology, (IT-)systems and FM activities directly affect the built environment. For instance, the adoption of sensors to streamline data-use and overall logistics has completely replaced the FM-systems that were in place beforehand. To cope with these changes, FM managers increasingly need to be technology savvy and able to adapt their ways of working to external influences. This requires a strategic vision, along with technical skills and an aptitude to recognise trends and future influences. Consequently, this has resulted in FM managers' need to be focussed on both present and future activities (Li et al., 2019).

In practice, FM-managers are often occupied with the effective choice and usage of performance indicators. This while PM has a guiding role in FM in ensuring the support of the organisational mission, realising facilitative requirements, and providing the needs to anticipate future outcomes of current management decisions (Lavy et al., 2010). Frameworks such as the BSc assist in the usage of PM systems and serve as guidelines and operational tools to FM-managers. However, the choice in PM frameworks is up to the FM-manager. Considering the continuous development of FM and its indications of performance, carrying out PM remains an ongoing challenge to FM managers, ever changing the environment in which they operate (De Toni et al., 2007).

To optimise the practices in the changing organisational environments, FM managers have begun to adopt facility-specific strategical management approaches. Interestingly, even while this stage is still in its infancy, it is already changing the managerial outlook on FM management practice. More specifically, the changing outlook once again strengthens the focus on the added value FM practices can bring to an organisation (Lehtonen and Salonen, 2006; Nik-Mat et al., 2011). Yet, even while FM

managers are advancing their business practices, their daily operations still include a high level of uncertainty. The majority of FM managers still indicate not knowing whether facility designs reflect the needs of the users, or how to resolve possible discrepancies between user-needs and what has actually been realised in practice (Kok, 2015). This has led to FM managers sometimes operating on what may be called 'educated guesses' or sub-optimal solutions found to be working in practice. In turn, this can be explained by the increasing portfolio of FM. Whereas the once used cost-reduction approach provided clear guidelines to FM, the management of FM has become far more extensive and inclusive of new perspectives and practices that are less straight-forward (Chitopanich, 2004; Khazraei and Deuse, 2011; Nik-Mat et al., 2011).

6.4 Changes in facility management practices from a practitioner perspective

In the first place, practitioners have experienced changes in FM operations due to the development of the FM industry as a whole. Standardisation, digitalisation, and higher needs in term of efficiency have shaped the way in which practitioners work with FM processes. For instance, the usage of real-time data and possibilities to visualise FM-based data have changed not only how practitioners work with FM, but how their work is evaluated as well (Li et al., 2019). Additionally, the development of FM has also changed and integrated different functions. For instance, the combination of engineering and maintenance has led to different professions fusing into one (Cholasuke et al., 2004). Due to developments like these, FM-practitioners have experienced continuous changes in their daily operations.

Second, the field of FM has become more user-centred as well. As Miller et al. (2001) stated, the inherent need to have an effect on our surroundings comes from human nature. Naturally, this need can also be found in employees' tendency to influence their workplaces. In this user-workplace relation, job satisfaction is clearly linked to the meaning employees give to their workplace. For instance, the quality of the indoor environment is even linked to employee absenteeism (Samani et al., 2017). Due to the growing awareness on the importance of the end-users in FM, their influence has also grown. Consequently, an increase in environmental considerations benefitting the end-users and the growing influence of the end-users on how their work-environment is being shaped can be observed throughout the FM-sector (Miller et al., 2001; Van der Voordt, 2004; Maarleveld et al., 2009).

The ongoing challenge to FM practitioners is to keep up with the changes in FM operations. The key to successfully keeping up with the dynamics of FM lies in constant training (Korsten, 2002). Even more so, a conservative attitude in FM-practitioners can actively harm the organisation, limiting the flexibility and willingness to change in FM operations. In conclusion, FM practitioners in modern-day FM are continuously being 'forced' by competitive forces to alter the way in which they operate towards newfound efficiency (Korsten, 2002). In this bid to increase efficiency, practitioners must thus combat more diverse work practice, global dispersion of work practices, and shorter business time horizons leading to a less predictable future with less certainty in organisational practices (Nutt, 2000).

6.5 Implications for the future of facility management practices

Due to the lengthy period of developments PM in FM has gone through described in chapters three to six, one may tend to assume the field of expertise is approaching its maturity. This is, however, far from what is actually happening. Most pressing, practice and academic literature remain far from aligned with one another. On the practical side, the implications of academic literature have not been sufficiently incorporated in practice. For example, the environmental office designs such as those mentioned by Roelofsen (2002) remains insufficiently incorporated in practice. In academical terms, FM literature does not support practice in providing guidelines to practitioners. To illustrate, the lack of an universally accepted list of FM functions or framework to PM indicators is an example of this lack of academic support to practitioners (Abdeen and Sandanayake, 2018; Bititci et al., 2012).

Yet, some notable developments have occurred. An example of an advancement in organisation specific PM measures is the BSc introduced by De Toni et al. (2007). This specific BSc has been developed with high practitioner involvement, leading to a more individually tailored BSc. Furthermore, even though this measure has not been widely implemented into practice yet, the number of initiatives like these is expected to grow in the future (Kincaid, 2000).

A notable feature in the development of FM operations is the incremental nature of the changes in the operations. These incremental changes are interrupted by so called disruptive changes, that take place far less often. Disruptive changes, while being more fundamental, take place in the medium or long term, with the most highly anticipated disruptive change to FM in the nearby future being the further introduction of artificial intelligence (Christensen et al., 2006; Atkin and Bildsten, 2017). In particular, it is expected from artificial intelligence to largely change the innovative technology in FM. Besides artificial intelligence, Building Information Modelling (BIM) is a reoccurring topic in FM, having returned in different forms, assisting FM professionals in the management and maintenance of buildings (Atkin and Bildsten, 2017). A further development herein is the introduction of 'soft landings'. Soft landings refers to the FM strategy aimed at breaching the gap between predicted and actual facility performance. Consequently, this is being done through the improvement of operational readiness towards the start-up of the facility and its sustained performance in operational terms. However, even though the philosophy of soft landings is highly present, its execution in practice remains a difficult issue to be tackled in the future (Atkin and Bildsten, 2017).

A final topic likely to have a large future influence on FM is sustainability. More specifically, environmental performance, social performance and the economic performance linked to sustainability, as indicated in the fifth chapter, are highly likely to be drivers to how performance is measured in FM. As described in section 5.4, customer demand affects management priorities. Management priorities dictate what is perceived as high performance, thus affecting performance measurement. Therefore, the sustainable considerations of customers may greatly influence the PM in FM (Atkin and Bildsten, 2017). Most pressing remains the integration of sustainability into strategic goals, proving itself to be difficult within FM. In this, the future linkage between sustainability and technology may yet be the key to success.

6.6 Conclusion

This chapter was based on the fourth sub-question: *how has the application of performance measurement in facility management developed over the past decades?* This chapter illustrates how the developments in the application of performance measurement has affected FM processes. These developments are approached from three different perspectives (academical, practitioner and managerial), to indicate that the developments of PM in FM have affected different actors in different ways. First, a high intensity of research and the difficulty of bridging the gap between academic research and practitioner demand are important features from an academical perspective. Second, the continuous change of working environments and difficulty in selection of PM indicators are essential to the perspective of FM managers. Third, continuous changes in daily operations and working environments becoming more user-centred are of high importance to the perspective of practitioners. Consequently, the developments in the field of PM in FM have led to a broad range of differences in the application of PM in FM, affecting different actors in the field of FM in different ways.

7. Discussion and conclusion

7.1 Introduction

In this chapter the findings concerning the research questions are provided. First, the research sub-questions will be answered, in order of the chapters they are interconnected with. Second, the main research question is answered. The main research question is formulated as follows: *What explanations are there to the most salient differences in the application of performance measurement in facility management departments from 1970 up to the present?* Third, the conclusions regarding the research questions are discussed. Lastly, the limitations to this study are given alongside recommendations for further research.

7.2 Main findings and conclusions

7.2.1 The changing portfolio of facility management

The third chapter of this report discussed the first research sub-question (section 3.1): *What is the portfolio of facility management and how does it affect core business?* One of the main findings within this chapter was the combination of both growth and restructure FM activities have gone through over the past decades. In terms of growth, the portfolio of FM has greatly increased in size and importance within organisational settings. The restructure comes from both existing activities finding a new place within FM settings and the constant restructuring of FM activities to remain suitable to organisational goals and objectives. The effect FM has on core business operations has changed over the past decades as well. Specifically, both the actual influence FM holds over core business objectives and the awareness on this influence have grown significantly. Due to this growth, the field of FM has become less clearly defined. Consequently, the exact scope and definition of FM are topics of ongoing discussion. This discussion is not likely to come to an end any time soon as well, whereas the field of FM is highly likely to remain changing and developing in the future.

7.2.2 Conceptualisation of performance measurement

The fourth chapter of this report was centred around the second research sub-question (section 4.1): *How can performance measurement be conceptualised?* Within this chapter, the strong rise of PM in FM was elaborated on. The rise of the usage of PM in FM is driven by a multitude of factors. Examples of these driving forces are competitive considerations, demands from practice and organisational aims towards more extensive indications of performance. The high demand towards non-financial indicators of performance has shaped the usage of PM in FM, leading to new methods of PM. In turn, the PM systems that transcended pure accounting techniques have provided new insights into FM activities. Nevertheless, the further integration of PM into FM has not only known success. The more extensive PM systems have provided to be difficult in usage to those working in FM sectors. In turn, this has also increased the difficulty of implementing PM systems into practice, whereas FM managers are hesitant to work with overly complicated systems. Even more so, the risk of using PM systems incorrectly can prove to be harmful to organisations. Therefore, for future purposes, PM measures most become both more organisation-specific and more generically applicable to keep up with practitioner demand in the FM sector.

7.2.3 Dominant indicators of performance management in facility management

The fifth chapter set out to answer the third research sub-question (section 5.1): *What have been the dominant indicators of performance measurement in facility management over the past five decades?* The main finding in this chapter was that what may be measured as to be 'performance' in FM at a certain point in time is highly linked to the priorities of organisational management. Although managerial priorities may differ, there are some common priorities that have led to FM development over the past decades. First and foremost, a large share of FM development can be explained by competitive considerations, in which efficiency plays a central role. Moreover, socio-economic demands can be seen as driving forces to organisational development, while consumers often dictate demand. Other developments and driving forces can be named, but the overall philosophy remains

that FM the dominant indications of performance in FM are formed by what FM actors expect FM to assist in throughout the organisation. Spanning from facilitative maintenance to a range of services throughout the organisation, if it 'works' and suits the core objectives of the organisation the performance is considered to be high. Partially, this can also be explained by the gap between literature and practice on this subject. While FM literature remains inadequate in providing PM measures suitable for practical usage, practitioners often consider performance in FM the absence of visible failures in FM activities.

7.2.4 Changes in facility management practice

The sixth chapter considered the fourth research sub-question (section 6.1): *How has the application of performance measurement in facility management developed over the past five decades?* Within this chapter the changes in FM are considered through the perspective of those working with FM. FM has changed so considerably throughout the past decades that those working in FM related professions have experienced radical changes in their professions. The changes consist of both unique challenges to each different actor and challenges applicable to the entire field of FM.
A salient issue in the resolving of these issues as a whole, is the lack of collaboration between the actors in general terms. Actors tend to face their own challenges first, thus leaving the common issues to all actors as a secondary concern. In terms of future FM developments, it is highly likely for FM to remain developing on the basis of the themes most valued by management at certain points in time. Due to the incremental nature of the changes in FM, it is most likely that the fields keeps altering itself bit by bit, until the more disruptive changes radically change the basis of FM once again.

7.2.5 Most salient differences in performance measurement within facility management

The main research question throughout this report has been: *What has changed in the application of performance measurement in facility management over the past five decades?*
First, FM and the portfolio linked to it have changed (section 7.2.1). As described in the third chapter, the portfolio of FM has been revised continuously over the past five decades. New activities and services have been added to the field of FM alongside activities yet existing being re-evaluated as FM activities. This development has broadened (knowledge of) the influence FM has on the core activities within organisations.
Second, the way in which performance is measured within FM has changed (section 7.2.2). FM has changed from being perceived a necessary burden to an effective tool in creating value for the core objectives of organisations. This change has led to an increasing interest in the measurement of performance in FM. Consequently, the usage of PM systems to monitor FM activities has become a standard to organisations.
Third, a combination of internal and external forces have forced the field of PM in FM to develop due to the organisational need to remain competitive (section 7.2.3). What is considered to be high performance to organisations depends on the preferences of organisational management. Therefore, PM in FM has developed in parallel with how socio-economic demand that shapes the preferences of FM managers.
Fourth, the application of PM in FM has changed alongside the changes in the environments of the actors in the field of FM (section 7.2.4). Changing organisational and academic environments presenting new and unique challenges have led to a continuative need for PM in FM to remain ever changing to match the changing environments.
In conclusion, it can be stated that the field of FM itself, the way in which performance is measured in FM, the needs of organisations that require FM, and the environments of those working with FM have all changed. Based on the main question, an answer would thus be that different measures of performance are currently being used to measure FM processes in other ways than ever before. This change in measurement has taken place to keep the PM in FM within organisations competitive, catered to user and management preferences, and suitable to changing organisational environments.

7.3 Discussion

While the field of PM in FM is highly likely to remain developing in the coming years, it is important to focus on the understanding of FM in the present. A strong understanding of how PM and FM have developed in the past and are developing in the present, can lead to more understanding of how the future will unfold. Besides that, there is the risk of the issues currently found in FM increasing in severity in the future due to wrongful or too little action in the present. Most pressingly, the significant gap in research to assess, compare, and evaluate the FM performance in organisations is currently mostly left unattended. In some ways, the gap is even only increasing. To illustrate, even while there are many publications on the topic of FM, the most cited articles are often at least a decade old (Atkin and Bildsten, 2017; Meng, 2015). This has left practitioners with either outdated information or has even left them to their own means. On the other hand, advances to bridge the gap are being made, in terms of higher cooperation between academics and practitioners and organisation specific PM systems (De Toni et al., 2007). Hence, the research into FM is plentiful, spanning a wide range of topics and issues, but lacking in coherence. Remarkably, even the most defining factor to FM, the definition of FM and the activities attributed to it, is often still a topic of discussion (Nor, 2014). Consequently, the ambiguity and uncertainty in the academic field of FM is working against the bridging of the gap towards the practical side of the field.

Consequently, the aim within this study is to contribute to the bridging of this gap. This study elaborates on the reasons behind the changes in how performance is perceived in FM. In turn, the drivers to change can explain and give insight into the change itself, while they force the change into existence. In the understanding of the changes in FM lies the understanding of where the field is lacking in or failing to change as well. Therefore, this study may be of great importance to all actors in the field of FM, academics, managers, and practitioners, as named in the sixth chapter. In addition to adding to the general awareness on a part of the issues found in FM, this study also provides historical insights to the development of PM in FM. Historical insight, in turn, can also help explain the modern day position of FM. Above all, the need for additional studies into the present and future positions of FM are needed. Even besides the discourse on its definition, FM lacks in clarity on its exact portfolio (Bitner, 1992; Kincaid, 1994), on its implications to organisations in terms of core objectives (Amaratunga et al., 2000; Cotts, 1998), and on the most effective usage of PM in FM activities(Abdeen and Sandanayake, 2018; Bititci et al., 2012). This high level of unclarity is detrimental to the developments in the field of FM, which makes it important to re-evaluate and research these subjects to increase clarity. Therefore, overall awareness on the topic must be raised, to which this report aims to contribute.

7.4 Limitations and further research

A number of limitations can be mentioned regarding this study. First, the sheer amount of publications and different topics in the field of FM required boundaries to the study. A large number of articles have not been discussed, having possibly insightful articles being overlooked. This may have altered the course of this study, possibly under- or over-estimating the conclusions. The same may have occurred due to the ‘snowballing’ techniques used to gather information. While in the case of snowballing one finds similar articles through the article first found, the risk of staying in a certain niche or area of research is very likely. Due to this, conclusions may yet again be overly focussed on similar sources of information, excluding different insights. Second, the field of FM is very practitioner focussed, which has led to FM being less visible in general academic literature (Fraser, 2014). Combined with the most cited articles in FM often being at least a decade old, this has led to a possibly disproportionate division of attention to FM articles, excluding less visible and newer articles from sight. Yet again, this leads to less consideration of possible articles providing different insights. Third, the absence of practical experience may be a drawback to this study. The theoretical assumptions of common practice to practitioners may be, considering the gap between literature and practice, insufficient or lacking. Even more so, due to the presence of the gap in literature, the

overall demands of practitioners and difficulties found in practice may be incorrectly described throughout this report. Therefore, in future research, the key to overcoming this gap lies in the cooperation of both academics and practitioners towards mutual understanding and assistance.

Future research should focus on explorative and descriptive studies that increase overall consensus on the current and future position of PM in FM. The incorporation of a higher number of universally accepted guidelines capturing the definition, usages and implications of FM are needed to create a stronger basis to work from for FM-researchers. Furthermore, the active participation of FM-practitioners is highly needed, in order to more effectively guide FM-academics in their studies is needed as well. High practitioner involvement is the key to higher rates of adoption of academical findings into practice as well. Consequently, the key to efficient future research into PM in FM lies in collaboration, consensus and a strong basis of research.

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