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An investigation of the integration of business intelligence tools with the roles of performance management of wholesale SMEs in the UK: to enhance decision making that maintains/improves operational performance

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PhD Thesis

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Abstract

This thesis investigates the role of business intelligence tools (BI) in performance management activities within small to medium enterprises (SME). The purpose of this investigation is to align the features of BI tools with the performance management activities in a model that supports the roles of performance management in the targeted sector. The proposed model also considers the characteristics of SMEs by choosing the appropriate technologies to support the role of BI with regard to the limited capabilities of SMEs. In general, this research proposes a model that supports the adoption of BI tools to enhance decision making that improves performance management activities in SMEs.

After identifying the influential sectors in the UK region, this investigation has targeted the wholesale industry because it is a major contributor to the national economy. In addition, the nature of the wholesale industry makes it more appropriate for the purpose of this research, to be able to generalise the results across the targeted sector. The purpose of this research is described through the research aims; these aims are 1) to encourage the use of BI tools to improve performance within the targeted sector, and 2).to remove the barriers facing wholesale SMEs when attempting to adopt BI tools. In course of this research, the accomplishment of these aims is described in a third aim, which is the principle aim of the research. This aim is to establish the basis for a new policy that encourages and promotes the adoption of BI tools in performance management activities, to enhance decision making that improves performance management within wholesale SMEs in the UK.

The features of the proposed model incorporate the defined BI tools and the performance management activities with the factors that influence 1) the strengths and weaknesses of SMEs in general, 2) performance management in wholesale SMEs and 3) the adoption of BI tools. The proposed model was developed through a literature survey that identifies the critical success factors (CSFs) that influence the functions of the model, the performance management activities at the operational level of performance management, and the appropriate BI tools that enhance decision making to improve the performance management activities. The model is further validated using a quantitative questionnaire survey using to validate the model within wholesale SMEs in the UK. And finally, the practicality of the proposed model in real life situations is evaluated through an interview with a manager of a wholesale SME.

Chapter One: Introduction

1.0 Introduction

Due to the large industrial shifts from labour-based to knowledge-based industries during the last three decades in the UK (Yip and Rugman 2006); the UK's economy could be described as a knowledge-based economy. In knowledge-based economies, acquiring knowledge is considered as an essential need for businesses to compete in the market (Sureephong et al. 2008; and Wierzbicki, 2007); therefore, the importance of business intelligence (BI) increases within businesses in such economies (Karim, 2011). This is where business intelligence is ultimately concerned with utilising computer technology to gain knowledge about the business.

As a result, the adoption of BI tools is considered to be of vital importance for businesses in the UK. BI tools may involve any computer technology that could be used to enhance decision making in business (Eick, 2000). And since businesses aim to enhance decision making in order to maintain and improve their business performance; the concept of business intelligence also aims to improve business performance. This research investigates the interactions between the adoption of business intelligence and performance management within British enterprises. In other words, this research aims to identify the roles of BI tools in managing performance within the UK's enterprises.

The tools of business intelligence are defined in Chapter Four as data warehouses (DWH), OLAP applications and data mining tools (Jing, 2006) in order to be examined as part of the activities of performance management. The concept of performance management is defined in Chapter Three as a continuous management cycle (Beer and Ruh, 1976; Chan, 2006); this cycle consists of two phases where each phase contains a defined set of activities, and the cycle is repeated over predefined periods of time (Fitt, 1992; Armstrong, 2006 p. 16; O'Connor, 2007 p. 139).

However, the purpose and activities of the performance management cycle may differ in different organizations (Armstrong and Baron 2005 pp. 1-2) and at different organisational levels (Brudan, 2010). In this sense, the choice and use of business intelligence tools in the performance management cycle is usually customised according to the specific needs and opportunities of the enterprise. Therefore, it is hard to generalize through the activities of the performance management cycle either the choice or use of BI tools for all enterprises. In this matter, this research targets a specific sector where the majority of enterprises share similar needs and opportunities that influence the adoption of BI tools.

In this sense, because the majority of SMEs share similar weaknesses, strengths, threats and opportunities (Wong & Merrilees, 2005; Hankinson et al., 1997; Maltay, 2000); this research was targeted on the SME sector in the UK. This research suggests that the shared strengths generate similar opportunities for SMEs to compete with large enterprises, while the weaknesses generate similar threats which affect the performance of SMEs. However, the SME sector is a highly heterogeneous sector because it consists of enterprises from almost all the different industries. Therefore, to generalise the roles of BI tools in the SME sector, the sector is narrowed down by differentiating between the different industries in this sector. In this case, the standard industrial classification (SIC) provides a clear guide to differentiating between SMEs according to their industries (Hughes and Brook, 2009). Based on this classification, this research differentiates between the different industries within the SME sector.

Reviewing the history of the UK region provides the guideline information to identify the influential industries within the SME sector. Reviewing the last three recessions points to the wholesale industry as an important industry that had a key role in the recovery from the loss

in manufacturing output (Yip and Rugman, 2006). This is highlighted by the fact that the export of goods has continued to increase while the production of goods was decreasing because of the manufacturing loss (Brook and Taylor, 2010). In addition, the operating environment in the wholesale industry increases the possibility of shared needs between wholesalers; this is because the roles of wholesalers are defined in the distribution industry (Rosenbloom & Warshaw, 1989; Bucklin, 1993), which generates a similar operating environment for the different types of wholesalers.

But again, the performance management cycle has different purposes at different organisational levels (strategic, operational and individual levels) (Brudan, 2010). And because wholesalers have three different types (Merchant wholesalers, manufacturers' sales branches, and merchandise brokers or agents); each type influences different strategies (Kotler et al. 1995; Lusch & Vargo, 1998). Therefore, the activities of the performance management cycle at strategic levels may differ according to the purpose of the different strategies of wholesalers, which influences the roles of BI tools. In this matter, this research also specifies the purpose of the performance management cycle by considering the implementation of the cycle only at the operational level.

As a result, this research aims to establish the basis for a new policy that supports the sector, by means of adopting BI tools to improve performance management activities. In other words, this policy will aim to improve the performance of wholesale SMEs in the UK by proposing a model that aligns the roles of BI tools in the performance management cycle at the operational level. To generate this model, this research first investigates the critical success factors (CSFs) that influence the success of wholesale SMEs in the UK, their operational performance, and the adoption of BI tools. The identification of the CSFs is achieved through a literature survey throughout Chapters Two, Three, and Four. These factors are then grouped and summarised in Chapter Five to define the requirements of the performance management cycle at the operational level in wholesale SMEs. And finally, the BI tools are defined that will align them with the performance management cycle of wholesale SMEs at the operational level.

This research uses a literature survey to define the CSFs and the requirements of the sector, in order to generate a preliminary model that describes the adoption of BI tools to support

performance management activities within wholesale SMEs. But this model is based on CSFs that were defined from different (related) disciplines related to the topic of this research. Therefore, in order to validate the preliminary version of the proposed model; it is important to test the influence of defined CSFs in the sector of this research (wholesale SMEs), as well as testing the defined elements in the proposed model. In this matter, Chapter Seven applies a quantitative research approach using a questionnaire survey to test the statistical influence of the CSFs and the model elements on the sector of this research. After that, a validation of the proposed model is discussed in Chapter Eight.

To provide a clear introduction to this research, this chapter is divided into three sections that aim to clarify 1) the scope of the research, 2) the definition of the research, and 3) the steps taken to support the achievement of the research aims and objectives. The first section of this chapter begins with defining the scope of research in order to establish the required background to define the research problem. And in the second section, defining the research generates the aims, are used to define questions that support the achievement of these aims. Then the research objectives are formulated to provide the appropriate answers for the defined questions. The research design is discussed in the third section of this chapter, describing the design of the research, the achievement of objectives, and the process of the research. In addition, the fourth section describes the layout of the chapters in the thesis, and the fifth section is the chapter summary.

1.1 Scope of research

The wholesale industry has an important influence on the performance of the UK economy (Brook and Taylor, 2010; Yip and Rugman, 2006), and SMEs form the majority of most industries in the UK (BIS 2011). Therefore, maintaining and improving the performance of SMEs in any industry is vital for the wellbeing of the industry and therefore the economy (Ghobadian and Gallear, 1997; Wolff and Pett, 2006). SMEs share similar weaknesses when they are compared with large enterprises (Wong & Merrilees, 2005; Hankinson et al. 1997; Maltay, 2000); these weaknesses are issues such as limited resources (O'Regan and Sims, 2006; Oke, et al. 2007; Taplin, 2005; Lo and Humphreys 2000) and managerial weaknesses (Chaston, 1994; Hankinson et al. 1997; Maltay, 2000; Wong & Merrilees, 2005). In contrast, SMEs share similar strengths such as flexibility and quick response/decision making

(Deshmukh, 2001; Julien, 1993; Nooteboom, 1994; Khalique et al. 2011). Hence SMEs within the same sector may experience similar opportunities (Zhang 2004), according to the strengths of SMEs; and similar threats (Birley and Norburn, 1985) according to the weaknesses. This research identifies the two main opportunities for wholesale SMEs in the UK as innovation (Nooteboom 1994; Simon 2002; O'Regan, et al. 2006; Gray, 2006) and globalisation (Jardine, 2008; Vasconcellos, et al. 2011; Peel and Bridge, 1998). The two main threats are training (Demougin and Siow, 1996) and development (Laird, 1984, pp. 11-13) capabilities.

To improve performance in SMEs, the concept of performance management is seen as the enterprise's motivator for monitoring and improving performance (Biazzo and Bernardi, 2003; Garengo, et al. 2005). This concept is typically applied at three different organisational levels (strategic, operational and individual) (Brudan, 2010; Forslund, 2012). At the strategic level, performance management involves the formulation and execution of the enterprise strategy (De Waal, 2007 p. 19; Chau, 2008). The operational performance management involves real time analysis and reporting about performance indicators (White, 2004; Wayne, 2005; Schiff 2011). And at the individual level, performance management involves evaluating 1) the employee commitment and performance in achieving the enterprise strategy, and 2) the employee appraisals and rewards policy (Zink et al. 1997; Schiff, 2007; Graham, 2004).

In the wholesale industry, three different types of wholesalers are differentiated in terms of strategy formulation; for example, manufacturer agents' strategies may focus on increasing the number of customers without considering the number of suppliers, while number of suppliers is an important concern for merchant wholesalers. Moreover, merchandise brokers also have different considerations in their strategy formulation from other types of wholesalers as they are only intermediaries that don't own or hold any inventory (Kotler et al. 1995; Lusch & Vargo, 1998). Therefore, the requirements of performance management at the strategic level may differ in each type of wholesalers, where different strategies are required for each type. But, the requirements of the operational performance management (OPM) seem to be similar across all types of wholesalers, where the roles of wholesale operations are defined in the distribution industry; OPM involves report making and analysis to monitor and measure the performance indicators in the enterprise. The requirements for the individual performance management may also differ across different types of wholesalers according to the enterprise and its individual characteristics.

In this instance, the concept of business intelligence focuses on creating business knowledge by collecting, storing and analysing information to enhance decision making (Fiora, 1998; Marren, 2004; Hill and Scott, 2004; Karim, 2011). In view of this, Chapter Four points to the concept of business intelligence as an appropriate solution that supports the operational performance management in SMEs (Ranjan & Bhatnagar, 2011; Zelbst, et al. 2010; Jin, 2006; St-Pierre & Delisle, 2006). Therefore, adopting BI tools is important for supporting the operational performance of wholesale SMEs in the UK.

This research aims to develop a model that describes the adoption of BI tools within wholesale SMEs. After reviewing the evolution of business intelligence in chapter four, BI tools were identified as data warehouses (DWH), OLAP applications, and data mining tools (Herschel and Jones, 2005; Eick, 2000; Jing 2006). Basically, the defined BI tools are purely information gathering, storage, and processing technologies; therefore, the adoption of business intelligence tools could be described as adopting business information systems (BIS). The adoption of IT/IS has been an interesting topic for research across different fields (Chibelushi & Costello, 2009; Ranjan, 2008), which has encouraged the development of various models and frameworks that describe the processes of IT/IS adoption and define the factors that influence the IT/IS adoption processes (e.g. Delone & Mclean, 1992; Ammenwerth et al. 2006; Nguyen 2009; Levy et al. 2011; Macredi & Mijinyawa, 2011). The proposed model in this research describes the utilisation of the features of BI tools to support the activities of the performance management cycle at the operational level. The models and frameworks that support the IT/IS adoption processes are discussed in Chapter Four to define the CSFs that influence the success of IT adoption processes.

1.2 Research Problem Definition

During the last two decades, information technologies have shaped a new ecosystem of competition between businesses; this is because these technologies have created new opportunities for small or new players to enter the market and compete, and has forced some existing market leaders to redefine their roles in the market (Mulhern, 1994; Storey, 1997; Caputo et al. 2002; Simon, 2002; Gray, 2006; Oke et al. 2007; Chen Y. &Yuan Y.,

2007). Therefore, using business information systems (BIS) to make sense out of the flowing data within and across the business processes has become an important aspect that influences the performance of a business.

The measurable factors of performance in business are endless, therefore, rather than the number of factors to measure, it is more important to measure the right factors. Therefore, the efforts of this research were carried out to define the important factors that may influence the development and adoption of a business intelligence model in wholesale SMEs to measure and improve performance. The selection of these factors may depend on different disciplines that relate to the focus of the proposed model.

The focus of the proposed model is to report and analyze data about performance; this is mainly involved with performance management at the operational level. In this sense, narrowing the range of factors for the proposed model could be through selecting the factors of the operational performance. In addition, selecting the factors of the operational performance will support developing a generic set of factors for the wholesale sector to monitor and measure the operational performance. This is because wholesalers share similar operational environment and requirements; this is due to the fact that the roles of wholesalers are defined in the distribution channels by other entities of the channel (producers and retailers). Therefore, because the proposed model concerns the factors that influence the operational performance, the model may be generalized for the majority of wholesale SMEs.

In this sense, BI tools are seen as useful solutions that construct information from huge data sets through complicated analysis to enhance decision making (Ranjan, 2008). This research investigates the adoption of business intelligence tools to enhance decision making that maintains/improves the operational performance of wholesale SMEs in the UK. The definition of this research comes from the common point of view that the choices, alignment, and uses of BI tools have significant uses to support the operational performance (Ranjan & Bhatnagar, 2011; Zelbst et al. 2010; Jin, 2006; St-Pierre & Delisle, 2006), including the operational performance of wholesale SMEs (Das & Tyagi, 1994). In this sense, this study clarifies the roles and alignment of BI tools within the activities of the performance management cycle within wholesale SMEs in the UK. In other words, it is likely for SMEs, within a specific sector or with similar business operations, to have similar requirements for

performance management only at the operational level. And according to the purpose of operational performance management, BI tools are employed to enhance decision making that supports operational performance in terms of report making and analysis. In view of this, the first research aim (RA1) could be defined as:

RA1: Encourage the use of BI tools within wholesale SMEs in the UK to improve operational performance.

To achieve RA1, the research explains the importance of adopting BI tools within wholesale SMEs to measure and monitor the CSFs that influence their operational performance. This is where utilising the defined BI tools ensures an effective use of information to enhance decision-making at the operational level of performance management (Talvinen, 1995; Otero-Neira et al. 2009; Vanpoucke, 2009). Therefore, SMEs are required to develop the appropriate IT strategies and capabilities that improve their use of information to maintain/improve operational performance (Franks J. 1998; Hoganson, 2001; Bhatt, 2000; Knol & Stroeken, 2001; Nguyen, 2009; Lim, 2009). But the majority of SMEs have limited financial and human resources, which causes uncertainties when choosing and implementing information technologies (Oke, 2007; Hankinson et al. 1997; Parker et al. 2003). As a result, most SMEs suffer from limited R&D capabilities which affect their uses of information in decision making (Simon, 2002; Owens, 2007). In this matter, the second research aim (RA2) intends to explain how to aid the adoption of BI tools within wholesale SMEs. RA2 could be defined as:

RA2: Remove the barriers that hinder the adoption of BI tools within wholesale SMEs in the UK.

Therefore, the mission of this research has been developed to enhance the operational performance of wholesale SMEs in the UK through the alignment of BI tools within the activities of the performance management cycle. To do so, the purposes of the performance management cycle within wholesale SMEs are defined through the identification of the CSFs that influence the operational performance, the IT adoption and the success of wholesale SMEs in the UK. In turn, defining the purposes of performance management assists the

identification of the activities of the performance management cycle in order to identify the roles of BI tools in enhancing the operational performance. Accordingly, the research aims to propose a model that aligns the roles of BI tools in the performance management cycle to support the operational performance in wholesale SMEs. As a result, the third research aim (RA3) is defined as the results of achieving the RA1 and RA2; this could be described as:

> *RA3: Establish the basis for a new policy that aids the adoption of BI tools within wholesale SMEs in the UK to enhance decision making that influences operational performance.*

To accomplish these aims, this research follows a multi-purpose design which aims to identify the CSFs that influence the performance of wholesale SMEs in UK, and to generate guideline information that describes the ways of utilising these factors using the features of BI tools to improve operational performance. The following subsections, based on the defined research, aim to formulate the research questions and identify the research objectives.

1.2.1 Research Questions

Generally, in order to support the activities of the performance management cycle, this research proposes a model which promotes the adoption of BI tools to measure and monitor a set of CSFs that influence the operational performance within wholesale SMEs in the UK. In addition to the CSFs that influence the operational performance, it is also important to consider the CSFs that influence the process of adopting information technologies. This is because BI tools are information technologies that enhance decision making in business. Accordingly, a research question arises to explore the CSFs that influence the development and adoption of the proposed model.

On the other hand, in order to identify the roles of BI tools in the proposed model, it is important to identify the features of a set of BI tools that fits within the performance management activities at the operational level. Therefore, it is important to identify the BI

tools that fit in the performance management activities. In addition, it is also important to explore the performance management activities that are associated with the use of the defined set of BI tools. Accordingly, a research question arises to explore the BI tools and the performance management activities that function in the proposed model.

As a result, these research questions are summarised as: What are 1) the CSFs influence the proposed model, and 2) the BI tools that function in the proposed model. These questions are grouped in the first research question (RQ1):

> *RQ1. What are the CSFs that influence effective use of the appropriate business intelligence tools to enhance decision making that supports performance management activities within wholesale SMEs in the UK?*

Chapter two scrutinizes the wholesale SME sector in the UK and identifies managerial weaknesses that result in training and development threats. In contrast, organisational strengths were also identified for this sector, such as flexibility and quick response, which result in innovation and globalisation opportunities. Therefore, the proposed model also aims to link performance management activities and use of BI tools with the capabilities and strengths of the targeted sector. Accordingly, a research question arises to describe the alignment of the performance management activities and BI tools with regards to the capabilities and strengths of wholesale SMEs in the UK.

Moreover, the proposed model also aims to link the features of the defined BI tools with supporting the fulfilment of the needs and opportunities within wholesale SMEs in the UK. This could be achieved by linking the defined activities of performance management with the features of the defined BI tools. Accordingly, a research question arises to describe the roles of BI tools in supporting performance management activities within wholesale SMEs.

As a result, these research questions are summarised as: 1) how can the defined performance management activities support the fulfilment of needs and opportunities within wholesale SMEs in the UK, and 2) how can the defined BI tools take effective roles in

supporting the defined performance management activities. These questions are grouped in the second research question (RQ2):

> *RQ2: How can the adoption of BI tools best enhance decision making that supports performance management activities to improve/maintain the operational performance of wholesale SMEs in the UK?*

1.2.2 Research Objectives

To address the defined research questions, this study investigates the characteristics of the targeted sector, the concept of performance management, the models of adopting technology, and the development and features of BI tools. It was found that the nature of SMEs gives them unique characteristics that generate similar needs and opportunities. In addition, the wholesale industry is highlighted in Chapter Two as an important sector that contributes to the output of the national economy in the UK. This is where reviewing the performance of the UK economy points to the wholesale industry as a flourishing industry. But because SMEs lag behind large enterprises in the adoption and utilisation of BI tools, the research defines its principle aim in RA3, which is establishing the basis for a new policy that supports performance management activities within wholesale SMEs through the adoption of BI tools.

Therefore, the research proposes a model that clarifies the accomplishment of RA3 through the alignment of the features of BI tools with performance management activities in a performance management cycle that supports wholesale SMEs in the UK. The development of this model is clarified in Figure 1.1, in order to generate the research objectives that support the achievement of the model development process.

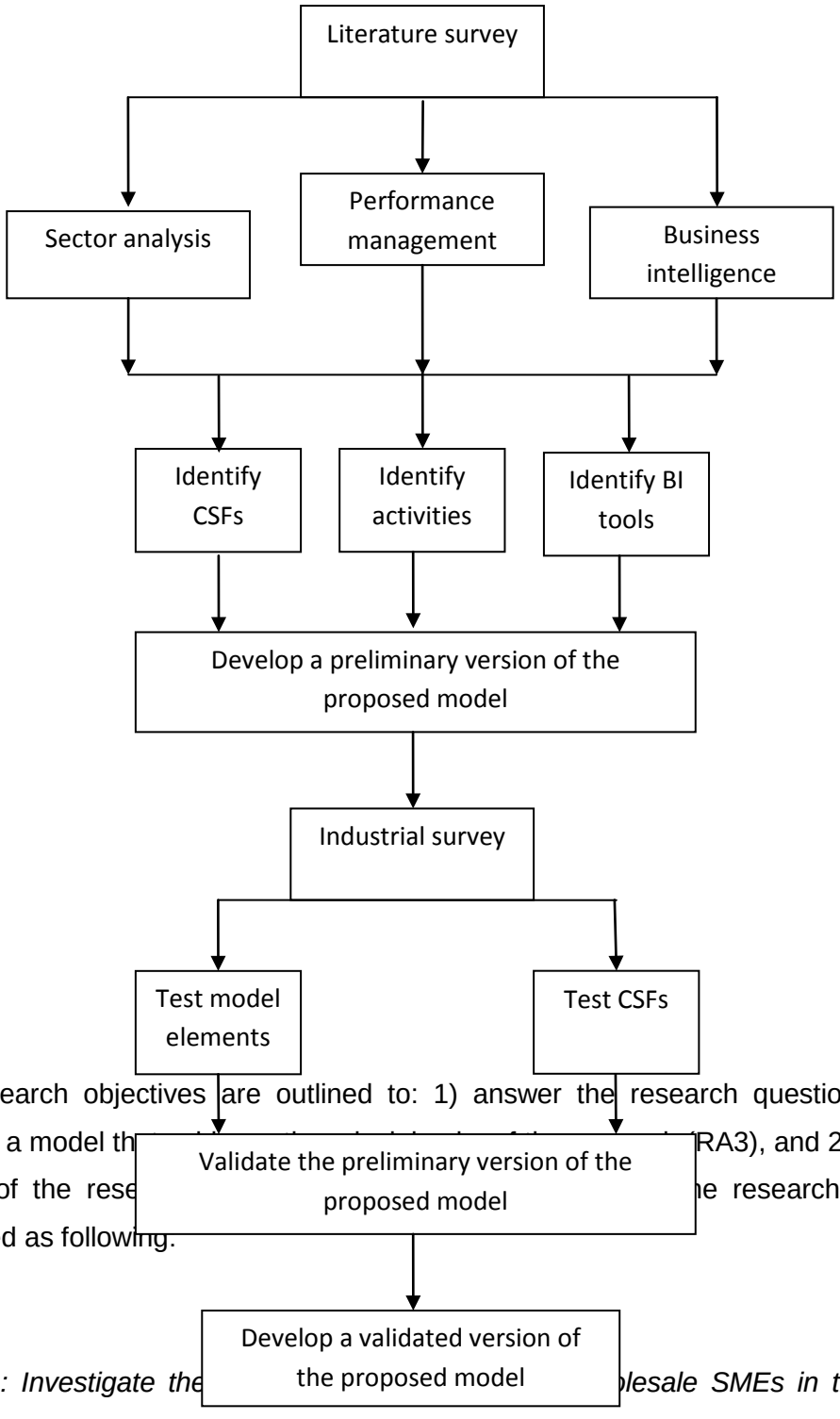


Figure 1.1: The process of model development.

The research objectives are outlined to: 1) answer the research questions, in order to propose a model th RA3), and 2) to validate the results of the rese e research objectives are illustrated as following:

RO1: Investigate the olesale SMEs in the UK and the nagement process.

RO2: Identify the CSFs that influence the performance of wholesale SMEs in the UK from three main perspectives (sector success, operational performance, and IT/IS adoption).

RO3: Develop a model that aligns the features of the defined BI tools in a performance management cycle that enhances the measurement and monitoring of the defined CSFs, to enhance decision making that improves the operational performance in wholesale SMEs.

RO4: Implement a questionnaire survey on wholesale SMEs in the UK to validate the preliminary version of the model through measuring the statistical influence of the defined CSFs and evaluating the model's elements.

1.3 Research design

The research design is the blueprint that guides the research towards achieving the research objectives, where it determines the research type, approach, and methods (Aaker et al. 2007 p. 77). In order to achieve the research objectives, the design of this research uses an exploratory study by implementing a literature survey and quantitative questionnaires. In the previous section, defining the research problem has led to the three research aims (RA1, RA2 and RA3). In line with these aims, two research questions (RQ1 and RQ2) were formulated. The design of this research follows an exploratory research to investigate the research problem and answer the research questions.

Reviewing the literature shows that several researchers have used exploratory studies to investigate the research problem. For instance, Christy and Wood (1999) used exploratory research to study the possibilities in the research population. Similarly, exploratory research was used by Ralston et al. (2001) to study the existence and the significance of the research problem.

In the case of this research, the exploratory research is used to develop a model that provides an answer to RQ1, and generate guideline information that establishes the basis for answering RQ2. Based on this, the exploratory study is used in this research to explore the

CSFs that influence the adoption and implementation of the proposed model within wholesale SMEs in the UK. The exploratory study also aims to explore the feature and roles of the appropriate BI tools that function in the proposed model. In this sense, the exploratory study in this research supports the achievement of the research objectives (RO1, RO2, RO3 and RO4). The data collection in the exploratory study is based on a combination of two research methods: a literature survey and an industrial survey. This is where the secondary data collection is performed through the literature survey to develop a preliminary version of the proposed model, which provides the material that will be used to direct the primary data collection process in a questionnaire survey. The findings of the exploratory research are then used to validate the proposed model.

Accordingly, quantitative questionnaires were chosen as the method of collection of the primary data in the exploratory study. The exploratory study in this research is explained with its corresponding data collection methods in Chapter Six. However, after defining the research design, it is essential to link the use of the suggested research methods with the achievement of the research aims, questions and objectives. Figure 1.2 briefly describes the design of the research by linking the defined data collection methods with the research aims, questions, and objectives.

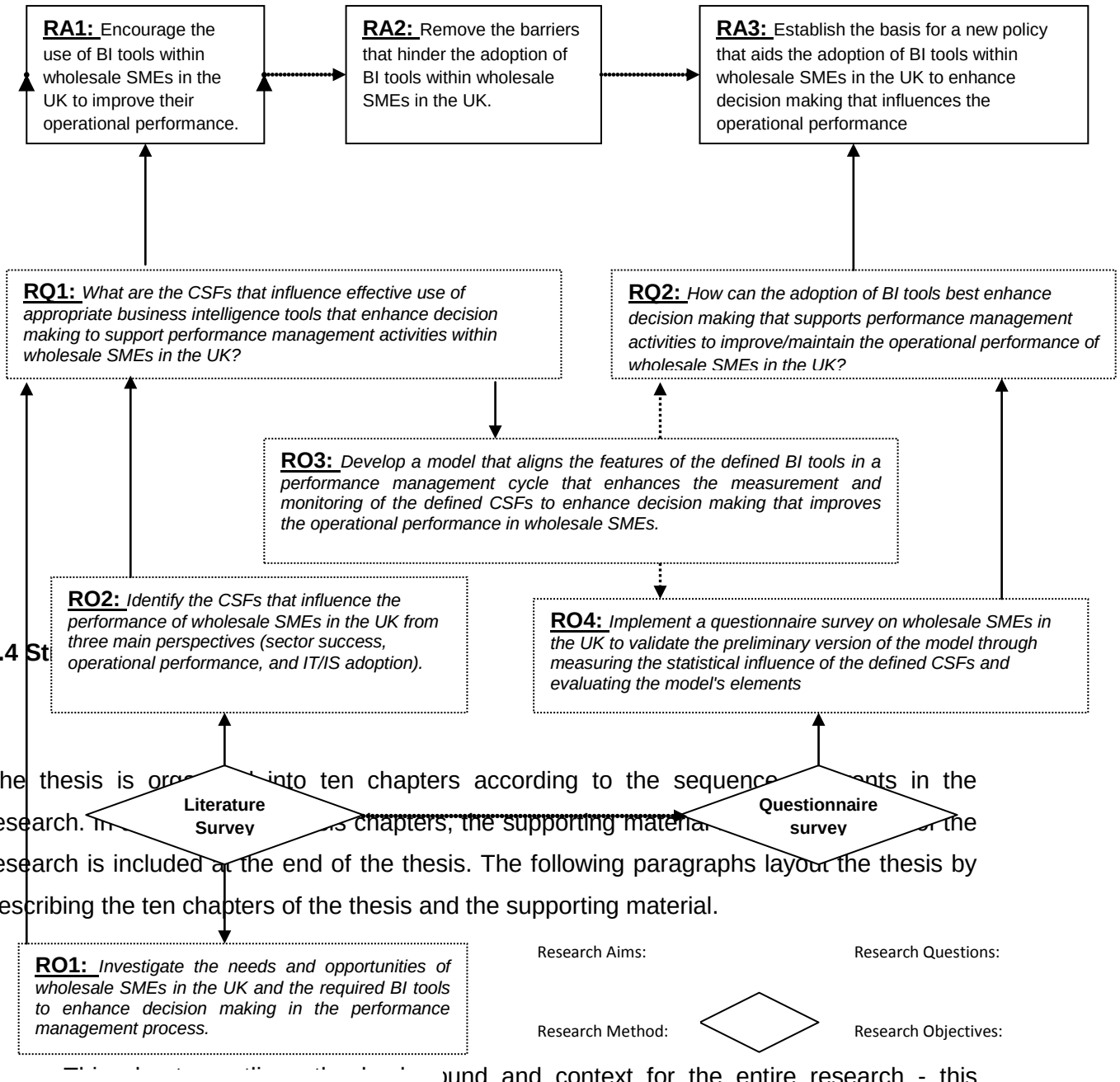


Figure 1.2, Research framework.

1.4 St

The thesis is orga[illegible] into ten chapters according to the sequence [illegible]nts in the research. In [illegible]s chapters, the supporting materia[illegible] the research is included at the end of the thesis. The following paragraphs layout the thesis by describing the ten chapters of the thesis and the supporting material.

[illegible]ound and context for the entire research - this includes the reasons and interests behind choosing the topic of the research, and the choice of wholesale SMEs in the UK as the targeted sector of research. This chapter also describes the scope of the research, its definition, aims, questions, objectives, design and methods; and the structure of the thesis.

- **Chapter Two: An overview on the SMEs operating within the wholesale industry in the UK**

This chapters aims to understand the characteristics of the targeted sector (wholesale SMEs in the UK), and identify the CSFs that influence the performance of the targeted sector. To do so, after reviewing the region and industry of the targeted sector, the targeted sector was analysed using SWOT analysis. And after that, the CSFs that influence the targeted sector were derived from the factors that influence the industry, and the SWOT analysis.

- **Chapter Three: The context of performance management**

  This chapter aims to review the context of performance management in order to define the term "performance management," identify the purposes of performance management, and describe the performance management cycle and its phases and activities. This chapter found that the purposes of this research are to support the purpose of performance management at the operational level. Therefore, this chapter identifies the relevant CSFs that influence the performance management process in the topic of this research as the factors that influence the operational performance.

- **Chapter Four: The concept of Business Intelligence and its corresponding tools and features**

  This chapter discusses the importance, evolution, and development of the term BI in academia and in business. BI is mainly involved with the adoption of information technologies. Therefore, this chapter investigates the adoption of business intelligence through reviewing some of the available models of technology adoption. After that, the tools that support the functions of BI were investigated in order to identify the features that support the roles of performance management in business. And finally, the relevant CSFs that influence the adoption of BI tools were identified in the summary of the chapter as the CSFs that influence the reviewed models of technology adoption.

- **Chapter Five: Summary and analysis of the literature survey**

  The main aim of this chapter is to develop a preliminary version of the proposed model, in order to provide the appropriate material to support the collection of the primary data in Chapter Six. This is accomplished in Chapter Five by summarising

the contents of the literature survey (Chapters Two, Three, and Four). This is where the findings of the literature survey were linked together and used to develop a preliminary version of the proposed model, and to summarise influencing CSFs.

- **Chapter Six: The research methodology**

  This chapter describes the design of the research in detail and identifies methods of collecting the primary data, sampling techniques, and access to samples.

- **Chapter Seven: The industrial survey analysis**

  This chapter aims to analyse the collected data through the exploratory study that uses self-administered quantitative questionnaires. Different statistical techniques were used to analyse the results of the questionnaires. The chapter begins with a simple data analysis course used to describe the research sample and identify the common needs and opportunities of the participating SMEs. After that, statistical techniques are used to evaluate the statistical influence of the defined CSFs and model elements in the targeted sector. For instance, the Spearman's rank correlation coefficient was used to measure the statistical influence of defined CSFs on the performance of the targeted sector. The proposed model is validated by developing multiple linear regression models that describes the correlation between the model's elements and the defined CSFs. Based on this discussion, Chapter Eight discusses the process and the findings of this research.

- **Chapter Eight: Discussion**

  The aim of this chapter is to use the findings of the industrial survey to explain the process of achieving aims and objectives, and find the contributions of the research. The chapter discusses the contribution of the elements of the proposed model to the research participants, and to the fulfilment of needs and opportunities in the targeted sector.

- **Chapter Nine: Conclusions and further research avenues**

This chapter highlights conclusions and verify them through an interview with a manger of a wholesale SME to evaluate the applicability of the proposed model in real life practices. In addition, the chapter also base on the interview to identify recommendations for further future research.

- **Supporting material**

  The end of the thesis includes the supporting materials: the references and appendices. The references contain the all the cited publications throughout the research, and the appendices include the questionnaire questions, and data analysis supporting tables.

1.5 Summary

This chapter introduces the required background to the research topic by justifying the choice of the research topic; and describing the scope, definition and design of the research. As a result, the research's aims, questions, objectives, and data collection methods are also described in this chapter. In the first section, the scope of the research has been quoted from several researches to reflect the required background to define the research topic.

Based on this background, the research was defined in the second section through the investigation of the research problem, aims, questions, and objectives. This investigation has identified two main research aims that have influenced the formulation of the principle aim of the research in a third research aim. Accordingly, two research questions were identified to clarify the required objectives that achieve the research aims. Four research objectives were identified to answer the research questions through the exploratory study. As a result, the design of this research in achieving the research objectives was described through the third section in this chapter.

The design of this research begins with a literature survey that identifies performance management activities, BI tools, and the CSFs that influence the success of adopting the

defined tools in supporting the defined activities within the targeted sector. This is where the findings of the literature survey are used to develop a preliminary version of a model that aligns the role and features of the appropriate BI tools in performance management activities at the operational level. After that, the preliminary version of the proposed model is validated in the targeted sector through an industrial survey by means of quantitative questionnaires.

Chapter Two: Wholesale SMEs in the UK

2.0 Wholesale SMEs in the UK

As motioned in chapter One, this research aims to develop a model that supports the use of BI tools within wholesale SMEs in the UK. Therefore, in order to describe how wholesale SMEs operate as a whole sector in the UK, this chapter reviews the current conditions and the future opportunities for wholesale SMEs. This review argues that the choice of this sector

is the most appropriate in this research because 1) the majority of wholesale SMEs have similar requirements for using business intelligence (BI) tools, and 2) supporting the performance of wholesale SMEs may have important effects on the performance of the national economy. This chapter also aims to identify the critical success factors (CSF) that influence the performance of wholesale SMEs. These CSFs are derived from the operational environment of wholesale companies and the shared characteristics of SMEs.

In this sense, shared characteristics of SMEs are identified to specify areas of investment in the SME sector. This is where weaknesses and needs of SMEs are identified to clarify the circumstances where the adoption of BI tools best enhances the performance of SMEs. The strengths and opportunities are identified to clarify how utilising the strengths of the SME sector may achieve competitive advantages that also support their performance. This, in turn, aims to generate sector-specific CSFs that form the basis for long-term improvements through management, policy and technology implementations within the UK's SMEs. This chapter also reviews the wholesale industry to identify the industry's CSFs that influence the performance of wholesale SMEs, and to explain how wholesale companies could be identified and chosen to participate in this research.

The first section of this chapter provides a background for the region in which the participating SMEs are operating. After identifying the region, the characteristics of wholesale companies are discussed in order to establish the relevant background for the industry of this research. The SME sector is then analysed using SWOT analysis. And finally, the analysis throughout the chapter sections is used to define sector specific critical success factors (CSFs) that will be used to constrain the data collection and model development in this research.

2.1 Region background

During the last four decades, the UK has been affected by three deep recessions (Years: 1979-1982, 1990-1992 and 2008-2010); this caused major downward shocks to both output

and employment during the recession periods (Martin 2012). After the second recession period, there was a large shift from manufacturing to other industries (mainly the service industry). As a result, most of the manufacturing output loss was lost forever (Chamberlin, 2010). Jeremy Browne, a Minister of State at the Foreign and Commonwealth Office, fears the UK is in danger of losing its status as a leading nation, as heavily populated and rapidly developing countries in Asia and Latin America forge ahead (Oakeshott, 2011). This is where, since the last two recession periods in the UK, the UK's share of the world's GDP has continued to drop. The UK's share of the world's GDP has continued to drop from 3.71 in 1990 to 3.18 in 2010 with only a slight increase in the year 2000, and the reason for this could be that emerging markets (e.g. China and India) have benefited from the loss in the UK's manufacturing output to increase their shares in the world's GDP (Jorgenson and Vu, 2011).

Nevertheless, Garner (2006) states, "There is a firm belief that the UK economy will be able to remain successful only if UK businesses innovate and if economic activity moves up the value chain." In this sense, Wilson (2009) reports, until 2008 the UK economy has continued to be one of the largest five economies in the world, after America, Japan, Germany and China. The economy of France then became the fifth largest economy, leaving the sixth place for the UK economy. Later, Brazil overtook the UK economy to make the UK the world's seventh largest economy (Doughty, 2011) leading to the latest order of the world's ten largest economies as: America, China, Japan, Germany, France, Brazil, UK, Italy, Russia, and India (Exploredia, 2012). Still, some experts expect a more prosperous future for the UK economy as Duncan (2011) argues that the UK economy will overtake the economies of Germany and France to be the biggest in Europe by the year 2050.

However, Gabriela Giudice, from the Directorate General for Economic and Financial Affairs, states: "The flexibility of the UK economy and its incipient shifting towards a more exports-based growth make it more likely that other sectors will step up to play their part and hence the recovery should be sustained" (The Financial Times, 2011). This is where the output of the UK's private sector was recovering from the loss in the manufacturing output via the growth of other industries, mostly the service industry and the wholesale and retail distribution industry respectively (Yip and Rugman, 2006). Therefore, the growth of the global market share of the service and the wholesale industries has played a crucial role in safeguarding the wellbeing of the UK's national economy when there was a loss in the output of other industries. For instance, since the year 2000 the service industry has grown

by more than double to reach the peak of £171 billion in exports in 2008, and then down to £159 billion after the last recession period in 2009. Over the same period, even with the loss in manufacturing output which lowers the production of goods, the exports of goods have increased by 30 per cent (Brook and Taylor, 2010). This indicates that the wholesale and distribution industry has played a crucial role in supporting the UK's share of the world's GDP, which influences the performance of the national economy in the UK.

The wholesale and distribution industry in the UK has always been an important intermediary for producers to market their products. This is why UK manufacturers were distributing about 60 per cent of their output through wholesalers and dealers (Moffat, 1992). Furthermore, it is believed that creating a free market of wholesalers and retailers may enhance the competitiveness of the market (Garattini and Tediosi, 2000). This is where intermediaries or wholesalers possess a pricing power in the market which may impose the retail prices (Coe and Hess, 2005). From another point of view, reducing the number of wholesalers may help producers to reduce their internal costs because dealing with fewer wholesalers creates more manageable business relationships (Kermani, 2010).

Nonetheless, Mustaffa and Potter (2009) claim: Wholesalers are considered as the most dominant intermediary to distribute goods; in the UK, wholesalers distribute 80 per cent of the total volume of goods. Although the manufacturing output in the UK has decreased to a large extent over the last two decades, the increase in UK exports of goods indicates that the wholesale and retail distribution industry has survived and continued to grow in international markets (Brook and Taylor, 2010). As a result, the wholesale industry could be seen as an important economic entity that may influence the growth of the national economy in the UK. For this reason, this research suggests supporting the performance of wholesalers supports the performance of the national economy.

On the other hand, small to medium enterprises (SME) in the UK account for 99.9% of all enterprises, 58.8% of private sector employment and 51.5% of private sector turnover. According to the Department for Business, Innovation and Skills (BIS 2011), 99.2% of the UK enterprises are considered as Small (0→49 employees), 0.7% are medium enterprises (50→249 employees), and only 0.1% are large enterprises (250 or more employees). Therefore, SMEs are considered to be a key driver for the growth of the UK's national

economy with a £1489 billion turnover (49% of the total private sector turnover), and they provide the majority of jobs in the private sector by employing 13.8 million people (59% of total private sector employment).

Based on the above-mentioned information, the UK's SME sector is a key driver for the majority of national resources, either human resources throughemploying 59% of the UK's private sector work force, or financial resources by generating 51.5% of the UK's private sector's total income. Ghobadian, A. and Gallear, D. (1997) state, "There is a broad agreement that SMEs fulfil a critical role in modern economies, and therefore their ability to survive, remain competitive and produce high quality outputs is of utmost importance at both micro and macro levels." As a result, improving the performance of SMEs is vital for the wellbeing of other entities in the economy, where SMEs are linked with the other entities of the economy by complex sets of inter-relationships (Wolff & Pett, 2006). This indicates that a big majority of enterprises in the wholesale and retail and distribution industry are considered to be small to medium enterprises (SMEs). Most SMEs are affected by similar weaknesses and opportunities (Zhang, 2004). For instance, the majority of SMEs share similar issues and limitations that keep them away from adopting advanced data collection and analysis tools (Wong & Merrilees, 2005, Hankinson et al. 1997: Maltay, 2000).

Based on the analysis above, this research targets the SMEs in the wholesale industry in the UK. The following subsections discuss the wholesale industry and SME sector separately in order to identify the characteristics of wholesale companies and the shared weaknesses and strengths between SMEs. This in turn will aim to determine the critical success factors of wholesale SMEs in the UK.

2.2 Wholesale and retail distribution industry

Wholesaling could be described as the process of buying and selling bulk quantities of inventories to and from other businesses in lower prices than retail prices. Wholesalers form important links in the distribution channel (Rosenbloom & Warshaw, 1989. Bucklin, 1993); they are thus also called industrial distributors. This is where the main responsibility of wholesalers is the movement of inventories from the seller/producer to the buyer/retailer. In

addition, wholesalers provide several business services that fulfil the needs of different entities in the distribution channels. These services may include marketing, supplying credit, customers' assistance, operating warehouses, stocking inventories and delivery of goods. Therefore, Das & Tyagi (1994) describe the wholesaling industry as a service system that works under some boundaries and interacts with the entities of the product/service distribution channels.

The standard industrial classification (SIC) scheme could be used to identify the wholesale sector in the UK region, where SIC is a method of classifying businesses by their type of economic activity, (Hughes and Brook, 2009). In addition, Ang (1995) points to SIC as a valid approach for researchers to apply sector classification. The SIC scheme classifies companies according to their business activities into sections ordered in an alphabetical order (see table 2.1), each section contains one or more divisions and each division contains one or more groups of industry associates. The UK's SIC has been revised six times between its introduction in 1948 and 2007 (Hughes and Brook, 2009).

This research applies the SIC approach to identify the sector of which the participating SMEs are operating based on the latest (2007) SIC scheme. The UK's 2007 SIC scheme contains 22 sections, ranging from A to U. The sections include 88 divisions, and there are 272 groups included within the divisions (ONS 2009). The wholesale sector is categorised in section G (see table 2.2) which includes three divisions representing motor vehicles (trade and repair), wholesale, and retail industries (divisions 45, 46 and 47). The wholesale industry has the highest market share in section G, which includes all entities of the distribution industry. Division 46 contains all groups of wholesalers except for motor vehicle wholesalers as shown in table 2.2.

Industrial Section SIC 2007					
A	Agriculture, forestry and fishing	H	Transport and storage	O	Public administration and defence; compulsory social security
B	Mining and quarrying	I	Accommodation and food service activities	P	Education

C	Manufacturing	J	Information and communication	Q	Human health and social work activities
D	Electricity, gas, steam and air conditioning supply	K	Financial and insurance activities	R	Arts, entertainment and recreation
E	Water supply, sewerage, waste management and remediation activities	L	Real estate activities	S	Other service activities
F	Construction	M	Professional, scientific and technical activities	T	Activities of households as employers; undifferentiated goods and services producing activities of households for own use
G	Wholesale and retail trade; repair of motor vehicles and motor cycles	N	Administrative and support service activities	U	Activities of extraterritorial organisations and bodies

Table 2.1: sections of the SIC scheme 2007. Source: ONS (2009)

Division	**Division Description**	**Market share in Section G**			**Division's associates**
		2008	**2009**	**2010**	
Division 45	Wholesale and retail trade and repair of motor vehicles and motorcycles	**11.10 %**	**11.02 %**	**10.82 %**	***45.1 Sale of motor vehicles, 45.2 Maintenance and repair of motor vehicles, 45.3 Sale of motor vehicle parts and accessories, 45.4 Sale, maintenance and repair of motorcycles and related parts and accessories.***

Division 46	Wholesale trade, except of motor vehicles and motorcycles.	**63.43 %**	**60.98 %**	**62.05 %**	***46.1 Wholesale on a fee or contract basis, 46.2 Wholesale of agricultural raw materials and live animals, 46.3 Wholesale of food, beverages and tobacco, 46.4 Wholesale of household goods, 46.5 Wholesale of information and communication equipment, 46.6 Wholesale of other machinery, equipment and supplies, 46.7 Other specialised wholesale, and 46.9 Non-specialised wholesale trade.***
Division 47	Retail trade, except of motor vehicles and motorcycles.	**25.47 %**	**27.91 %**	**27.13 %**	***47.1 Retail sale in non-specialised stores, 47.2 Retail sale of food, beverages and tobacco in specialised stores, 47.3 Retail sale of automotive fuel in specialised stores, 47.4 Retail sale of information and communication equipment in specialised stores, 47.5 Retail sale of other household equipment in specialised stores, 47.6 Retail sale of cultural and recreation goods in specialised stores, 47.7 Retail sale of other goods in specialised stores, 47.8 Retail sale via stalls and markets, and 47.9 Retail trade not in stores, stalls or markets.***

Table 2.2: Section G in SIC scheme 2007. Source: ONS (2012).

Nonetheless, wholesalers have three main types, which are merchant wholesalers, manufacturers' sales branches and merchandise agents; each type of wholesalers is explained in the following bullets (Kotler et al. 1995; Lusch & Vargo, 1998).

- Merchant-wholesalers: independent businesses that buy large quantities of inventories from producers; store and distribute inventories.
- Manufacturers' sales branches: businesses established by manufacturers to directly sell their products to retailers.
- Merchandise brokers or agents, acting as middlemen between sellers/producers and buyers/retailers. They don't own the inventories nor take physical possession of them. They may represent the buyer or the seller and in most cases they get their commission from the party that they represent; they are classified into three different types, which are manufacturers' agents, selling agents or purchasing agents (Kotler et al. 1995).

This study targets SMEs who are considered as Merchant-wholesalers in the UK, also known as distributors or supply houses. Merchant wholesalers are independent businesses who purchase inventories and then distribute them to retailers. Merchant-wholesalers are categorised into two categories: full-service wholesalers and limited-service wholesalers (Kotler et al. 1995). Full service wholesalers tend to move large volumes of inventories to larger customers. These wholesalers are categorised as full-service because of the big range of services they provide for their customers. The services provided by full-service merchant-wholesalers are described by Kotler et al. (1995) as: "stocking inventories, operating warehouses, supplying credit, employing sales people to assist customers and delivering goods to customers." Moreover, the full-service wholesalers could be further classified into general-line (wide variety of inventories) or Specialty (narrow line of inventories) according to their business domain. On the other hand, limited-service wholesalers aim to reduce their operational costs by reducing the costs of providing services, as they offer fewer services for their customers. For instance, some cash and carry wholesalers sell on cash only basis and they don't deliver goods for their customers. Therefore, they are considered as limited-service wholesalers. Table 2.3 shows the different characteristics of full-service wholesalers and limited service wholesalers.

Full-service wholesalers	**Limited-service wholesalers**
Larger sales volume.	Smaller sales volume.
Provide a wide range of services for their customers.	Provide fewer services for their customers.
Sell to bigger retailers on supplying credit basis.	Sell to smaller retailers on cash-only basis.

Table 2.3: Types of wholesalers. Source: Kotler et al. (1995)

Furthermore, wholesalers are classified by Houthoofd et al. (2010) into two categories in terms of their business domain and according to three dimensions (buyer groups, product types, geographical reach) Table 2.4 differentiates between wholesalers according to their business domains.

Local wholesaler	**Regional or international wholesaler**
A larger part of their products is from a limited number of suppliers.	They get their products from a large number of suppliers.
They specialise in brands/products (good product knowledge).	They are less specialized and have different types of inventories.
Maintain a higher degree of service to their clients/customers.	Their sales mainly depend on price competition.
Lower inventories and thus lower costs.	Moving large volumes of inventories, thus higher costs.
Obtain discount prices more support from their suppliers.	Larger number of back office operations to get best prices from different suppliers.

Table 2.4: business domains of wholesalers. Source: Das & Tyagi (1994).

2.3 Small to medium enterprises (SMEs)

All over the world SMEs form the bulk of enterprises in the national economies (Storey 1997). Similarly, it has been argued by Wolff & Pett (2006) that the drivers of most national economies are SMEs and entrepreneurial firms. In the UK, SMEs play crucial roles in maintaining the national economy for many reasons, such as: SMEs are more responsive and flexible than larger firms, SMEs complement the activities of larger firms (Boocock et al. 1994), and some SMEs are the source of innovation and dynamism in the economy (Mulhern, 1994).

Reviewing the available definitions of SMEs indicates that definitions of SMEs vary in different countries around the world and across different industries. But all the available definitions differentiate SMEs from large enterprises according to defined limits (e.g. turnover, balance sheet, staff headcount, sales, assets, net profits) that are usually outlined by governmental organisations. These limits may vary in different countries or industries; hence, there is no official and universal definition for SMEs (Mukhtar, 1998). In view of that, the available definitions for SMEs are meant to describe enterprises within a specific domain. For instance, an early definition of SMEs by Roach (1989) defines UK SMEs as "those with an annual turnover of less than £1 million but who were big enough to need VAT registration." In addition to this definition, Roach (1989) identifies the industries in which the SME sector operates within the UK according to a report by the central statistical office (CSO) in 1982; these industries are presented in table 2.5. This indicates that the definition of SMEs has been in use for over three decades in the UK.

Sector	Number	%
Manufacturing	145,000	9
Building and construction	197,000	11
Road transport and transport services	57,000	3
Wholesaling and dealing	98,000	5
Retailing	346,000	20
Financial, property, and professional services	92,000	5
Catering, hotels, public houses	289,000	17
Motor trades	69,000	3
Other services	468,000	27
Total	1,762,000	100

Table 2.5 UK SMEs by sector (All firms registered for VAT in 1982). Source: Roach (1989).

Several publications have introduced different definitions for SMEs according to governmental reports and classifications. In the countries which have signed agreements with the European Union (EU), an official definition for SMEs was introduced by the European Commission in 1996 to replace all the definitions of SMEs (Pissarides, 1999). As stated by the European Commission in 1996, the definition of SMEs is: independent enterprises (no more than 25% or more of the capital or the voting rights owned by one enterprise) which employ less than 250 employees, and have either an annual turnover not exceeding ECU 40 million or an annual balance sheet total not exceeding ECU 27 million. Furthermore, this definition has also differentiated between small and medium enterprise as small enterprises are those with fewer than 50 employees and an annual turnover not exceeding ECU 7 million or a balance sheet total not exceeding ECU 5 million (the European Commission,1996).

For the purpose of this research, SMEs are defined as enterprises that employ a limited number of employees and have a limited annual turnover, and/or a limited annual balance sheet. In this way, the firm size is classified in line with the latest definition of small and medium-sized enterprises (SMEs) adopted by the EU Commission in May 2005. This definition was introduced in enterprise and industry publications and was attributed to three main factors, a company's headcount, turnover and balance sheet total, as shown in the following quotation.

"The category of micro, small and medium-sized enterprises consists of enterprises which employ fewer than 250 persons and which have either an annual turnover not exceeding 50 million euro, or an annual balance sheet total not exceeding 43 million euro" (the European Commission, 2005).

As noted, the SME definition contains three different categories of SMEs (micro, small and medium). These categories may contain enterprises in the forms of self-employed, family firms, partnerships and associations. Each category is differentiated from others in terms of the staff headcount, annual turnover, and annual balance sheet total as shown in Table 2.6.

Enterprise category	**Staff Headcount**	**Annual turnover**	**Annual balance sheet total**
Medium	< 250	<= 50 M €	<= 43 M €
Small	< 50	<= 10 M €	<= 10 M €
Micro	< 10	<= 2 M €	<= 2 M €

Table 2.6: Definition of SMEs. Source: European commission (2005).

However, comparing SMEs with large enterprises shows that SMEs suffer from resource scarcity (Lo and Humphreys, 2000), such as limited funds (Vos et al. 2007) and lack of both human and financial resources (Taplin, 2005), with similar difficulties or weaknesses for SMEs in general. But when compared with large enterprises, the entry to and exit from different markets is sometimes almost free for SMEs, and the challenges for SMEs are post-entry penetration and survival in the market (Contini and Revelli, 1997). As a result, sometimes the weaknesses of SMEs can mask opportunities, for example specialisation and flexibility advantage, because of their small scale managerial processes (Pil and Holweg, 2003). Therefore, a SWOT analysis is used in the following subsections in order to clarify the shared weaknesses, threats, strengths and opportunities in the SME

sector. This in turn aims to support the identification of the CSFs that influence the performance of SMEs. Table 2.7 provides an overview on this SWOT analysis.

Strengths	Weaknesses
• Flexibility • Quick response	• Managerial weaknesses • Limited resources
Opportunities	**Threats**
• Innovation • Globalization	• Training needs • Development needs • IT investments

Table 2.7: Overview of the SWOT analysis on wholesale SMEs

2.3.1 Weaknesses of SMEs

Lee et al. (2010) conclude that SMEs face different difficulties than those faced by large enterprises, for instance, SMEs usually suffer from lack of information, lack of infrastructure and lack of financial resources, but instead, difficulties in large enterprises may include oligopolists, needlessness of innovation or a R&D department without power. This is because, unlike large enterprise, most SMEs suffer from resource constraints (Sims and O'Regan, 2006); these constraints are mainly caused by the lack of human and financial resources (Taplin, 2005). In this sense, Lo and Humphreys (2000) state: "One of the most serious disadvantages faced by SMEs is arguably resource scarcity. This is where; SMEs also suffer from a lack of specialist knowledge and technical expertise, insufficient information on which to base decisions, and lack of capital." Therefore, limited resources could be the key weakness that differentiates SMEs from large enterprises, as well as weaknesses in managerial capabilities.

The resource constraints in SMEs have led to a lack of guidance in implementing the appropriate technology (Mullins, et al. 2001). Undoubtedly, this has influenced the information search and analysis activities which influence the importance of different issues in SMEs (Pineda et al. 1998). Therefore, large enterprises depend on specialised sources of information used for legislation and annual reports (Haase and Franco, 2011), while "SME

decision makers utilize a selective cognitive simplification process in their information search activities" (Liao et al. 2008). Decision makers in SMEs thus tend to select information gathering activities from the available sources according to their own opinions, and they are not willing to seek advice from others (Pineda et al. 1998). Therefore, McNamee (2003) states:

"SMEs suffer from a strategic information deficit, that is, the quality of information that they need in order to make effective strategic decisions is poor when compared with the quality of such information available to large firms."

As the discussion above attests, besides the resource constraints in SMEs, the management skills and capabilities are another key weakness that differentiates SMEs from large enterprises. Chaston (1994) claims that poor management skills are considered to be a common cause of failure within the SME sector in the UK. A study conducted by Hankinson et al. (1997) on 800 SMEs across different industries concludes that the strengths of SME management in the UK are hard work and enthusiasm, while the weaknesses are marketing, finance, languages and Information Technology. Therefore, Winch and McDonald (1999) argue that there is a need for innovative new approaches to SME managerial skills development. In this matter, the UK government have made several attempts to deal with the training issues faced by enterprises across different industries.

In this matter, one of the efforts of the UK's government to improve business performance through the management and development of people skills was by introducing a quality standard known as Investors in People (IIP) in 1991 (Bourne et al. 2008). This standard (IIP) is administrated by the UK Commission for Employment and Skills in association with the Department for Business, Innovation and Skills (BIS). Another early attempt involved introducing the concept of the University for Industry (UFI), pioneered by Gordon Brown in 1992, to tackle the skills deficit in the British workforce, to encourage continuous learning in the workplace (Wintour, 1994) and to allow the dissemination of ideas and information to the workplace itself (Brown, 1993). Later, the UFI concept was adopted by the Labour government in 1997 as a national policy that aims to "enhance the competitiveness of British industry by stimulating demand for lifelong learning among businesses and individuals and improving access to relevant high-quality learning resources" (Sambrook, 2003). In the autumn of 2000, LearnDirect was launched to deliver over 80% of the UFI services online (Hillage, et al. 2001).

2.3.2 Threats for SMEs

Because of the defined weaknesses of SMEs, training and development activities in SMEs are considered as expenses rather than investments (McPherson 2008). Therefore, Hill and Stewart (2000) describe training and development in SMEs as “short-term and almost exclusively directed at the solution of immediate work-related problems rather than development.” However, Laird (1984, page 11-13) makes a distinction between training and development, inasmuch as training is concerned with enabling employees to perform standards. And development is a continuous long-term intervention that aims to prepare for the undefined future. In this way, training refers to building the required skills in the employees for an effective execution their job roles, but development refers to all the efforts oriented towards the improvement of future job performance (Aroge and Hassan, 2011).

In 1996 the IIP standard introduced a definition for training and development as any activity that develops skills and/or knowledge, and/or behaviour (Hill and Stewart, 2000). This definition highlights three main measures for training and development activities (Skills, Knowledge and Behaviour). According to these measures, training activities may improve skills in the current job role, but the improvement in knowledge and behaviour may depend on the available capabilities to acquire/share knowledge or to perform job roles. From this point of view, table 2.8 aims to differentiate between training and development needs in SMEs according to their managerial weaknesses by dividing these into training and development threats. The following two subsections discuss SMEs' training and development threats in separate subsections.

Training threats	Weaknesses in time management.
	Uninterested in higher education.
	Marketing, finance, and management expertise are not identified

Development threats	Weaknesses in personal analysis, reflection, developing strategies and analysing results.
	Limited knowledge acquiring activities.
	Only nine out of 800 SMEs have used consultants before.
	Usually not prepared for further development and fundamental changes over the next few years.

Table 2.8: Findings of a study by Hankinson et al. (1997) on SME management weaknesses.

2.3.2.1 Training needs

The increase in regulations and bureaucracy in large enterprises forces companies to offer more training to their employees in order to ensure that all the requirements are met (Felstead and Green, 1996). Still, training is equally important for large enterprises and SMEs, but the availability of resources in large enterprises to fulfil training needs is considered as a key advantage that SMEs usually lose (Demougin and Siow, 1996). This is where economies of scale make it possible for large enterprises to offer training for more employees in a reduced cost, where costs are spread over a large number of employees (Zheng, et al. 2007). Therefore, because it is cheaper for large enterprises to produce skilled managers in the market, Demougin and Siow (1996) conclude that most of the skilled managers in SMEs were produced by large enterprises. Training needs may differ in accordance with the size of the enterprise, though; hence, the training for large enterprises may not work for SMEs (Sambrook, 2003). In consequence, fulfilling the training needs in SMEs is a challenging threat that obstructs the development of their managerial skills.

Reviewing the literature indicates that SME owners/managers' training needs are not fulfilled for the majority of SMEs in the UK (Maltay, 2000). The reason for this lack in training needs is that complex and interrelated weaknesses (see table 2.8) are hindering managerial performance and causing conflicts between operational decisions and targets/goals, which leads to a low level of control over the business processes and thus lowers the business performance. Therefore, management skills are considered as a key factor for improving the performance of SMEs (Wong & Merrilees, 2005). Similarly, Parker et al. (2003) point to the improvement in SME owner/manager skills and business development as essential factors that influence enterprise performance.

2.3.2.2 Development needs

According to Hankinson et al. (1997), SMEs share weaknesses in management skills and capabilities that obstruct their business development; these weaknesses include very little time spent on R&D; marketing, finance and management expertise are not identified in most SMEs, and most SMEs are not prepared for future development. This kind of weaknesses differentiates the conditions for business development in SMEs from those in large enterprises (Birley and Norburn, 1985). The findings of Hankinson et al. (1997) provide a description about the conditions of business development in SMEs, saying that most SME managers/owners have to decide on almost everything (e.g. IT, marketing or HR) because the roles of departments and expertise are not identified. Accordingly, problems will arise if the SME owner/manager absences exceed two weeks a year, where most of the UK SMEs are totally managed by the SME's owner-manager.

Reviewing the literature indicates that SMEs usually lack the infrastructure to search, collect and analyse information (Liao et al. 2008). Therefore, SMEs are "sometimes missing out on the added value afforded by holistic use of the available information sources" (Haase and Franco, 2011). This is where "data management, storing and interchange are major tools of business development" (Inkinen, et al. 2009). But when compared with large enterprises, limited technological assets in SMEs may reduce their ability to access information sources, as accessing information sources is associated with the technological competence of the firms' activities (Narula, 2004). In this case, SME managers in many cases are uncertain about which IT firm or IT expert could help them to fulfil their IT needs (Caldeira and Dhillon, 2010); on the other hand, IT departments in large enterprises tend to deal with such issues. Therefore, SMEs are usually forced to restrict the types of information sources in use (Walters, et al. 2005).

The knowledge acquiring activities are usually not performed properly by SME managers/owners (Hankinson et al. 1997), therefore the managerial weaknesses in SMEs may influence their business development capabilities and needs. The knowledge and the behaviour measures, as mentioned in the definition of training and development by the IIP

standard, are examined in the following paragraph against the managerial weaknesses in SMEs in order to analyse their development needs. In line with the purpose of this research, knowledge could be examined in terms of information-acquiring activities, while behaviour concern the availability of and access to information sources.

In order to improve performance, growth, and responsiveness to the demand of new technologies, SMEs need specific information (e.g. information about operations or performance) from internal information sources beside the available general information from external information sources (Mulhern 1994). As a result, the minimal information resources in SMEs reduce the employees' ability to access information, which may in turn restrict the knowledge acquiring activities that influence the employees' behaviour in executing their job roles (e.g. decision making). Therefore, several researches have considered information access as an important factor that influences the performance of SMEs in the UK (Chiware & Dick, 2008; Desouza & Awazu, 2006). In this matter, adopting information systems provides both internal information sources and external information sources by offering formal and informal links between SMEs and the other entities in the market (Gray, 2006).

2.3.3 Strengths of SMEs

When compared to large enterprises, beside weaknesses, reviewing the literature shows that SMEs share similar strengths that shape opportunities to survive in the market against large enterprises. Dangayach and Deshmukh (2001) state: SME strengths are such as "flexibility, quick decision making and cooperation from employees, while weaknesses are the lack of technical superiority, of infrastructural facilities and of financial resources." Furthermore, Julien (1993) defines the strengths of SMEs as flexibility, organic organisation, centralised decision-making and the fact that they are close to the customers. Similarly, Nooteboom (1994) points to the major strengths of SMEs as innovation, unique skills, rapid communication, less bureaucracy, and close contact to market and internally. In this sense, Khalique et al. (2011) state that even with the lack of tangible resources, the opportunities may be offered for SMEs from the effective use of their intangible resources.

For example, as discussed previously, the simple management style in SMEs may cause training and development weaknesses, but also it causes simple rules and procedures which are considered as an advantage for SMEs (Holm, 2003). This is where the simple managerial process in SMEs enforces their ability to be more flexible and to adapt rapidly to the market changes (Buckley, 1997). From this point of view, Sharif et al. (2005) argue that SMEs should seize the opportunity of flexibility by aiming "to maintain and/or further develop fast responding capabilities and adaptable organisational structures that will allow them to react to uncertainty and market changes quickly." This is where the less formalised internal and external systems in SMEs allow shorter internal communication lines which facilitate quick response times to problem solving and decision making (Winch and McDonald, 1999).

This in turn develops the traditional strengths of SMEs as the ability to serve niche markets and develop strong relationships with customers (Gilmore et al. 2007). This is where the flexibility of SMEs enhances their relationships with the other entities in the markets (e.g. suppliers and customers) (Sharif et al. 2005). In view of this, Hayter et al. (1999) claim, SMEs enjoy more entrepreneurial strengths than large enterprises. These strengths in SMEs may include serving niche markets, developing customer intimacy and exploiting local knowledge (Drew, 2003).

2.3.4 Opportunities

As noticed, the strengths of SMEs lie in behavioural advantages that cause "internal conditions that encourage innovativeness, such as entrepreneurship, flexibility, and rapid response" (Nieto and Santamaría, 2010). From this point of view, the term innovation may be used to describe gaining opportunities offered for SMEs in general because of their similar strengths. Moreover, as discussed in section 2.1, wholesale SMEs control 80% of the flow of goods in the UK (Mustaffa and Potter, 2009). Also, statistical releases show that increases in the services and goods exports had the most vital contributions of the private sector to partially recover from the manufacturing loss and maintain the national economy (Brook and Taylor, 2010). From this point of view, the increase in the export of goods with the loss in the output of manufacturing confirms that the globalisation of the wholesale industry has provided the opportunities for the industry to grow.Therefore, this research considers innovation and globalisation as the two main opportunities that are shared by

wholesale SMEs in the UK. The following subsections discuss the opportunities offered through innovation and globalisation within the sector of this research.

2.3.2.1 Innovation in SMEs

Innovation has direct (e.g. value for the firm) and indirect (e.g. value for the customer) positive impacts on the performance of businesses; these impacts are derived from three major causes, which are IT capabilities, network competencies and organisational learning (Chailom and Mumi, 2010). This is where these innovation antecedents "allow firms to develop and license new technologies, adopt more efficient production techniques, introduce new products and processes, and consequently become more competitive and increase their economic performance" (Kafouros et al. 2008). Therefore, Sunley et al. (2008) confirm that innovation has significant impacts on the economy; furthermore, Simmie (2002) states: "Since the recessions of the early and late 1980s, interest in innovation has risen dramatically. It is increasingly seen as an essential basis for economic growth in the advanced economies." For instance, in the UK, the loss of manufacturing output has followed the recession periods, but a big part of this loss was recovered through the growth of other industries (mostly the service industry). The private sector output recovery in the UK was caused by the growth of other industries; the process of this growth could be referred to as innovation. This is where innovation is described by Quintane et al. (2011) as "a result that cannot be foreseen, but that the process that led to an innovation can be understood once the innovation has been generated." Therefore, the UK government is encouraging innovation in British enterprises; searching the world "innovation" in any of the UK's governmental trade and industry websites such as direct.gov.uk returns about 5600 results (direct.gov.uk 2011), bis.gov.uk returns 37200 results (bis.gov.uk Sept, 2011), data.gov.uk returns about 2000 results (data.gov.uk Sept, 2011) and much more.

Reviewing the literature shows several researchers have studied innovation from different perspectives and for different purposes; this produced numerous different definitions for innovation. Freeman and Perez (1988) define innovation as "the introduction of new and improved ways of doing things at work." A similar definition by Tuzzio et al. (2009) is: "new ideas or approaches that have the potential to add value and change the way the organization works." These definitions point to innovation as business development

activities, hence Mitra (2000) defines innovation as the learning derived from the interaction between people, technologies and processes. This is where innovation could be “an idea, practice or object perceived by its adopter to be new and an improvement” (Jalonen, 2012).

From another point of view, innovation is more concerned with creativity and invention rather than business development. Love and Ashcroft (1999) define innovation as “the introduction of a commercially significant new product at the establishment level.” If not, innovation is the “adoption of an internally generated or purchased device, system, policy, program, process, product, or service that is new to the adopting organization” (Damanpour, 1991). In general, innovation is “the introduction of something new, whether an idea, method or device” (Ball et al. 2010).

As a result, the diversity of the definitions for innovation makes it hard to predict the needs of innovation; Jalonen (2012) states “innovation is defined as a process that is fraught with uncertainty,” therefore, innovation is considered as one of the principal challenges to the management of SMEs (O'Regan et al. 2006). This is because innovation is seen as a continuous process that is important for businesses to compete and survive in the market (Sohal and Prajogo, 2006). Johne (1999) states:

> “In times of fast changing markets and fast changing technology, businesses which want to safeguard their future must innovate. If they want to be proactive and develop further by organic means, they must engage not just in occasional bursts of innovation, but in continuous change.”

To maintain the firm’s performance and competitive advantage, top management is required to spend more time and effort on understanding the market, customers, suppliers, competitors and internal operations in order to identify targets and meet them innovatively. Different firms have different strategies, and therefore, they adopt innovation in different ways or types (Congden & Schroeder 1993). Prange and Schlegelmilch (2010) state: “Firms have an innate propensity to adhere to different types of innovation.” Johne (1999) identifies three main types of innovation, which are market innovation (how market needs are served), product innovation (improving the product/ service range), and process innovation (improving the internal operations).

Furthermore, any type of innovation may fall into two categories, as defined by Herrmann (1999); these categories are radical and incremental innovations. Radical innovations tend to be major innovations that come out with a new product/service where customers are uncertain of the new product/service. Investing in this category of innovation involves high risk and requires more effort and resource commitment. incremental innovations improve the capabilities or the quality of the product/service by making small improvements on an existing product/service, and investing in this category involves lower risks, effort and resource commitment (Oke 2007). Table 2.9 shows examples of the different types and categories of innovation.

Innovation Type	**Radical**	**Incremental**
Product Innovation	Introducing new products/services.	Improving existing products/services.
Process Innovation	Adopting new information systems.	Expanding the uses of existing information system.
Market Innovation	Introducing new types of distributors.	Expanding the roles of existing distributors.

Table2.9: Types of Innovation.

Innovation is described as the life blood of SMEs (Simon 2002), but when SMEs suffer from limited resources, limited development capabilities will obstruct or prevent innovation. This is where, besides being a risky action, innovation requires commitment of financial and human resources. But resources constraints force SMEs to adjust with their needs as they arise rather than predicting and controlling the turbulence of their needs (D' Amboise and Muldowney, 1988), therefore, Caputo et al. (2002) claim, SMEs tend to be more adoptive rather than innovative. Otherwise, Oke et al. (2007) argue that even if the SME suffers from lack of resources and expertise to implement innovation, SMEs still focus on incremental innovation rather than radical innovations, where radical innovations require more resources and expertise. Figure 2.1 illustrates the obstacles of innovation transfer to SMEs when compared with larger firms.

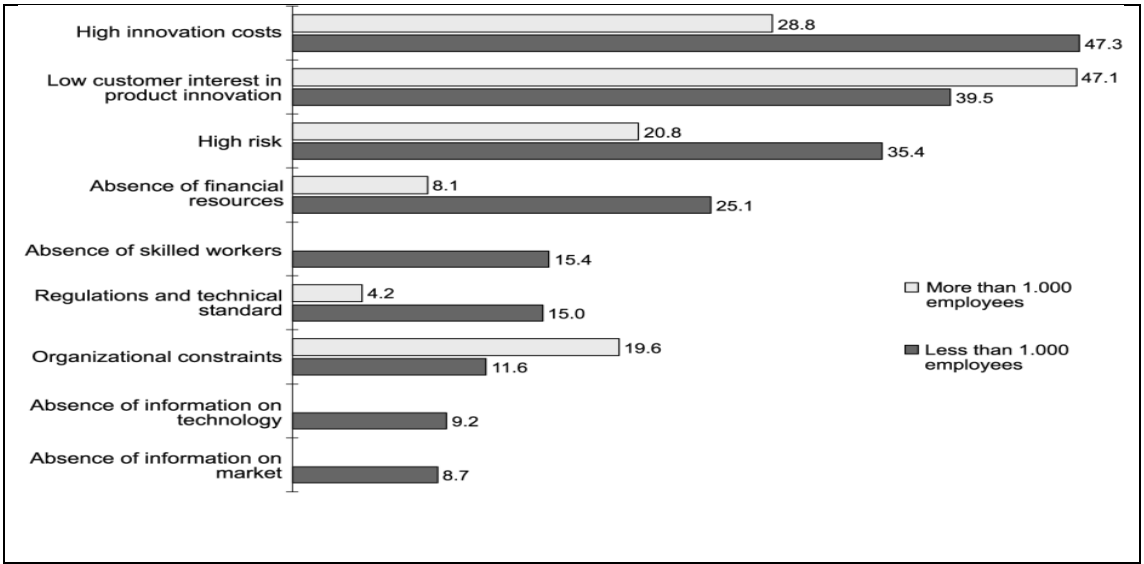


Figure 2.1: The obstacles of innovation transfer to SMEs comparing with larger firms. Source: Caputo et al. (2002)

As shown in figure 3, the three key obstacles that obstruct innovation in SMEs are skilled workers, information on technology and information on markets. To overcome these obstacles in SMEs, Owens (2007) suggests putting into practice active and visible management commitment, introducing new technologies and work methods, and involving functional groups and consultants. Similarly, Gray (2006) argues that in order to survive in the new competitive market (environment), SMEs must be able to absorb the benefits of adopting new ideas, technologies, ways of working, and new tools and equipment; SMEs are therefore required to implement a policy that enhances innovation in the enterprise where innovation has a direct influence on the development of the economic system.

From this perspective, technological innovations could be seen as the most appropriate solution for SMEs. This is where technology innovation may be achieved by adopting information systems that may improve the information sources in SMEs, and their managerial knowledge and skills as a result; these are the key innovation obstacles in SMEs (see figure 3). In turn, the improved knowledge may influence the development of other types of innovation. Moreover, with regard to resource scarcity in SMEs, information systems provide a very attractive innovation opportunity for SMEs. This is where, because of the characteristics of SMEs, information systems can be successfully implemented and operated with a minimum investment in formal training and additional consultancy (Noudoostbeni et al. 2010). Based on this, the proposed model in this research aims to align the roles of BI

technologies in the managerial activities within wholesale SMEs to enhance innovativeness, where the result of applying BI technologies may enhance decision making that improves the performance of the SME, which is considered as technological innovation.

Moreover, Chen & Yuan (2007) state: “technology innovation is of vital importance for firms to survive and develop in markets under intense competition.” Thus, innovation could be considered as the SMEs’ generator of growth and competiveness which improve their overall performance, and different types of innovations may support performance at different organisational levels (such as strategic, operational or individual) (Otero-Neira et al. 2009). Therefore, in this research, the needs for innovation are considered from two different perspectives: the first perspective perceives innovation as a result (e.g. economic growth), while the second perspective perceives innovation as the process that leads to innovation (e.g. management cycle).

Henry (2007) declares that there is a correlation between economic performance, management, and innovation. Based on this point of view, Carpinetti et al. (2007) confirm the relation between the concepts of performance management and innovation in SMEs. Therefore, performance management could be considered as a mediator for encouraging innovation in SMEs. This is where the organisational levels of performance management may involve the key antecedents for innovation, which are strategic performance management (competencies), operational performance management (IT capability) and individual performance management (organisational learning).

2.3.2.2 Globalization in SMEs

Tracing the meaning of globalisation leads to very old roots that are linked to ancient civilizations when international trading began to appear. In the modern era, the term globalisation has been used to describe the system, the environment and the processes of international trading; Lenin (1939) described globalisation as the most advanced phase of capitalism. After that, globalisation was described by Munck (1988) and Perez (1997) as a result from the response to the evolution of mass production and mass customisation that appeared in the late 1960s/early 1970s. More recently, several researchers define

globalisation as the global integration of national economies by creating globally integrated structures of international trading, foreign investments, capital flows and spread of technology (Kidger, 2002; Beke, 2011; Veloshnee and Mooney, 2011). From the same point of view, Rasmussen (2007) argues that the interconnected world through information and communication technologies (ICT) and international markets has made globalisation a political and cultural phenomenon as well. Therefore, in practice, the meaning of globalisation is complicated and not clear except that it has something to do with increasing trade and investment flows (Milner, 1998).

Globalisation could be defined as the "process of global concentration, measured in terms of the number of major competitive players worldwide and their cumulative world market share" (Carr and Garcia, 2003). This is where, in the process of globalisation, "production and markets are becoming increasingly interdependent due to dynamic flows of products, capitals and technology" (Rasmussen, 2007). In view of this, Matlay (2009) argues: "Because of the speed and extent of globalisation and changes in the UK economy, researchers are struggling to keep up with progress in small business and enterprise development." This is because SMEs are more flexible than larger enterprises (Parker, 2000; Zainol and Daud 2011); they can adjust with economic changes rapidly and more frequently (Jardine, 2008). As a result, adjusting to the needs and the changes of the global economy forms continuous development opportunities for SMEs, using their main strength (flexibility). From this point of view, the nature of SMEs makes it easier to react speedily to the opportunities and threats of the increasing globalisation of markets (Peel and Bridge, 1998).

However, as a result of globalisation, SMEs need to adopt a dynamic nature to respond to the continuous changes in the global marketplace ;therefore, globalisation has brought new challenges for SMEs, but at the same time it has brought new opportunities as well (Vasconcellos e Sá et al. 2011). Backer (2009) states: "The integration of national economies into one global economy is accelerating and intensifying, driven by new technologies and new opportunities." The new opportunities offered by globalisation include introducing new customers and suppliers globally. Based on this point of view, globalisation has brought a rapid growth in the wholesale industry, where world trade agreements introduced new suppliers, partners and customers from all over the globe. Therefore, the impacts of globalisation have forced international and local wholesalers to become more

dynamic and flexible with the continuous changes of the global market. Accordingly, to enjoy the benefits of flexibility, SMEs should monitor their operational performance by measuring their operational success and failure factors to continuously redefine targets/goals that maintain the efficiency and effectiveness of their dynamic business operations.

When compared with large enterprises, the nature of SMEs makes it easier to respond and adapt to global changes. But to do so, SMEs are required to provide the tools and techniques for their employees to detect change requirements and adjust to them, and frequently redefine targets/goals that aim to maintain the efficiency and effectiveness of their business operations. In this case, SMEs are more flexible and adaptive to change than larger firms, but they lack skills and resources which limit their capabilities for purchasing and implementing new systems to cope with global changes (Metaxiotis, 2009). Consequently, limited skills and resources form a weakness that affects SMEs in terms of responding to global changes and sustaining efficient and effective operations. In this matter, Chailom and Mumi (2010) claim that process innovation is considered to be a main strategy that firms implement as a tool to gain viability in the globally competitive markets. This is where the integration of national economies (globalisation) is driven by the developments of technology and communication, and the reduction in transport costs rather than developments of products/services (Harris, 1993).

After all, managing globalisation as an opportunity forces SMEs in the wholesale industry to acquire innovative ways of gaining a competitive edge. In this sense, innovation of products in the wholesale industry could be easily defeated by other competitors in such a huge market worldwide, while implementing innovative processes that ensure the dynamism, efficiency and effectiveness of business operations may allow SMEs to obtain the benefits of being flexible, and thus detect and respond to opportunities quicker than competitors.

This research suggests that the benefits of globalisation could be effectively obtained by wholesale SMEs through the adoption of information technologies (IT) and information systems (IS). IT/IS implementations could serve as long term investments to maintain the company's level of operational performance and thus flexibility to adjust with change. This is because IT/IS implementations are capable of consistently measuring and demonstrating the success factors for managers to support decision making that maintains/improves the

performance of the SME. Nevertheless, academics, experts and mangers haven't yet agreed on how to effectively apply IT/IS applications in their organisations to improve their global performance. But this research has revealed the need of globalisation to support the identification of the CSFs that influence the performance of the UK's wholesale SMEs in section 2.4.

2.4 Sector specific success factors

The assumption of this research comes from the point of view that the choices and alignments of BI tools have significant implications and consequences for the performance of wholesale SMEs (Das & Tyagi, 1994). The distribution industry may be divided into producers, wholesalers, customers (retailers), and consumers (Tietz, 197; Das & Tyagi, 1994). Mallen, (1996) indicates that the structure of a distribution process is subject to change with changes in several factors, such as changes in the customer buying habits, changes in the marketing mix, changes in the availability of middlemen, changes in resources, changes in competition, and changes in environmental factors. For that reason, flexibility is considered as an important feature for wholesalers; this is where wholesalers need to adjust with changes to the needs of different entities in the distribution channel at the same time. Wholesalers may respond to these changes by redesigning their systems or services, therefore, the operational requirements for wholesalers are subject to change depending on several factors. The changes in the operational requirements may involve procurement and warehousing or transport and distribution. Thus, it is important to simultaneously measure operational performance factors in order to balance the costs with the obtained value in the firm's operations. In this matter, the success factors of the operational performance are discussed in section 3.4.

However, wholesalers have several challenges to cope with, for instance, retailers expect wholesalers to provide on time deliveries and competitive financial services. Considering the changes in the distribution channels are critical and complex decisions that may affect the operations of wholesalers. Jantan and Ndubisi (2003) state that changes in marketing channels may affect the performance of other marketing channels and the overall decisions

about how the product will be offered in the marketplace. For example, the advent of the internet has provided new links between producers and retailers or even consumers, which had effects on some of the wholesalers operations in the distribution channel.

Moreover, producers expect their distributors (wholesalers) to represent a good image for their products by ensuring a good service quality for customers. As a result, it is important for wholesalers to estimate the costs of new customers or suppliers by calculating the costs of providing new or increased services for customers with the available or needed resources. In this matter, the adoption of BI technologies facilitates monitoring the performance of business operations in order to quickly react to changes and identify opportunities. The factors of adopting BI technologies are discussed in section 4.5.

Monitoring the performance of business operations is important to ensure operational efficiency, which is a major concern for wholesalers because the wholesale trade is considered as a capital-intensive business; operational efficiency is required to reduce costs and to maintain other operational performance factors such as liquidity and profitability (Das & Tyagi, 1994). Factors of operational efficiency are determined in Section 3.4 as return on investment (ROI), payback period (PBP), volume discount, indirect costs, inventory turnover rates, human capital and liquidity. As a conclusion, monitoring and measuring operational efficiency factors supports the decision making to improve/maintain the operational performance within wholesale SMEs.

Tietz (1971) defines the factors affecting the wholesale industry as socio-economic factors, changes in the numbers of suppliers, customers, computers, market changes, location, legal changes, communication, and IT/IS adoption. Moreover, Das & Tyagi (1994) define the factors that affect the wholesale industry as volume discount, location, trade-offs between transport, purchasing and warehousing costs, selection of suppliers and cost of adding new customers, suppliers or services. Similarly, Mazzarol & Choo (2003) define the factors affecting the wholesale industry as market reseller strategies, transport services, volume-discounted rates and liquidity.

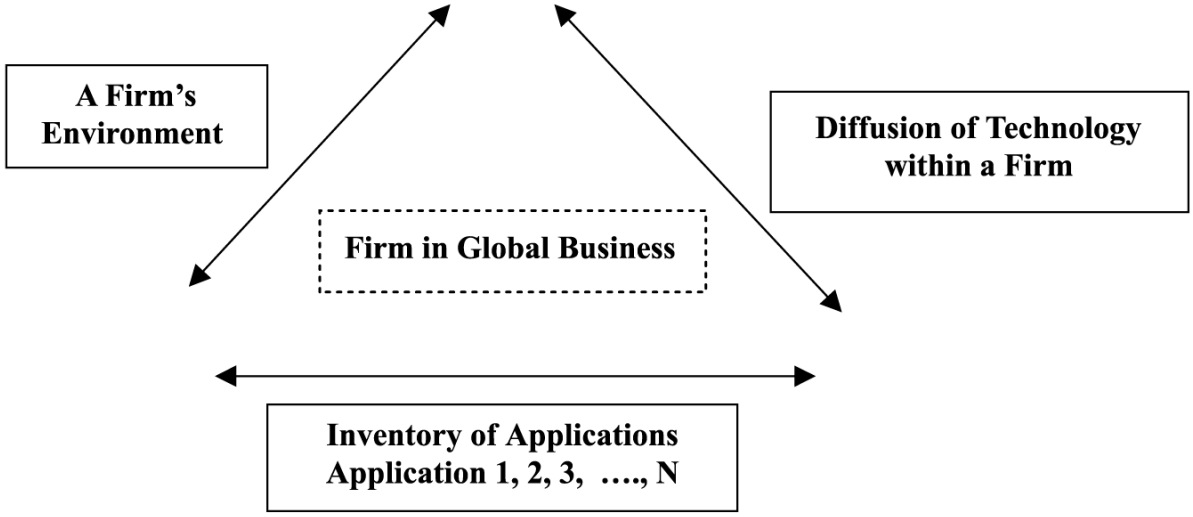
As discussed in the previous sections, the majority of wholesalers in the UK are considered as SMEs, and the majority of SMEs share similar weaknesses, threats, strengths and opportunities. The threats were defined as training and development needs, and opportunities as innovation and globalisation processes. The defined threats of SMEs may depend on the available resources and capabilities rather than other factors, and so they are considered to be clear and straightforward. But reviewing the literature indicates that the defined opportunities of SMEs are usually influenced by several factors, therefore, the following paragraphs aim to discuss the factors that influence success in these opportunities.

Innovations have significant impacts on the firm's performance depending on several factors. The factors affecting innovations in SMEs were investigated by many researchers; Oke (2007) illustrates these factors as innovation strategy, human resource management, creativity management, portfolio management, and implementation. Similarly, the innovation factors within SMEs were determined by Ar & Baki (2011) as "R&D strategy, top management support, customer focus, capability of organizational learning, capability of creativity, operational collaboration, and supplier relationship management." More specifically, Congden & Schroeder (1993) define the factors affecting process innovations as competitive strategy, adoption tuning, usage patterns, and firm characteristics. In addition, Hewitt (1995) determines the process innovation factors, which are: recognition of the need to change, operational skills and techniques, timely based process analysis, process reengineering, information technology, human motivation to change, new ways of work and technical aspects of process design and technology change.

As discussed in section 2.3.4, globalisation is considered as a broad phenomenon that involves economic, cultural and political impacts. Therefore, the factors that influence the global performance of SMEs diverge in terms of their globalisation purpose. For example, cultural factors are used to study the effects of globalisation on the community, political factors are used to identify the effects of globalisation on the region, and economic factors are used to evaluate the effect of globalisation on businesses and thus on the economy. But in the case of this research, the factors of globalisation are regarded to as the opportunities provided for wholesale SMEs through technology adoption. In this pattern, Desai et al. (2004) develop a global information technology model for enterprises to support the opportunities offered by globalisation: "this model is based on three main dimensions—a

firm's environment, the firm's level of technological diffusion, and the existing IT applications or prospective technology applications based on the existing inventory of IT applications".

According to the global information technology model, the firm's environment dimension consists of the internal and external factors that influence the firm's business activities, while the technological diffusion refers to the extent of technology literacy among the firm's employees, the technological resources used within the firm, and the firm's ability to access technological resources from its external environment. A third dimension focuses on the existing IT applications used by the firm in current processes. It also includes business processes that do not use IT applications but are potential candidates for IT applications. This model is demonstrated in figure 2.2.



Figuer 2.2: global information technology model. Source: Desai et al. (2004).

The environment dimension depends on demographics, socio-cultural, politico-legal, macroeconomic, global and technological as well as competitive factors; the inputs of these factors that affect the IT adoption in globalisation are either internal or external inputs. Internal inputs are those such as human capital and skill levels at local and global markets which clarify the needs of training and developing employees, or external inputs such as industrial infrastructure, electrical power and telecommunication services which clarify the capabilities needed. The technology diffusion dimension is affected by the management commitment factor. This is where understanding the technology diffusion helps management

to define their current state and the next step to take in their technological development. In addition, the management commitment to the adoption of technology allows estimation of the cost for adopting new technology. The existing and potential IT applications dimension is affected by the business process complexity; this is where understanding the level of complexity in business processes helps to determine the nature of the needed IT applications or techniques, costs, and the processes to be involved.

2.5 Summary

The discussion in this chapter has included the analysis of the sector that this research targets (wholesale SMEs in the UK). According to this analysis, the characteristics of the UK economy indicate that the performance of wholesale SMEs is important in safeguarding wellbeing of the national economy. In addition, the analysis in this chapter has identified the CSFs that influence the performance of wholesale SMEs in two phases, which are 1) the analysis of the wholesale industry, and 2) a SWOT analysis of the SME sector.

Wholesalers form an important link in the distribution channel between producers and retailers. Therefore, the wholesale industry is considered as a part of the distribution industry. The wholesale industry consists of three main types of wholesalers (merchant-wholesalers, manufacturing agents, and intermediaries). Wholesaling companies are categorised in the UK's SIC scheme 2007 under section G in division 46, and the majority of wholesalers are considered as SMEs. SMEs are enterprises which employ fewer than 250 employees and which have either an annual turnover not exceeding 50 million euro or a balance sheet total not exceeding 40 million euro.

SMEs are affected by similar weaknesses, threats, strengths and opportunities. According to the SWOT analysis in section 2.3, the weaknesses of SMEs are summarised as resource constraints and managerial weaknesses, and they originate training and development threats. On the other hand, the strengths are summarised as quick response and flexibility and they originate innovation and globalisation opportunities. According to the results of the SWOT analysis, the CSFs are derived in section 2.4 and they are summarised in table 2.10.

This chapter aims to identify the sector specific CSFs for wholesale SMEs in the UK, these CSFs were derived from two main arenas. The first arena is the CSFs that influence the wholesale industry, and this was documented through analyzing the operational environment of wholesalers in section 2.2. And the second arena is the CSFs that influence small to medium enterprises, and this was documented through conducting a SWOT analysis. The defined threats and opportunities in the SWOT analysis were the source of the CSFs. This is where the threats were derived from the weaknesses of SMEs, and because these weaknesses are managerial weaknesses and limited resources; the factors that influence the weaknesses are highly diverse and uncontrollable. Therefore, the defined threats were considered as CSFs. But the opportunities of SMEs are influenced by the use of the strength factors, therefore the factors that influence the opportunities were documented as the CSFs. This is summarized in table 2.10.

Wholesale industry	**SWOT on Small to medium enterprises (SME)**
Customer buying habits. Marketing mix. Availability of middlemen and resources.	Training capabilities. Development capabilities. Innovation: | Globalization

Competition. Environmental factors. Operational efficiency. Socio-economic factors. Suppliers. Customers Computers. Market changes. Location. Legal changes Communication. IT/IS adoption. Volume discount. Location. Trade-offs between transports. Purchasing and warehousing costs. Selection of suppliers. Cost of new customers, suppliers or services Market reseller strategies. Transport services. Volume-discounted Liquidity.	Innovation strategy. Human resource management. Creativity management. Portfolio management. Implementation R&D strategy Top management support. Customer focus. Capability of organizational learning. Operational collaboration, skills and techniques. Supplier relationship management, Competitive strategy. Change management. Firm characteristics. Process analysis. Process reengineering Information technology New ways of work. Technical aspects. Process design. Technology change.	Demographic. Socio-cultural. Politico-legal. Macroeconomic. Global Technological Competitive Management commitment Human capital Skill levels Training and Development Industrial Infrastructure. Electrical power. Telecommunication services.

Table 2.10 Wholesale SMEs' sector specific CSFs.

Chapter Three:

Performance Management

3.0 Performance management

As discussed in Chapter Two, besides resource constraints, a main issue in the majority of SMEs is managerial weaknesses which influence their training and development needs. In this matter, the literature on SMEs points to the concept of performance management as an effective tool that enhances managerial growth in SMEs (Biazzo and Bernardi 2003; Garengo et al. 2005). Moreover, reviewing the literature emphasises that there is a poor understanding and use of performance management in SMEs (Garengo and Bititci, 2007). This is where SMEs share similar characteristics that derive similar weaknesses, but derive similar strengths as well. The main strength of SMEs was defined in Chapter Two as flexibility, hence the quick response to change was considered as another key strength for SMEs that could be used to support innovation and globalisation opportunities. In this case, "the relative shortage of performance management tools, combined with the prevailing environmental uncertainty and complexity, makes it difficult to control and steer the firm in the right direction" (Bahri et al. 2011). In this respect, performance management involves defining responsibilities, goals, and how to achieve success; therefore performance management is also a process of strengthening practical management to drive superior performance (Dong, 2011).

Therefore, supporting managerial capabilities within wholesale SMEs in the UK has been identified as vitally important for the sector to grow and develop. In this way, better managerial capabilities improve the training and development within the enterprise and in turn develop the enterprise's capabilities to take advantage of innovation and globalisation opportunities. The factors of performance management were seen as the most relevant factors to affect the managerial capabilities and performance. This chapter describes the activities, processes and challenges that arise in the performance management process. The first three sections provide a general background about the process of performance management and measurement. After that, section 3.4 aims to identify the factors that influence performance management through the adoption of information systems. In this section, the influence of adopting information systems/BI tools was linked to the factors of operational performance where the aim of performance management at operational levels is report making and analysis.

3.1 Definition of performance management

Early performance management activities appeared in the public sector in the early 1900s at the New York Bureau of City Betterment; they began by making studies of management that proposed managerial improvements to improve performance, and it soon enlarged to analyse the activities of other cities to suggest improvements (Dahlberg 1967). Smith (1967) defines performance management as the assembly of procedures to use existing resources in producing outputs, sales, exports and profits. However, performance management starts with evaluating the company's policies, activities, organisation, and accomplishment, then it proceeds to improve the performance of the company. This early definition by Smith (1967) described performance management as the business model of the company, and it did not point to the performance of teams and individuals. The utilisation of performance management in business has emerged during the mid-1970s (Armstrong and Baron, 2005 p. 7); in academia, Beer and Ruh (1976) were the first to define performance management as a continuous management approach. They defined performance management as a management approach that emphasises the importance of learning derived from job experience with the guidance of managers who are supported by the feedback and reflection of their employees. This definition has expanded the meaning of the term performance management to include the role of management in improving the performance of teams and individuals.

Nonetheless, performance management remained unrecognised as a management approach until the mid-1980s. After that, there was increased interest in the term performance management, which developed different meanings in different organisations. This is where research in the early 1990s indicated that the meaning of performance management was in a confused state. Some managers considered performance management as an appraisal process or performance related pay, and others considered it as training and development activities. Later, in 1997, research found much more agreement on the meaning of performance management to be a process of managing individuals and teams to achieve high levels of organisational performance through a shared understanding of what is to be done and the best approach to ensure that it will be achieved (Armstrong and Baron 2005 pp. 1-2). Neely (1999) identifies the main reasons that make performance management a fast evolving topic to be: the changing nature of work, increasing competition, specific improvement initiatives, national and international quality awards,

changing organisational roles; changing external demands, and the power of information technology. Nowadays, many scholars report an increasing interest in performance management across different industries (e.g. Freyer et al. 2009; Forslund, 2012). Therefore, several definitions of performance management have been developed over time; the following bullets show some of the available definitions for performance management:

- "The way employees are managed to achieve organisational goals, leading to sustainable competitive advantage" (Boselie and Wiele, 2002).
- "The process that enables an organization to deliver a predictable contribution to sustained value creation" (Waal, 2002).
- "A strategy which relates to every activity of the organisation set in the context of its human resources policies, culture, style, and communication systems." (Armstrong and Baron, 2005 p. 7).
- "Understanding and managing performance within an agreed framework of planned goals, standards, and competence requirements in a systematic process of developing individuals and teams." (Armstrong, 2006 p. 1).
- "The overarching process that deals with performance" (Brudan, 2010).
- "A system that generates performance information through strategic planning and performance measurement routines and that connects this information to decision venues where, ideally, the information influences a range of possible decisions" (Moynihan, 2008 p. 5).

From the definitions above, researchers define performance management as a strategy, framework, process, behaviour or a system of collecting, analysing and generating performance information to support decision making (Moynihan, 2008 p. 5), operations (Waal, 2002), and teams and individuals (Boselie and Wiele, 2002). Therefore, performance management may involve almost all organisational activities across different organisational levels, Brudan (2010) claims: the elements of performance management are linked to a multitude of organisational capabilities, which created a multipurpose nature for performance management that has various features across different organisational levels (strategic, operational and individual). The roles of performance management are discussed at the different organisational levels in the following section.

3.2 Organisational levels of performance management

The concept of business performance management is traditionally divided into three organisational levels: strategic, operational and individual performance management (Brudan, 2010). Armstrong and Baron (2005 p. 7) state: “The nature of performance management depends on the organisational context and may vary from organisation to organisation.” This is where the processes of performance management differ at different organisational levels, where it may involve target setting (strategic), report making and analysis (operational), and perceived demand for performance management (individual) (Forslund, 2012). To differentiate between the uses of performance management at different organisational levels, this section discusses the use of performance management at each organisational level in the following subsections.

3.2.1 Strategic performance management

Performance management at strategic levels involves the achievement of the organisational objectives in the course of strategy formulation and execution; practitioners may refer to it as corporate or enterprise performance management. Hence, strategic performance management (SPM) is considered as the overarching level of using performance management (Brudan, 2010); this is where SPM deals with the major objectives that guide the objectives at operational and team/individual levels of performance management. Bourne et al. (2003) claim that the term corporate/strategic performance management was developed to differentiate between individual and organisational levels of applying performance management. The concept of SPM is defined by De Waal (2007 p. 19) as “the steering of the organisation through the systematic definition of mission strategy and objectives in order to take corrective actions to keep the organisation on track.” Similarly, Chau (2008) defines SPM as focusing the efforts of top management, middle management and strategic operations of the organisation to achieve its strategy. Both definitions point to SPM as an activity of strategic planning where the two key processes of SPM are strategy formulation and execution (Brudan, 2010). Therefore, the SPM could be measured in terms of achieving strategic goals, and these measures depend on financial aspects such as:

return on investment, return on sales, earnings per share, return on equity, and earnings growth rate (Eccles, 1991).

On the other hand, there are numerous frameworks and quality awards that influence the SPM by focusing on guiding the achievement of organisational goals. Examples of awards are the Baldrige Award and the European Foundation for Quality Management (EFQM) Excellence Model. A SPM framework could be the strategy dynamic framework developed by Warren (2008) that is concerned with the understanding and managing of business performance through time, focusing on the factors that explain why performance is as it is today, and how it might be managed into the future.

3.2.2 Operational performance management

Performance management at operational levels deals with the achievement of departmental or functional objectives. Although it is aligned with strategic objectives, its focus is more functional (Brudan, 2010). Schiff (2007) refers to OPM as operational analytics and indicates that it "aims to deliver in-depth and focused analysis of the performance of each key operational area of the business." In this way OPM covers operational analytics, and profitability optimisation of each business unit and function (Schiff, 2011). Therefore, the term OPM excludes strategic and higher performance measures, and it involves the "implementation and use of performance measures on the level of day-to-day operations executed by shopfloor operators in factories and warehouses" (de Leeuw and van den Berg 2011).

From another point of view, OPM may involve any area of business such as sales, services marketing, IT, HR or finance where its main role is to give the "senior management a more comprehensive and holistic view of the business which enables them to make decisions that take into account the impact on departments across the company" (Schiff, 2007). White (2004) considers OPM as real-time performance management, which could be referred to as business process management or business activity monitoring. Consequently, several software applications were built to support the OPM; the main role of these applications was

described by Wayne (2005) as collecting data from the plant floor for real-time and historic downtime, and providing performance analysis and reporting.

3.2.3 Individual performance management

Traditionally, the Individual Performance Management (IPM) aims to evaluate and recognise employees' commitment and performance (Zink et al. 1997). Yet, individual performance is considered as the key element of the performance system where it has critical effects on enhancing the organisation's effectiveness. The key factors that affect the individual performance are personality, management and organisational environment (Bai and Wand, 2010). Considering management as the key factor that affects the individual performance promotes the term IPM as maintaining or improving the performance of individuals. Schiff (2007) defines the IPM as "taking the company's goals, objectives, and measures down to an individual employee level." This is where each employee has individual key measures which tie to his/her departmental objectives that tie back to the corporate goals which promote IPM as enforcing the strategic alignment company-wide.

Similarly, Graham (2004) defines IPM as "aligning the job of each employee with the organizational strategic plan so that the employee's efforts are focused on behaviours, products/services, and processes that contribute to the success of the organization as a whole." From the discussion above, IPM follows two key trends; the first trend involves maintaining the performance of individuals by conducting performance appraisals or self-assessment for performance. The second trend involves integrating the strategic performance with the individual performance, and this could be achieved by using performance management tools such as balanced scorecards and benchmarking.

3.3 The process of performance management

The term performance management in business is referred to as a management process, this is where Armstrong (2006 p. 4, 16) describes performance management as a natural process of management that involves managers and employees acting as partners within an

agreed framework which specifies how they can best work together to achieve their goals and objectives. Similarly, Armstrong and Baron (2005) describe performance management as a process which contributes to the effective management of individuals and teams in order to achieve high levels of organisational performance. In that respect, the process of performance management aims to communicate and reinforce the corporate strategy by connecting the employees' responsibilities and objectives with the corporate strategy and goals (Chan, 2006); likewise, Bititci, et al. (1997) state: "The performance management process is seen as a closed loop control system which deploys policy and strategy, and obtains feedback from various levels in order to manage the performance of the business." Therefore, the process of performance management could be described as a cycle that is completed over a period of time to track and manage the performance of the business.

Traditionally, the cycle of performance management is completed annually, but many organisations seek more accurate tracking of their performance by completing the performance management cycle quarterly in order to ensure that milestones are reached (Williamson, 2011). Hence, the process of performance management is usually defined as an annual cycle where managers set key objectives for the employees in line with organisational goals (Montoya and Graham, 2007 p. 24). Nevertheless, the performance management process needs to be simple, clear and jargon free, thus, it should not consume excessive time or effort nor become bureaucratic (O'Connor, 2007 p. 23). Chan (2006) states: performance management should be treated as a continuous process that is a part of the normal management practice in organisations. Hence, the process of performance management is differentiated from other managerial practices by being a continuous cycle of completing predefined activities over given periods of time. The performance management cycle has been described by several scholars as a set of activities that carry out the performance management practice in organisations. The following subsection discusses the activities of the performance management cycle.

3.3.1 The performance management cycle

The performance management cycle is defined by Armstrong (2006 p. 16) as a self-renewing cycle which follows the sequence of activities of the management cycle that was defined by the total quality expert Deming (1986) as plan-act-monitor-review. Different

organisational structures manage their performance management cycle in different ways; still, they have significant similarities (Lega and Vendramini, 2008). Based on these similarities O'Connor (2007 p. 139) classifies two phases of the performance management cycle; the first phase is performance development activities and ischaracterised as soft, and the second phase represents performance measurement activities and is characterised as hard. Also, Parker-Gore (1996) states: “Reviewing competence (hard) and development (soft) as part of the performance management cycle ensures a fully integrated and aligned process.” These two phases are seen in the management cycle of Deming (1986) as soft: planning and acting, and as hard: monitor and review. The activities of the performance management cycle were studied in several scholars from different perspectives. These activities could be classified into soft or hard activities. For instance, Fitt (1992) defines the activities of the performance management cycle as soft: planning, and as hard: coaching and review. Moreover, the activities of the performance management cycle were defined by Forslund and Jonsson (2007) as soft: selecting performance variables, defining metrics and setting targets and as hard: measuring, and analysing.

The activities of the soft phase of performance management are completed at the beginning of the cycle period and may involve defining job responsibilities, expectations, goals, or objectives, while the hard phase is completed at the end of the cycle period and may involve monitoring performance, providing feedback, coaching. After this is the evaluation stage that is based on performance appraisal, which leads to revisions of performance plans (Fitt, 1992). Again, the phases of the performance management cycle could be characterised as soft, which involves improving on performance, and as hard, which involves performance measurement. Based on the discussion above, the two phases in the performance management cycle are demonstrated in figure 3.1 and are discussed in following subsections. Each phase is discussed separately in the following subsections.

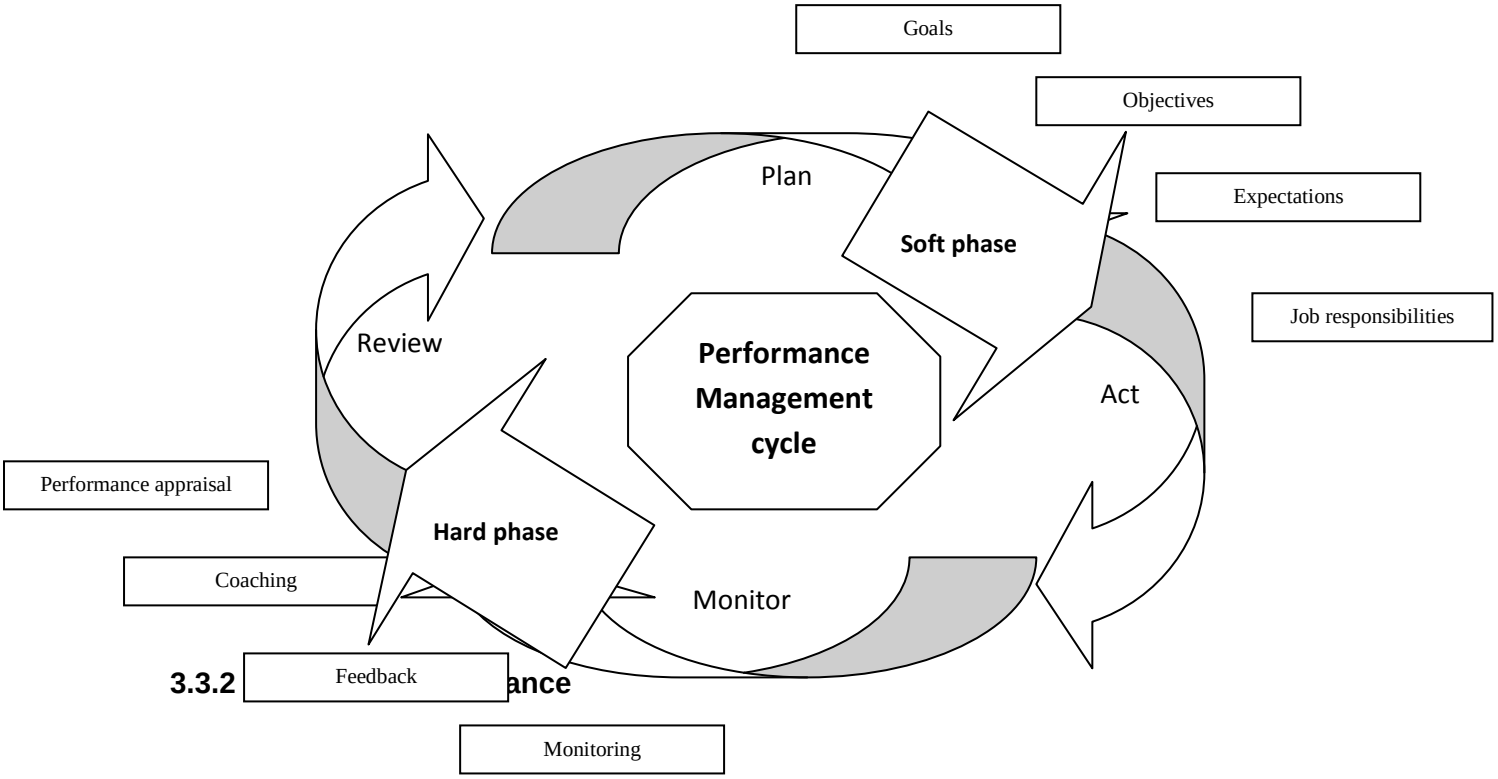


Figure 3.1 The performance management cycle.

3.3.2 ance

Improving performance is a fundamental part of the performance management process ssed in the previous section, improving or developing performance is categorised by O'Connor (2007 page 139) as the soft phase of the performance management cycle; this phase involves the performance development activities at the begging of the cycle (Fitt, 1992). This is where Broad (2006) identifies the tasks of improving performance as:

- "Task 1. Define the complex system and the performance the organisation seeks to improve, and identify important stakeholders in major components of the system (including top managers for strategic interventions).
- Task 2. Educate stakeholders on the two sets of factors that support performance of supervised and autonomous workers.
- Task 3. Get stakeholders to commit to specific actions to take to support those factors, during and after the intervention, including top management support throughout.

- Task 4. Manage implementation of the intervention so that contributions from important stakeholders are visible and made when they are needed."

However, Forslund (2012) argues that the challenges of improving performance are affected by organisational issues such as "lack of understanding and knowledge, poor capabilities for adapting performance metrics definitions, and lagging IT solutions for performance report-making;" hence, identifying the obstacles to improving performance is of vital importance for improving the performance. The sources of these obstacles may be errors of leadership, management, systems of work, or employees (Armstrong 2006 p. 119). Freyer et al. (2009) categorise the obstacles of improving performance into technical, systems and involvement obstacles. The following bullets aim to relate the soft phase of performance management to the obstacles of performance management as explained by Freyer et al. (2009).

- Technical: obstacles may involve the activities of developing (soft) and measuring (hard) performance, soft activities include defining performance indicators and data, and hard activities include data collection, interpretation and analysis.

- Systems: obstacles may involve strategic planning activities that relate to developing performance (soft); these activities include integrating the performance management system with the existing systems, encouraging the strategic focus, clarifying and communicating objectives, and determining the cost of performance management.

- Involvement: obstacles may involve people issues and involvement in the performance management system and they are related to the activities of developing performance (soft). These activities include encouraging employee and customer involvement, and ensuring top management or decision makers' support and commitment in the performance management system.

From the discussion above, the soft phase of performance management aims to establish the required knowledge on the performance management obstacles in order to formulate strategies, goals, objectives, and measures to improve performance. Therefore, improving performance takes place in the first half of the performance cycle where soft activities of performance management are implemented. The second half of the performance cycle is the hard phase, which involves performance measurement activities. Nevertheless, performance measurement is considered as a pre-requisite for improving performance (National

Research Council, 2006 p. 83) where Parker (2000) states “Performance measurement is an important aid to making judgments and to making decisions.” In this instance, the performance management cycle is described as a continuous and self-renewing cycle where measurement activities deal with the evaluation of results and defining what is to be important (Booth, 2006) while improving performance deals with planning according to the results of the performance measurement phase. The hard phase of the performance management cycle (performance measurement) is discussed in section 3.3.3.

3.3.3 Performance measurement

Performance measurement is considered as a very wide topic that involves “the development of goals and related performance measures and the provision of feedback” (Dumond, 1994). Neely (2002, p. xiii) defines performance measurement as the process of quantifying past activities in terms of their efficiency and effectiveness. However, Ghalayini and Noble (1996) claim that the changing bases of performance measurement are formed by identifying the characteristics of information that are relevant to improving performance. These characteristics identify the performance measures that may vary in different organisations in terms of different key performance measures, such as profit, customer satisfaction or sales maximisation. Still, performance measures may have significant similarities among enterprises from the same sector or with the same business activities. Based on this, Chow et al. (1994) categorise the performance measures into “hard measures (such as net income and accounting figures), and soft measures (such as customer satisfaction ratings).” Similarly, Parker (2000) categorises the performance measures into lagging (soft) measures and leading (hard) measures. In addition, these two categories contain four types of performance measures which are outcome and input measures (soft), action measures (hard), and diagnostic measures that include hard and soft measures.

However, there are infinite performance measures that can be measured in each of these types. Thus, companies have to carefully select performance measures that they *should* measure rather than selecting what they *can* measure. In this instance, the performance measurement expert John Miller states that the two key performance measures that

businesses should measure are return on investment (ROI) and revenue growth, and after that, businesses should move towards measuring the key performance indicators (KPI) that may vary in different businesses and industries (Miller, 2012). The relevant performance measures to the purpose of this research are critically reviewed and analysed in section 3.4.3.

To achieve business success in the market place, companies should adopt performance measurement tools and techniques to monitor, maintain and improve their performance; based on the fact that this has appeared in one of the UK's white papers (RSA, 1994); Neely (1999) claims that business performance measurement has been an obsession for current and previous UK governments. On the other hand, Marr & Schiuma (2003) describe business performance measurement as a fast evolving and diverse research field which involves academics and practitioners in general management, accounting, operations research, marketing and human resources. In consequence, research from different fields has contributed to the business performance measurement arena for different purposes, which created a lack of agreement on defining the term performance measurement (Franco-Santos et al. 2007). Burdan (2010) indicates that reviewing the literature shows confusion in differentiating between performance management and measurement, where authors define these terms according to their own criteria, and they even use these terms interchangeably.

According to the previous discussion in section 3.3.1, performance measurement could be differentiated from performance management by considering it as the hard phase of the performance management cycle. This is where performance measurement involves the hard activities in the performance management cycle such as monitoring, feedback, coaching and appraisals (Parker-Gore, 1996). In this sense, Brudan (2010) defines performance measurement as "a sub process of the performance management process that focuses on the identification, tracking and communication of performance results by the use of performance indicators" or measures.

On the other hand, the world expert in performance measurement, Prof. Andy Neely, defines the essential processes of performance measurement as system design, implementation,

administration and refreshing the measurement system (Powell, 2004). From the same point of view, several researchers define performance measurement as a system; this system uses a set of performance measures to align business activities across departments with the corporate strategy (Rogers 1990, Lebas 1995, Otley 1999, Bourne et al. 2003). Therefore, the performance measurement literature is influenced by a variety of frameworks of applying performance measurement systems such as balanced scorecards, strategic measurement analysis and reporting techniques, integrated performance measurement and much more (Umit et al. 2000). The most dominant framework of performance measurement systems is seen to be the balanced scorecards that were introduced by Kaplan and Norton (1992). These frameworks may be considered as the roots of developing business intelligence (BI). This research aims to introduce a sector specific performance management framework that identifies the roles of BI tools in the performance management cycle. Therefore, the following section demonstrates and critically analyses the CSFs that influence the success of the performance management process within the sector of this research.

3.4 Performance Management CSFs

As discussed in previous sections, performance management is an overarching process that deals with performance where it may involve all the managerial practices in the enterprise. Therefore, the CSFs of performance management are considered to be all the factors that influence the business in general. Identifying the CSFs of performance management could be narrowed down by considering the aim of the research and then relating the suitable organisational level of applying performance management to the aim of the research. This is because the aims of applying performance management differ at different organisational levels: target setting (strategic), report making and analysis (operational), and perceived demand for performance management (individual).

The aim of this research is to support the adoption of business intelligence (BI) tools in wholesale SMEs, and the aim of adopting BI tools is to provide the capability to analyse and report on data. In this case, the aim of the research is aligned with the report making and analysis aim of the operational performance management. Therefore, the factors that influence the operational performance management are considered to be the performance

management factors in this research. The following subsection aims to establish a background about the operational performance and then identify the factors that influence it.

3.4.1 Operational performance

The term operational performance reflects the performance of internal operations in terms of cost/waste reduction, improvement in quality, flexibility, delivery and productivity. Therefore, the operational performance could be described as the performance of the enterprise's internal operations (Feng et al. 2008). The operational performance is a broad concept that represents the performance in terms of operational efficiency and effectiveness. Effectiveness is a balancing act that aims to balance the customers' requirements with the needs of the operating units; thus, effectiveness is mostly concerned with the internal operations of the enterprise while efficiency is concerned with ways of using resources to execute operations. The operational performance could be measured by comparing the input with the output of value creating processes (Baguley P. 1994 pp. 13-14). Similarly, Neely et al. (2005) point to operational performance as a function of two fundamental dimensions: efficiency and effectiveness. Effectiveness is related to the level of meeting the customers' requirements, while efficiency is related to how economically the enterprise is using its resources to maintain or improve customers' satisfaction. Form this point of view; Mabin and Baldstone (2003) define the factors of operational performance in relation to efficiency as throughput, and in relation to effectiveness as inventory and operating costs.

The continuous measurement of the operational performance forms the basis for maintaining or improving the efficiency and effectiveness of internal operations. This is where improving/maintaining the operational performance involves the continuous balancing of operational requirements with the changes to the goals/targets and processes (Naranjo et al. 2008). Therefore, information about operational performance is required to be able to observe and measure the key success/failure factors that influence the operational performance in an enterprise. Knowledge about these factors supports managers in taking early decisions about actions to be taken in order to maintain or improve the operational performance. For instance, these actions may involve resource allocation and usage; this may be influenced by several factors, such as cost per hour, cost of service, or cost per

asset/square metre. Therefore, it is important to continuously align the decisions and choices of the management with the factors affecting operational performance.

As discussed in Chapter Two, the majority of wholesale SMEs enjoy a flexible structure that provides a comfortable environment for operational changes in response to continuous market changes. In this case, ensuring the efficiency and effectiveness of internal operations allows the management to make more rapid and effective decisions. This may be considered as an opportunity that could be taken by making the right actions before competitors do. Therefore, it is important to take advantage of flexibility by making decisions according to the changing performance measures rather than predicting and estimating operational needs and demands (Martínez-Sánchez et al. 2007; Karuppan and Kepes, 2006; Baguley, 1994). In this matter, measuring and monitoring the factors of operational performance alerts the management when changes to the internal operations are necessary.

Therefore, improving the enterprise's capabilities in information technology is a key factor for improving operational performance (Hatch, 2008). In this respect, information systems support decision makers to monitor and control the efficiency and the effectiveness of the internal operations by providing valuable sources of information (Yeung et al. 2008). From this point of view, Huckman and Zinner (2008) claim that enterprises which improve their IT capabilities perceive improvements on their throughput, inventory and operating costs which result in enhancements to their operational performance.

Still, in order for the adoption of technology to work, it is essential that the relevant technology is adopted under the right circumstances and at the right time. In addition, the technology adoption should be understood and supported by the people within the organisation. Therefore, soft or human factors have an effect on the technology adoption which in turn affects the operational performance; the factors of technology adoption are discussed in section 4.5. Accordingly, soft/human factors also have an impact on the operational performance of the enterprise. The soft factors of the operational performance were identified by Sneyd & Rowley (2011) as shared vision, accepted responsibilities, customer focus and group cohesiveness.

This research aims to develop a model that supports the adoption of BI tools in SMEs within the wholesale industry in the UK. The model aims to identify the information processing, sharing, and storing practices within a performance management cycle. This model is proposed to enhance decision making that maintains/improves the operational performance of wholesale SMEs in the UK. Thus, the factors that influence the operational performance are considered as key drivers for the processes that the proposed model highlights.

3.4.2 Operational performance measurement

To achieve higher levels of service at substantially lower costs, it is important to measure and improve operational performance. The operational performance measurement involves the factors of operational performance and their relationships to the internal operations (Manikas & Terry, 2010). The factors of operational performance have been discussed in literature by many researchers; some of the relevant researches are mentioned in the following section. However, as discussed in previous sections, because of the instability of the market (external environment) and its effects on internal operations (operational requirements), flexibility is considered as the key strength in the majority of wholesale SMEs. Accordingly, the factors of operational performance are affected by a continuous change. Therefore, these factors should be continuously measured and used to support decision making that improves/maintains the operational performance in the enterprise.

Performance measurement is “the process of quantifying actions, where measurement is the process of quantification of the action that lead to performance” (Neely et al. 2005). As discussed in the previous section, operational performance concerns the internal operations in the enterprise; therefore, it is measured by quantifying the actions of performing the business operations. Reviewing the literature shows that several studies have investigated the measurement of operational performance (Threat, 1993; Manikas & Terry, 2010; Dal et al. 2000). Sneyd & Rowley (2011) identify the key points to consider when implementing the process of operational performance measurement as illustrated in the following bullets.

- Measure the right things.
- Link strategy to operational work processes (enable employees to understand their goals).

- Relate process performance to customers' needs.
- Determine appropriate measures for each factor.
- Compare the value of the measurement process with the cost of doing it.
- Progressively enhance the measures.
- Distinguish between the measures for different purposes or stakeholders.
- Ensure that measures cover the scope of all the operations.
- Ensure that measurement is accurate and timely.

The measurement of operational performance forms the basis for the decision making that maintains or improves the level of operational performance in the enterprise. This involves calculating the values that represent the measures that influence the factors of operational performance. Therefore, in order for the measurement process to cope with the changes in the internal operations, it is important to cautiously update information about the CSFs of operational performance. Baguley (1994 p.9) defines the characteristics of information about the operational performance factors in the following bullets:

- Timely: concerned only with the current situation.
- Cost effective: the cost of measuring them must be balanced with their potential benefits.
- Credible: seen as realistic and relevant by both those who use them (management level) and those whose performance is measured by these factors.
- Understandable: they are clear and don't need special knowledge for their comprehension.
- Focused: concerns key issues or pulse points in the operations.

Therefore, a successful management should be able to monitor and analyse the factors of operational performance at all times. The operational performance has been measured by many researchers, there is a quite few studies that defined the measures of operational performance from five dimensions and they are cost, delivery, flexibility, quality and innovation (Ferdows & Meyer, 1990; Noble, 1995).

However, there is a common agreement in the literature that adopting information technologies enhances the decision making in SMEs. This is where information technologies are capable of improving the operational control by providing accurate and timely information with the capability of analysing data and making reports. As discussed in Chapter Five, this

creates a relationship between the adoption of Business Intelligence (BI) tools and the operational performance (Ranjan & Bhatnagar, 2011; Zelbst et al. 2010; Jin, 2006; St-Pierre & Delisle, 2006). In this way adopting BI tools provides the information capability for decision makers to monitor and analyse information about the factors of operational performance in order to base their decisions on accurate analysis of the current conditions. For instance, some operational efficiency factors, such as payback period, return on investment, costs and liquidity, may be measured separately or in consideration of less complicated relationships. But using BI tools facilitates complex statistical analysis and comparisons between the operational performance factors and each related measure. This allows the management to identify conflicts or correlations between the CSFs of operational performance. Therefore, this research aims to evaluate the importance of the operational performance factors in terms of their measures, inputs and outputs. On the other hand, this research aims to identify the correlations between the operational performance CSFs and measures as shown in Chapter Seven.

For instance, in wholesale SMEs, the input for customer satisfaction may be affected by the price performance against competitors. A decision to deal with such an issue when it occurs may involve decreasing the return on investment (ROI) factor. But this may decrease the income and therefore affect other factors such as the level of liquidity. In this case, a decision should be taken to sustain the level of liquidity in the enterprise, and the liquidity factor may be increased by the effects of other factors that are correlated with liquidity such as payback periods. The payback period factor is supported by fast and timely orders, thus, this factor may be affected by efficiency factors such as human capital but mostly by effectiveness factors such as supplier response time, orders and supplies consistency or time taken to process an order. The synergy of BI tools with the activities performed in the enterprise operations provides the capability to collect and analyse data, and therefore measure the relationships between all the factors of operational performance to ensure the effectiveness and efficiency of the enterprise operations; this in turn enhances a more effective decision making process that maintains/improves operational performance.

As discussed before, the factors of the strategic performance may differ according to the different visions and missions of companies. In this sense, different types wholesalers may follow different strategies which manipulate different visions and missions. Hence, the factors that influence the strategic performance may vary according to the different types,

strategies, visions, or missions of different wholesale SMEs. This makes it hard to collect and generalize a specific set of factors that influence the strategic performance of wholesale SMEs. This is because the strategic performance is mainly involved with strategy formulation and execution.

However, the proposed model focuses on the factors of the operational performance, still this model also supports the strategic performance management. This is because the operational performance management is involved with providing knowledge about the current performance of the business which could be used to formulate strategies or to monitor the execution of the corporate strategy. Therefore, the strategic performance of wholesale SMEs is also supported through the adoption of the defined BI tools in the proposed model.

3.5 Summary

As discussed in Chapter Two, besides resource constraints, SMEs also suffer managerial weaknesses. In response, the concept of performance management is highlighted in this research as an effective mediator to enhance the managerial capabilities in SMEs. Performance management is defined in this research as a continuous managerial process that involves performing planning, acting and monitoring activities to enhance decision making through the collection, generation, and analysis of information about the enterprise performance. The implementation of performance management processes is considered as a self-renewing cycle that has two main phases of performing the performance management activities (soft phase and the hard phase). The soft phase involves the activities that aim to develop or improve on performance, and the hard phase involves activities to measure the performance indicators. But performance management has different purposes at different organisational levels. For instance, at strategic levels, performance management involves strategy formulation and execution, at operational levels, it involves report making and analysis, and at the team/individual level it aims to evaluate and recognize the employees' commitment and performance. Therefore, the heart of this research is in the implementation of performance management at the operational level. This is where BI tools are mainly involved with report making and analysis to enhance decision making.

Many studies were conducted to determine the factors affecting the operational performance, and reviewing these studies identified several measures for performance from different dimensions such as organisational, innovation, financial, non-financial, quality, and operational performance. For instance, several studies have considered performance from two dimensions: the first dimension is the organisational performance, which concerns financial measures such as revenue, return on investment, profit, etc., and the second measure is the operations performance and factors such as flexibility, delivery, productivity, quality, and reducing costs and waste (Koh et al. 2007; Ramamurthy, 1995; and Beaumont et al. 2002). Feng et al. (2008) added two more factors, which are product/service and customer satisfaction. These factors are relevant to the operational efficiency and effectiveness dimensions that were defined in the previous section as the main drivers of operational performance. Table 3.1 summarises a list of factors affecting the operational performance as obtained from reviewing the literature.

Factor	**Citations**	**Freq.**	**Factors**	**Citations**	**Freq.**
Deliveries lead times	White (1996); Noble, (1997); Germain Voss et al. (2002); Iver (2006); Rahman et al. (2010); Iyer (2011); Peng et al. (2011)	7	Business unit culture	Baird et al. (2011)	1
Product/service Quality.	White (1996); Noble, (1997); Feng et al. (2008); Santa, et al. (2010); Baird, et al. (2011)	6	Inventory management	Baird et al. (2011)	1
Inventory turnover rates	Voss et al. (2002); Germain & Iver (2006); Peng et al. (2011); Iyer (2011);	4	Supplier quality management	Baird et al. (2011)	1
Flexibility	White (1996); Noble, (1997); Germain & Iver (2006); Santa, et al. (2010)	4	cost of products relative to competitors	Rahman et al. (2010);	1
productivity	Feng et al. (2008); Chen and Chen (2009); Rahman et al. (2010);	3	Space utilisation.	Manikas & Terry (2010)	1
Cancelled and returned orders	Peng et al. (2011); Iyer (2011)	2	Financial turnover	Sharp & Crilley (2006)	1
Process	Chen & Chen (2009); Baird et	2	Manager profile.	Sharp & Crilley (2006)	1

management	al. (2011)				
Innovation	Noble, (1997); Chen & Chen (2009)	2	Managerial qualities.	Sharp & Crilley (2006)	1
Data and reporting	Manikas & Terry (2010); Baird et al. (2011)	2	Management style	Sharp & Crilley (2006)	1
Customers' satisfaction.	Feng et al. (2008); Rahman et al. (2010);	2			
Throughput	Mabin & Baldstone (2003); Manikas & Terry (2010)	2	speed of operations	White (1996)	1
Demand chain collaboration	Germain & Iver (2006)	1	Total assets	Chen & Chen (2009)	1
New product/service	Peng, et al. (2011)	1	Cost of operations	Chen & Chen (2009)	1
Dependability of departments	Noble (1997)	1	Net sales	Chen & Chen (2009)	1

Table 3.1 factors affecting operational performance.

Chapter Four: Business Intelligence

4.0 Business intelligence

As discussed in Chapter Two, a loss in manufacturing output in the UK has negatively affected the UK's national output, but the national output was recovering from this loss through the rapid growth in other industries, mostly service and goods industries. This change has caused huge industrial shifts from labour-based to knowledge-based industries.

In this case, the heart of the economic output is the production functions that mainly depend on factors such as labour, capital and materials, and the new economic structure has added the knowledge-base as an important factor that affects the economic output (Godin, 2006). Adding the knowledge-base as an important factor affecting the economic output changes the structure of the economy to become a knowledge-based economy. This is where the concept of knowledge-based economy depends on the production, distribution and use of information and knowledge by most industries to gain more competitive advantage than others (Sureephong et al. 2008). Based on this, Wierzbicki (2007) states:

"Computerized mathematical modelling will be widely used for representing and organizing knowledge in knowledge-based economy and in the new era of informational and knowledge civilisation."

Therefore, the high competition in the contemporary knowledge-based economy forces businesses across different sectors to use information systems for utilising data and spreading information among knowledge workers to support decision making (Karim, 2011). In view of that, using analytical methods for collecting and analysing data to display performance metrics and clarify the business behaviour is commonly referred to as business intelligence (BI) (Hedgebeth, 2007).

The concept of business intelligence emerged as a research topic in the mid-1980s when Rhines (1985) published a paper on transferring artificial intelligence technologies from laboratories into businesses. This paper confirms that computers are capable of simulating some aspects of human intelligence in business, and points to the expert systems as an example of capturing knowledge and using this knowledge to give solutions in predefined situations in the same way as human experts do. From the same point of view, Herring (1988) concludes that artificial intelligence technologies are useful inventions in commerce, industry and government to assist companies in achieving competitive advantage to counter domestic and foreign competition.

Consequently, the roots of defining BI applications start at artificial intelligence technologies, which make BI tools technological-based innovations. But when investing in business intelligence, it is important to consider the organisation of the business in order to align the implementation of technology with the business and people's needs (Allen 2000). This is where Fuld (1991) states that identifying business and people's needs and the information to

support those needs is essential for business intelligence implementations. As a result, the definitions of the term business intelligence may involve different areas such as technology, data analysis and management.

Therefore, different definitions of business intelligence were developed by different authors depending on the need of the definition and according to the author's point of view (Karim, 2011). This section focuses on the development of business intelligence; for this reason, the following subsections aim to provide a complete background about the evolution of BI, identify the tools for implementing BI, and define the CSFs affecting the adoption of BI tools. However, the term BI is a wide research topic which involves all the available software applications that collect and analyse business data in order to generate business insights out of the data (Eick, 2000). In this way, the aim of applying business intelligence applications is to support enterprise users in making better business decisions; these applications may involve "the activities of decision support, query and reporting, online analytical processing (OLAP), statistical analysis, forecasting and data mining" (Jing, 2006). Therefore, before moving to the definition of business intelligence, it is important to consider the use of computer/software technologies in business. The following subsection provides a general background to the development and adoption of computer technologies in business. It then identifies the tools of BI, after discussing the definition and evolution of the term business intelligence.

4.1 IT/IS in business

Information sharing and collaboration is a vital challenge for businesses across different industries (Vanpoucke, 2009). As discussed in pervious chapters, wholesale SMEs require flexible structures to respond to the continuous change in several factors. In this case, information technology plays critical roles in gaining the required knowledge about these factors. Technology adoption enhances the ability of the business to adjust to uncertain situations, such as unforeseen competitor actions and changing customer requirements; this is due to increased availability of information for informed decision-making (Gustin et al. 1995).

To review the evolution of information technology in business, Merle (1995, pp. 3-5) provides a historical overview of the adoption of computer technology in business. The use of computer technology was introduced to businesses during the late 1950s when computers were mainly used for accounting tasks only. In the 1960s, the computer technology expanded to facilitate manufacturing applications such as inventory and production control. After that, during the late 1960s and early 1970s, computer technologies became an important subject for Research and Development (R&D); in this period, researchers experimented how far computer technology could stretch in business. During the mid to late 1970s this R&D period established several events and conditions that forced mangers in all businesses to start looking more closely at information systems. Then, at the beginning of the 1980s, management teams began investigating how to use computer technology as a strategic tool, where information systems could be significant resources to support the business performance. Nowadays, firms are even more aware of the importance of Business Information Systems (BIS) and that the design and analysis of BISs have direct contributions to firm's strategic goals.

The evolution of Information Systems (IS) has formed a nexus among the fields of computer science, management and organization theory, operations research, and accounting (Hirschheim, 2012). Therefore, Information technology (IT) became a very attractive technology for businesses to monitor and react to the factors that affect business performance from different perspectives. IT and IS are relatively new fields that extend beyond the use of new tools to reach deeper and make more valuable changes to the culture of the organisation, where information systems provide the structure of accessing, using and sharing information in organisations (Srisa-ard 2005). Reviewing the literature shows that the wide fields of IT and IS seem to be in a confused state, and differentiating between them is confusing for most people. The field of IS differs from IT by being a combination of management and computer science, while the field of IT is a combination of communication and computer science (Checkland & Holwell 2004 page 9).

Information Technology (IT) is a set of computer-based tools used when working with information to support information gathering, storing and processing using hardware and software (Haag, et al. 2007, p. 29). Similarly, Checkland & Holwell (2004 pp. 8-11) describe IT as a collection of practices, techniques, and devices that deal with collecting, storing, processing and distributing data/information. On the other hand, Information Systems were

defined by Clifton (2000 pp. 9-31) as a set of organised components that work together to achieve specific purposes under some boundaries, and they are implemented by businesses to monitor the business performance and achieve business objectives (such as cost reduction, control improvement and service quality improvement). The development of Information systems is usually related to the development of information technologies, though, but the field of IS also differs from IT by being concerned with the timing of information collection and analysis, IT best practices, the management of IT resources, and the wider applications of IT resources (Checkland & Holwell 2004 p. 10).

Moreover, Information Systems change the way people work together; they integrate with almost all aspects of business to enable new strategies and new business opportunities that support the performance of the business (Pearlson & Saunders 2006 p. 3). Bhatt, G. D. (2000) states:

"The use of business information systems (BIS) has been of enormous importance for eliminating duplicate activities, preventing errors, reducing cycle time in product development, and improving customers' expectations in products and services."

From this point of view, Ranjan (2008) claims that using information systems to make sense of the data flowing within and across the business processes is the key success factor for businesses in knowledge based economies. Different information technologies are used to construct useful information from the available data (such as database query and reporting, data warehousing, online analytical processing (OLAP), data mining and much more).

Therefore, handling and using information flows to set targets and goals is considered to be an important concern which influences the adoption of information systems, as stated by Talvinen (1995):

"To handle the increasing external and internal information flow and to improve its quality, companies will need to take advantage of the opportunities offered by modern information technology (IT) and information systems (IS)."

Accordingly, the adoption of IT in any business serves as the primary vehicle to keep up with growth, complexity and speed of business activities (Hoganson, K., 2001). Therefore,

information technology (IT) is considered as a critical resource that supports and consumes the organisations' resources at the same time. In this sense, research shows that more than fifty per cent of organisational investments in business are in IT, and growing organisations are increasing their investments in different types of IT implementations (Pearlson & Saunders, 2006 p. 3). Based on this, Checkland & Holwell (2004 pp. 8-9) claim that thinking (researching) about the fields of IT and IS cannot keep up with the continuous development of information technology in business. A reason for this could be that the use of information technology can play a role in most kinds of day-to-day business operations where organisations use it in sales, processing data, generating useful information, sharing information (communication), and a lot more. As result, Franks (1998) states that: "The "glue" that binds the various corporate components together is technology".

Moreover, information technologies are adopted by SMEs in order to improve their growth, competitiveness and innovation capabilities (Nguyen 2009). Therefore, developing the adoption of IT is an important aspect for SMEs to survive in the contemporary marketplace (Hoganson, 2001). Harker & Akkeren (2002) describe IT adoption by SMEs as a complex and challenging operational context. And so the adoption of BI tools by SMEs requires understanding of complex data analysis, communication and technology which is far from being simple (stage by stage progression); this is because the adoption of IT systems is influenced by controllable internal drivers and uncontrollable external drivers (Lim, 2009).

The process of IT adoption is defined as the stages taken by an organization before integrating the new/enhanced IT architecture or infrastructure in the enterprise (Kamal, 2006). This process is considered to be successful only when the new/enhanced IT systems are integrated within the organisation successfully. The speed of adopting technology is an important factor for the technology adoption process to be successful, where the business operations need to keep running while the adoption process is taking place. Chibelushi & Costello (2009) identify the factors affecting the speed of adopting new technologies in UK SMEs as:

- SME owner-manager level of education.
- Lack of knowledge regarding the perceived benefits from adopting new ICT technologies.
- Low ICT investment.

- Lack of research and developments (R&D) which leads to lack of innovation.

In order to identify the factors that influence the IT/IS adoption process, the following subsection aims to investigate some of the available models that describe the adoption of IT/IS.

4.1.1 Models of IT/IS adoption

As discussed in pervious sections, the general aim in adopting IT/IS is achieved by successfully gaining business knowledge through the use of information management and data analysis capabilities (e.g. DWH, OLAP, and data mining). Therefore, the factors that influence the adoption of IT/IS in business are related to the use and implementation of information management and data analysis capabilities. Such factors are considered in the literature through the models and frameworks of adopting technology. The adoption of IT involves any technology that could be used to store, process, collect, transport or graphically display data (Knol and Stroeken, 2001). Therefore, several researchers have studied the adoption of IT in business, and a variety of frameworks developed to support IT adoption processes. This section discusses some of the available IT adoption frameworks in the following paragraphs.

As mentioned in previous chapters, this research aims to develop a model of IT adoption that enhances decision making that maintains/improves the operational performance within wholesale SMEs. In relation to this aim, Nguyen (2009) developed a framework through a literature survey to describe the influences of technology adoption in SMEs according to the challenges that have been mentioned in the literature. This model suggests that the sources of challenges that face SMEs when adopting IT are both internal and external. The internal sources are those that depend on the status of the business (such as life cycle of the system and maturity level of the enterprise) while the external challenges are those that depend on the status of the market (such as Market-pull/innovation and Technology push/ competition). On the other hand, this framework categorises the influences to adopt IT by SMEs into four

types of factors, which are organisational, networking, external expertise, and IT capabilities. The following Figure 4.1 explains this framework.

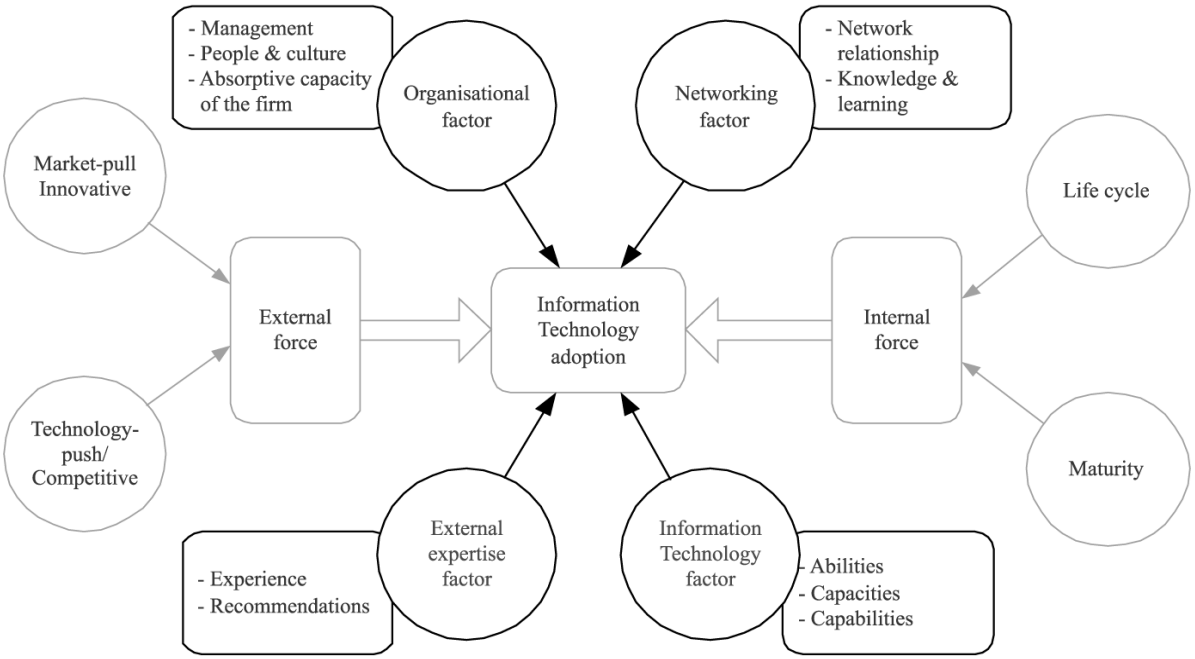


Figure 4.1: Nguyen (2009) technology adoption model.

This model is based on data collected from several researches that have been conducted for different purposes. As a result, this model contributes to the available literature in terms of determining the common (repeated) factors of adopting IT in SMEs. Therefore, in this research, Nguyen's framework could be only used as a reference for the common reasons and factors of adopting IT/IS in SMEs; this is because this framework doesn't clarify guidelines for a way, a technique, or a purpose to adopt technology. On the other hand, the environment of the SME sector is highly heterogynous, hence, the challenges and factors of adopting technology are very varied depending on the environment of each industry; this framework has discussed SMEs in general which makes it very wide and may be not suitable in many cases.

Nevertheless, reviewing the literature indicates that there have been many unsuccessful IT implementations in SMEs; the reason for that could be the limited level of knowledge and/or skilled owner-manager & workers within the SME as discussed in previous sections.

Proudlock (1999) claims that in order to reduce the possibility of an unsuccessful IT adoption, the variables of IT adoption must be examined before the adoption takes place. These variables include IT planning, choice of IT adoption strategy, IT training and investment, and the need to employ external support.

In this matter, Delone & McLean (1992) developed an information systems success model for applying management information systems to impact the organisational performance. This model claims that the adoption of ISs impacts two success factors for the business, which are the individual performance and the organisational performance, and this impact is affected by two key factors: user satisfaction and the way of using the IS. On the other hand, the quality of the information and the quality of the system itself are the factors that influence the user satisfaction and use of IS. Figure 4.2 represents the IS success model developed by Delone & McLean (1992).

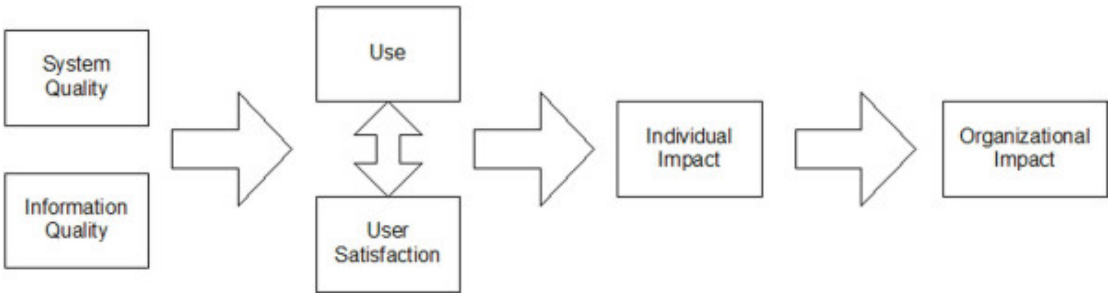


Figure 4.2: Delone and McLean (1992) IT adoption model.

This model suggests that the success of adopting ISs depends on the interactions between several factors, hence, it suggests that considering the interactions between success measures is vital when adopting ISs. The model is based on a literature survey and it has been further studied through hundreds of papers to apply, validate, challenge, and propose enhancements to the original model (Delone and McLean 2003). The contributions of these papers were grouped ten years after the introduction of the model and are considered by Delone and McLean (2003) to develop a refined version of the model. The refined version of the model introduces only minor refinements; these refinements advocate the application of the measures that exist rather than the development of new measures. This is because the term “impacts” may be negative or positive, the updated Delone and McLean model

combines the individual and organisational impacts measures into a single measure (Net-Benefits).

On the other hand, a lack in net-benefits may lead to decreased use and user satisfaction; therefore, the updated version of the model adds a feedback loop between the net-benefits measure and the system's use and user satisfaction measures. Moreover, the measures of information quality and systems quality may affect the systems use and user satisfaction measures jointly or separately. Consequently, the updated version of the model suggests measuring these measures separately. In addition, the growing development in using ISs and e-commerce increases the effect of service quality on the success of information systems. Hence, the service quality measure has been added to the model. Figure 4.3 shows the refined version of Delone and McLean's model.

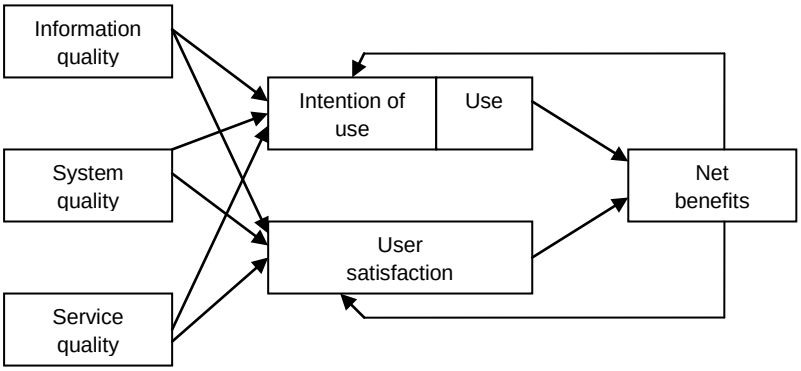


Figure 4.3:Updated D&M IS Success Model. Source: Delone and Mclean (2003)

The Delone and McLean model considers the drivers of a successful information system, but it ignores the drivers of a successful IS adoption process. In this sense, Ammenwerth et al. (2006) describe the drivers of a successful IT adoption process through a framework designed for the health services sector. The framework suggests that a successful IT/IS adoption process depends on the fit between the attributes of individual users (such as computer anxiety and motivation), processes/tasks (such as organisation and task complexity), and technology (such as usability, functionality, and performance). Therefore, this framework is known as Fit between Individuals, Tasks, and Technology (FITT). Figure 4.4 represents the FITT framework.

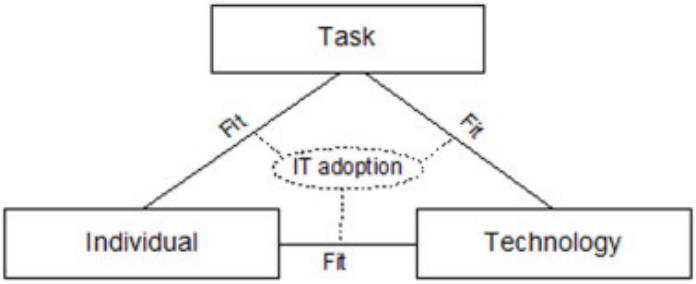


Figure 4.4: FITT framework. Source: Ammenwerth et al. (2006)

The FITT framework identifies three dimensions of IT adoption (Task, Technology and Individual); each dimension is influenced by several attributes and interventions. The attributes aspects of each factor are discussed in the following bullets:

• Attributes on individual level: IT knowledge, motivation and interest in the task to be completed, flexibility and openness to new ways of working, team culture, organizational context, cooperation within a team, and politics within an organisation.

• Attributes on task level: Organisation of the tasks to be completed, activities and their interdependence, complexity of tasks.

• Attributes on technology level: Stability and usability of a software or hardware tool, costs of a tool, functionality, available technical infrastructure, integration of tools, availability of tools in a certain clinical situation (Ammenwerth et al. 2006).

The intervention aspects are categorised into direct interventions and external influences. The direct interventions are the interventions that could be controlled by the management; these intervention are mentioned in the following bullets.

• Intervention on the individual level: user involvement, training, user support, management motivation.

• Intervention on the task level: working processes, clarification of responsibilities.

• Intervention on the technology level: Hardware and software updates, redesign of paper-based forms, network upgrade.

The external influences are the uncontrollable factors and they are mentioned in the following bullets.

• External influences on the individual level: Staff changes, workload of staff, changes of strategy.

• External influences on the task level: Rising complexity of the task (e.g. by new legal documentation requirements), general organisational changes in the organisation, changes in patient profiles.

• External influences on the technology level: New software standards, new technological achievements.

This model has been used by several researchers, for example, the FITT framework has been used by Lepanto et al. (2011) to study the relation between task-technology fit and the perceived net benefits of adopting technology. This study points to the FITT framework as a valid tool to assess perceived benefits. Moreover, Liu et al. (2011) investigate the relations between the dimensions of the FITT framework. This study describes the relationship between the task, technology and individual dimensions as a double-edged sword; this is where an increase in the fit between the individual and technology dimensions decreases the fit between the individual and task dimensions. However, the development of the FITT framework is based on a literature survey. Therefore, this framework has included the common/repeated factors of IT adoption in the literature, categorised them in three categories (Individual, task and technology) and identified the measures of each category. But there were no sector specific factors; hence the suitability of the FITT framework is not restricted to the health care sector.

4.2 Definition of Business Intelligence (BI)

The earliest appearance of the term business intelligence was by Luhn (1958) in the IBM journal article, and it was used to describe as an automatic system that distributed information to the various sections of any industrial, scientific or government organisation. However Reviewing the literature shows a common agreement that the first definition of business intelligence was born in 1989 by Howard Dresner while working as an analyst in Gartner Inc. (Chou et al. 2005; Karim, 2011; Management Today, 2006). This definition describes BI as “a broad category of software and solutions for gathering, consolidating,

analysing and providing access to data in a way that lets enterprise users make better business decisions" (Karim 2011).

Nevertheless, the term business intelligence has appeared in a lot of research before 1989, when Howard Dresner claimed the introduction of the term. Searching the term "business intelligence" as a phrase on scholar databases returns several publications before the year 1989; for instance, on Emerald database there are 34 publications and there are 600 on Summons. In this matter, it is believed that Gartner Inc. had a strong impact on the IT industry, and when their researcher addressed the definition of business intelligence, the term became closer to CIOs and IT managers. Therefore, the credit for defining the term business intelligence has been given to Dresner rather than other researchers.

All the reviewed literature seems to agree on that the aim of applying BI is to acquire information (knowledge) that enhances decision making in the enterprise. Still, defining the term business intelligence involves wider knowledge-gathering techniques and tools; thus, researchers across various fields have defined BI for different purposes or uses. In this respect, some studies describe BI as knowledge (eg. Fiora, 1998; Hill & Scott, 2004) and others describe BI as the implementation of information systems (e.g. Herschel and Jones, 2005; Management Today, 2006). Haag et al. (2007, p. 527) differentiate between the two points of view by describing BI as knowledge and the BI system as the IT implementations to support BI, as shown in the following bullets.

- BI is "knowledge about your customers, your competitors, your business partners, your competitive environment, and your internal operations. That gives you the ability to make effective, important and often strategic business decisions."

- The BI system is "the IT applications and tools that support the business intelligence function within an organisation."

However, reviewing the literature indicates that BI is an interest of many scholars across different areas (e.g. HR, Marketing, Finance, management, etc.). New definitions of BI emerge with the changes in researchers' needs; nonetheless, all the available definitions of BI consider the importance of information; therefore, new definitions of BI may emerge with the developments in the IT industry as well. The following bullets include some of the common definitions for BI over the past two decades.

- “To constantly monitor and assess the emerging market, the players, and the instruments and forces of change” (O'Brien and Fuld, 1991).
- “Business intelligence is a series of systematic techniques to collect, validate, analyze, and deliver public information and expert insights about the competitive environment to those in your firm who can act upon it” (Fiora, 1998).
- “Business intelligence is the rational application of the principles of intelligence services to business. It is simply the collection, analysis, and application of strategic information to business decisions” (Marren, 2004).
- “The integration of core information with relevant contextual information to detect significant events and illuminate cloudy issues for management decision-makers. It includes the ability to monitor business trends, to evolve and adapt quickly as situations change and to make intelligent business decisions on uncertain judgments and contradictory information” (Hill and Scott, 2004).
- “The decision making using data warehousing and online analytical processing techniques (OLAP)” (Herschel and Jones, 2005).
- “The acquisition of information, often by the use of technology, about one's own operations and those of one's competitors” (Management Today, 2006).
- “The mixture of the gathering, cleaning and integrating data from various sources, and introducing results in a mode that can enhance business decisions making” (Karim 2011).

According to the definitions above, knowledge is the main requirement for intelligence, and therefore, business intelligence could be described as business knowledge acquiring activities. Lonnqvist and Pirttimaki (2006) define BI as knowledge about the business environment (e.g. markets, customers and competitors) and the organisation (e.g. business performance and economic issues). Likewise, Dobbs et al. (2002) indicate that knowledge is the key building block of BI, where the aim of BI is enabling decision-making according to business knowledge rather than making assumptions. This knowledge could be gained through the internalisation of information, data, and experience (Stuhlman, 2010); hence, knowledge could be described as the utilisation of information (Metaxiotis et al. 2002).
In business, data provides business information about business aspects such as people, products, operations and locations. This information is necessary to answer business questions (e.g. which product is the best? how are my sales and my people doing?). The answers to such business questions provide knowledge about the business, and decisions are made based on this knowledge. As a result, business information is the input to business

knowledge, which is the input to intelligence. Therefore, businesses across different industries have focused on the utilisation of information as an important aspect in generating business intelligence.

As a result, tools that are used to support the achievement of business intelligence are mainly concerned with creating knowledge through information gathering and processing functions. Therefore, the tools of supporting business intelligence are discussed in the following section (section 4.3) in order to identify the main tools of business intelligence. In addition, this research aims to propose a model that aligns the roles of business intelligence tools in the performance management cycle of wholesale SMEs. The identification of BI tools is vital for the development of the proposed model in this research.

4.3 The tools of business intelligence

BI mainly concerns the use of IT/IS to enhance decision making in business. Therefore, BI tools may be defined as any computer technology that could be used to support decision making in business. Therefore, the roots of identifying BI tools start at the first computer technology that was used in business to manage information and support decision making. The following paragraphs aim to identify the main BI tools through explaining the developments in IT/IS technologies to support decision making in business.

As discussed through the previous sections, because business information is valuable, and it needs to be stored and used, businesses require information management capabilities. In this matter, the need for an intelligent solution to store and use information has emerged. In response to this need, the concept of databases was introduced by the mathematician Dr Edgar Codd while working as a researcher at IBM. Dr Codd realized that the discipline of mathematics could be deployed to manage information, and based on this he developed the rational model for data management (databases). His first definition of databases appeared in the IBM research report published in 1969 (Date, 2009 p. 6 and Halpin and Morgan, 2008 p. 17). In this paper by Codd (1969), the normalisation process was defined as the process of organising data into entities, each entity with its own attributes, and then the interrelationships between those entities were defined (Ries, 2011 p. 10).

To generate business knowledge, information should be applied in the right time at the right place and in the right manner (Folkes, 2004). Therefore, the concept of databases is considered as an important information resource that creates business knowledge. This is where businesses tend to record data from their business transactions directly on the database to access information and gain the required knowledge for making effective decisions. But, besides information storage, other information management capabilities are required to access knowledge from databases. That's why information systems in the 1970s were designed to expand the uses of information technology in business, therefore, issues such as data access and user friendliness have become concerns for future development of IT applications. This is where ISs aim to create a functional and pleasant environment that fulfils the users' needs (Jain, 2003 p. 23).

After introducing the concept of databases to businesses during the early 1970s, new IT vendors were founded, providing innovative information management capabilities (ISs) to enter, manipulate and retrieve data from the database. For instance, the software provider SAP was founded in 1972 by former IBM employees (Delaney, 2003). Likewise, J.D. Edwards was founded by McVaney in 1977 (Liedtke, 2003). In this period, the available ISs for businesses were based on the classical online transactional processing (OLTP) applications to enter, update or delete current data in the database (Bivio, 2012). In this since, OLTP applications where considered as the main facilitators to use business data from databases, which is an early facilitator for BI processes.

To describe the alignment of IT technologies in business; it is important to discuss the architectures of business information systems. The architectures of information systems are typically divided into three layers: presentation layer, business logic (application) layer, and the data layer (Clementini and Billen, 2006; Huang et al. 2000). The IT applications of the 1970s had the three architectural layers installed in one system or server. This architectural design is described as 1-tier architecture, also known as monolithic architectures because the entire software components are installed on one machine (tier). Thus, the features of the presentation, the functionality of the application and the capacity of the database all share the same memory and processing capabilities, and they have ended up interfering with one another (Khanna, 2008 p. 53). This is because if there were more than one application in use, the data would be coming from multiple locations (applications) where each application has its own data layer (database).

In this matter, connecting the data from different applications provides deeper uses of information (Kepczyk, 2005). This is where accessing data from different applications is of vital importance to monitor the business performance and support decision making (Songini, 2002). But in the 1970s, information access was only to fragmented data that was stored in different applications. In this matter, storing the data outside the operational system enables the incorporation of data from different applications (Taylor, 1999).

Consequently, the need for an intelligent solution to access data from different applications has emerged. In response to this need, the advent of data warehouses became an important aspect for the development of IT applications in business. The concept of data warehouses was originated by IBM researchers Barry Devlin and Paul Murphy in a seminar paper called "An architecture for a business and information system" that was published in 1988 in the IBM Systems Journal (Bouman et al. 2010 p. xxxi). Nevertheless, Hayes (2002) claims that during the 1980s, IT vendors built experimental data warehouses only, until 1991 when "W.H. Bill Inmon made data warehouses a practical solution by publishing the how-to guide, Building the Data Warehouse (John Wiley & Sons)."

However, during the same period of introducing data warehouses, the term business intelligence was formally defined in the IT industry by Howard Dresner. The use of data warehouses has become a requirement for the implementation of an effective business intelligence system. Therefore, the DWH are considered as the first BI tool; this is where data warehouses provide the capability for storing large amounts of information from different applications which are then used to generate knowledge, but this knowledge is captured from different IT applications and contained in different dimensions for different purposes. Therefore, advanced data reporting and analysis tools are necessary to establish connections between data from different dimensions and grasp knowledge from this data.

In this sense, before introducing data warehouses, each information system was designed to solve a particular problem and each application stored its own data independently, which was simple non-dimensional data. But with the advent of data warehouses, business data models became more complicated as they are developed through the dimensional data modelling techniques as explained in section 4.4.1. In this way, different kinds of historical data from different applications were grouped in one place, which makes it complex and hard to understand (Codd et al. 1993). Therefore, the concept of online analytical processing (OLAP) was introduced by the founder of databases, Edgar Codd, in 1993 to offer a

competent solution for the analysis of dimensioned and aggregated information from the data warehouse to support decision making (Halpin and Morgan, 2008 p. 841); the operations of OLAP are discussed in section 4.4.2.

In view of that, the first definition of the term business intelligence emerged in the IT industry at the same period of introducing data warehouses and OLAP applications. Therefore, early business intelligence systems were based on these tow tools. The data warehouse involves the aggregation of historical data from different operational databases and in different dimensions. And OLAP applications are employed to facilitate a multi-dimensional view of data in order to discover knowledge from the aggregated data in the data warehouse, this knowledge in return is used to support decision making. But in order to make use of the features these tools to generate business knowledge: the operational/front end application (OLTP) are vital to function the defined tools. OLTP applications involve transferring the current data from business transactions to its operational databases which feed the DWH. Moreover, as a development on the tools of business intelligence to gain more advanced analysis on data, data mining tools are used to (automatically or semi- automatically) identify correlations between data from different dimensions and discover hidden knowledge. The uses and benefits of data mining techniques are further explained in section 4.3.3.

However, the architectural design of ISs is also considered to be a key area for improving IT applications to fulfil users' needs (Jain, 2003 p. 23). Therefore, the increasing demand on computational power has resulted in the development of new computer architectures composed by multiple machines/systems connected by a network (Martins et al. 2012). The computer architectures has developed from "the stand-alone computer systems of the 1960s to the networked stovepipes of the 1970s and 1980s to the glued-together middleware systems of the 1990s, and finally to the present-day disaggregated, service-oriented architecture model" (Balter, 2011). According to these architectural developments, the roles of information systems in business have also developed. "Information systems in 1960s and 1970s were used as tools for data processing, in the 1980s, their role evolved to that of systems that supported managers' needs to take better decisions. The 1990s saw the role of information systems change to "strategic", i.e. systems that support business goals of organizations and help to create competitive advantage" (Pant et al. 2001). The 1980s has "witnessed the introduction of a wide variety of new computer architectures that complement and extend the major approaches to parallel computing developed in the 1960s and 1970s" (Duncan, 1990), hence, during the 1990s, high performance and distributed computing capabilities have emerged (Tourino, 2007). These parallel computer capabilities helped in

reducing the computation time for data reporting and analysis processes (Pahner et al.1999).

In this sense, the introduction of data warehouses has encouraged the development and use of more functional multi-tier architectures for IT applications in business. This is because data warehouses store the data from different applications on a discrete server independently from the application and presentation layers of each application. In this instance, client/server architectures divide the software system into server and clients, the client applications contain application and presentation layers for each application independently, and the server application contains the data layers from all the available IT applications in a single server or data warehouse (Folmer et al. 2006). Therefore, "client/server computing has become the dominant form of architecture for information systems in the 1990s" (Dringus, 1999), where distributed client/server architecture has replaced the old central computing paradigm, increasing the need for end users support (Forsman, 1998).

With the increasing number of enterprise applications such as business process and information integration, and information search and navigation; improved IT capabilities became necessary for businesses. These capabilities may be evaluated in terms of scalability, performance and efficient storage and manipulation of large scale data (Lee, 2006). In response to this, in the 2000s, computer and communication technologies have joined up and developed towards complicated networks (Zhouying, 2002).

However, as noticed in the previous discussion, during the last three decades, some of the key developments on IT/IS technologies in business aimed to facilitate the successful use or to better utilise the features of data. Based on this, analysing the uses and the features of data warehouses can provide a clear explanation of roles of BI tools in supporting decision making in business. Therefore, the following section (section 4.4) discusses the significance and features of data warehouses in business, and the roles of the different BI tools in utilising these features. This is considered as significant in this research in order to understand the roles of BI tools, to be able to effectively align them in the proposed model in this research.

4.4 Data warehouses

Businesses across different industries consider data analysis as a generator of knowledge that supports decision making. This knowledge provides the required answers to make the right decision and to drive strategic actions (Chu, 2003 p. 206). In operational databases, the data is normalised to a large extent, which aims to enforce consistency, reduce redundancies and to allow data retrieval of individual records. Databases work fine within their operational systems, but they are not suitable for complex data analysis in enterprise wide systems (Ramachandran et al. 2010). Therefore, data warehouses (DWH) were designed to provide the required capability for businesses in all sectors to effectively store and analyse data; Baker and Baker (1993) state that: “Analysis is the number one reason organizations and executives give for wanting a data warehouse.”

Data warehouses (DWH) are large data repositories that organize integrated historical data in a specific logical design that supports analytical purposes (Malinowski and Zimányi, 2006). This logical design of data warehouses is known as star schema or the multi-dimensional model, and it seeks a high performance data access and analysis for aiding decision making. This is where, in a DWH, the key data entities are arranged as multiple dimensions (subject areas) rather than multiple relations as in the case of databases. In this way, DWHs provide a multi-dimensional view of data that enhances the decision support queries (Ramachandran et al. 2010).

Therefore, DWHs could be described as central information storehouses that are used to access and process information in different ways than databases. DWHs are defined as enterprise-wide database management systems that are capable of managing large amounts of data in a design that enhances the use and analysis of data in businesses (Griffin, 1998). Likewise, Chu (2003 p. 35) defines a DWH as “a set of computer databases specifically designed with related historical blissful data that assist in formulating decisions and taking action.” The most common definition of DWHs is the original definition coined by Inmon (1990), which defines the DWH as “a subject-oriented, integrated, time-variant, and non-volatile collection of data in support of management’s decisions” (Chu, 2003 p. 6). According to this definition, the characteristics of DWHs are used to differentiate between operational databases and DWHs in table 4.1.

Characteristics	Data in Data Warehouses	Data in Databases
Integrated	Include data from different sources in different formats, and then it defines and standardizes all the aggregated data and stores it in a separate environment **(Chu, 2003 page: 207)**.	Include data from a single source which is the application where the database is installed.
Subject-oriented	The integrated historical data is arranged an organized by dimensions, each dimension represents a subject area.	The data is arranged by rational within a single subject (purpose of the application).
Time-variant	Represents the data flow over time. Data is added periodically (Little and Gibson, 2003).	Represents data about current transactions. Data is added continuously.
Non-volatile	Data is read only and it can't be modified or removed (Little and Gibson, 2003).	Data may be modified or removed.

Table 4.1: Differentiating between DWHs and databases

Moreover, the main features of DWHs are to cleanse and consolidate corporate data, report on the data and to enhance data analysis (Baker and Baker, 1993). As discussed in previous sections, the role of BI tools could be defined by discussing the utilisation of the features of DWHs in business. The functions of each feature are discussed in the following sub-sections to explain the design and implementation of DWHs as BI solutions and their corresponding tools.

4.4.1 Cleanse and consolidate corporate data

To cleanse corporate data, DWHs replicate data from operational databases and external sources (e.g. emails or news) on periodic bases, and stores the aggregated data on a read only database that is used to discover patterns of behaviour to support decision making (Little and Gibson, 2003). Accordingly, DWHs require a large amount of memory, thus, DWHs are typically maintained separately from the operational applications to prevent

slowing or negatively impacting other operational systems (Chu, 2003 p. 207). And to consolidate corporate data, DWHs model the data in a way that makes querying and reporting easier. This is where DWHs contain summary and detailed data; the detailed data is obtained from the operational databases and kept for analysis purposes, the summary data is generated to describe the detailed data, and it is used for reporting purposes (Little and Gibson, 2003).

The detailed data (e.g. customer or sales records) is categorised into subject areas and contained within dimension tables where each dimension represents a dimension table that contains data about a specific subject (e.g. human resources, customers, sales, inventory or products) (Wu et al. 2012). The summary data represents the business performance measures (e. g. number of customers or amount of sales); each measure represents a fact on the business performance and all the facts are grouped in the facts table (Harinath and Quinn, 2006 p. 6). The central entity of the DWH is the facts table, and it contains summaries of enterprise-wide data that provide an overall view of the business performance (Guan et al. 2002). Each dimension table is connected to the facts table in a one-to-many relation, which generates the multi-dimensional view for each performance measure.
Figure 4.5 demonstrates the multi-dimensional (start-schema) view of the sales fact.

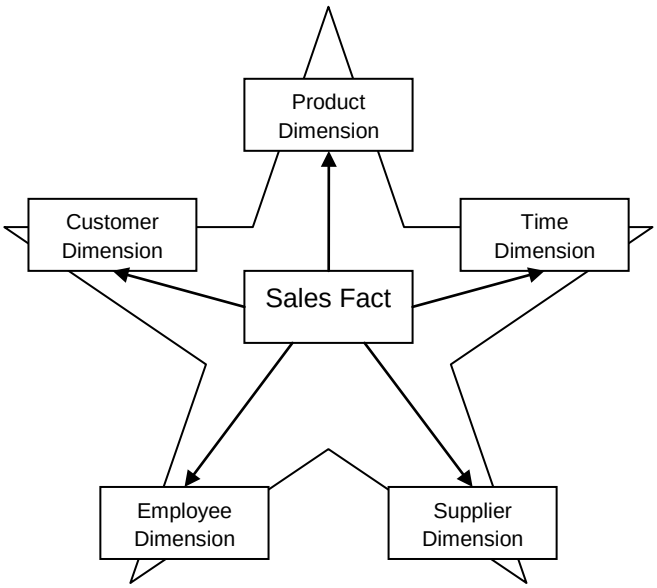


Figure 4.5: An example on a multi-dimensional view for the sales fact table.

The dimension tables are contained within the DWH in smaller DWHs known as data marts (Guan et al. 2002). Hence, data marts are also known as departmental databases (Ha & Park, 1998) where each data mart is meant to involve a single subject to support a specific department (Coskun Samli et al. 2002). Chu (2003 p. 35) defines data marts as "a type of data warehouse with data specifically designed for a defined set of functions." This is where each department has its own interpretation of how the data mart should look and what it should contain. Thus, data marts are created according to specific needs defined by a specific department (Damirchi & Shafai, 2011).

Based on these concepts, several approaches to data modelling have emerged; these approaches describe data models that aim to develop and operate DWHs efficiently and effectively. The approaches of data modelling for DWHs are generally based on two main approaches: the dimensional modelling by Kimball and the normalised modelling by Inmon (Breslin, 2004). Both of these approaches agree on the elements of a DWH (dimensions and facts) and that dimensional modelling is a main data modelling technique for developing DWHs.

But the normalised and the dimensional approaches differ in the methods of using these elements to build the DWH. This is where the normalised approach starts with using the traditional modelling approach used with databases (ER modelling) to build the DWH; after that, the DWH feeds data into dimensionally modelled data marts (Jukic, 2006). Implementing the normalised approach starts at developing the facts table (summary data) and then it moves down to identify the detailed data (dimensions), thus, the normalised approach is described as the top-down approach. On the other hand, the dimensional approach defines the DWH as a union of dimensionally modelled data marts fed directly from the operational databases, thus suggesting that building a DWH is not necessary (Sherman, 2005). The dimensional approach is described as bottom-up approach, where building the DWH begins with building the data marts, which contain detailed data, and then it moves up to calculate the measures of the summarised data in several facts tables.

There is still no agreement on which approach is better for developing DWHs, where DWH practitioners and researchers mention several advantages and disadvantages for each approach. Because the normalised modelling approach builds the DWH with an underlying ER model, the DWH could form the basis for dimensional and non-dimensional data

extracts. But in the dimensional approach, dimensional data marts are built without an underlying ER model, so it only involves the extracts of dimensional data, so it doesn't offer an enterprise-wide focus. On the other hand, the normalised data modelling process requires a high level of expertise to create the facts table and the corresponding ETL processes. While in the dimensional modelling approach, the facts table is not built in the first place. Therefore, Jukic (2006) describes the normalised approach as a more extensive and powerful approach, and the dimensional approach as a quicker and simpler approach.

However, the main idea in both approaches is the dimensional data model (DDM). The DDM arranges data into facts and dimensions, where facts represent summaries of data obtained from operational databases, and then dimensions represent subject-oriented detailed data that contain the context of the summary data (Gavin, 2005 page: 15). Developing the DDM starts at defining and modelling business processes to precisely outline the focus of the required decision support queries (performance measures). In this way, the focus of the dimensional model involves a set of measurements for the outcomes of the defined business processes (Ramachandran et al. 2010). Gavin, (2005 p. 22) defines the steps of designing the DM as:

- Businesses processes: defining the business performance measures, and it results in defining the facts table.
- Granularity: defining the required level of detail in data.
- Dimensions: defining the kind of data that goes into the front end application pick lists where those dimensions are fed directly from the operational databases.
- Facts: creating the facts table that contains summaries of the data from dimension tables.

4.4.2 Report on the data

Another purpose of implementing DWHs is to report on data; this purpose is considered by most companies and executives as the primary function of DWHs (Baker and Baker, 1993). This is where business' data flows from the DWH to various departments for reporting purposes; each department uses specific dimensions or data marts from the DWH (Ha &

Park, 1998). But DWHs are huge repositories of dimensionally modelled data, and digging into these repositories for querying and reporting is very hard and time consuming. Therefore, an analytical application is required to process queries that generate views of data in order to keep the management up-to-date about the state of their business (Damirchi & Shafai, 2011). In this case, businesses use online analytical processing (OLAP) applications to meet their reporting needs in order to support decision making across departments (Malinowski and Zimányi, 2006). This is where OLAP applications assist the decision making by enabling managers to view appropriate groups of data from the DWH, and define the relations between these groups (Datta and Thomas, 1999). Accordingly, Lau et al. (2004) define OLAP applications as converting raw data into meaningful knowledge that reflects the dimensionality of the enterprise, in an understandable manner that supports effective decision making.

Therefore, the main concepts that drive OLAP applications are dimensions and measures (facts), where dimensions are used to define subject areas of different data groups, and measures are calculated to provide a summarised view of the detailed data (Chen et al. 2009). As a result, OLAP applications facilitate a multi-dimensional view of data for users to access the features of DWHs (Chowet al. 2005). This multi-dimensional view is provided by OLAP applications through four main operations that aim to 1) adjust the level of detail in data, 2) select data groups, 3) define data groups, and 4) generating summarised data (facts) from detailed data (dimensions). These operations are described by Luján-Mora et al. (2004) as: roll-up (presentation of data at a higher level of detail), drill down (presentation of data at a lower level of detail), slice/dice (data selection and projection), and pivoting (re-orienting the multi-dimensional view of data).

The operations of OLAP manipulate data from the multidimensional data cube in order to generate business reports, this is where slice and dice operations are used to extract data from the DWH, roll-up and drill-down operations are used to view data in different levels, and pivot (or rotate) operations are used to view data in different dimensions (Lee et al. 2011). Figure 4.2 represents the execution of OLAP operations on a multidimensional data cube.

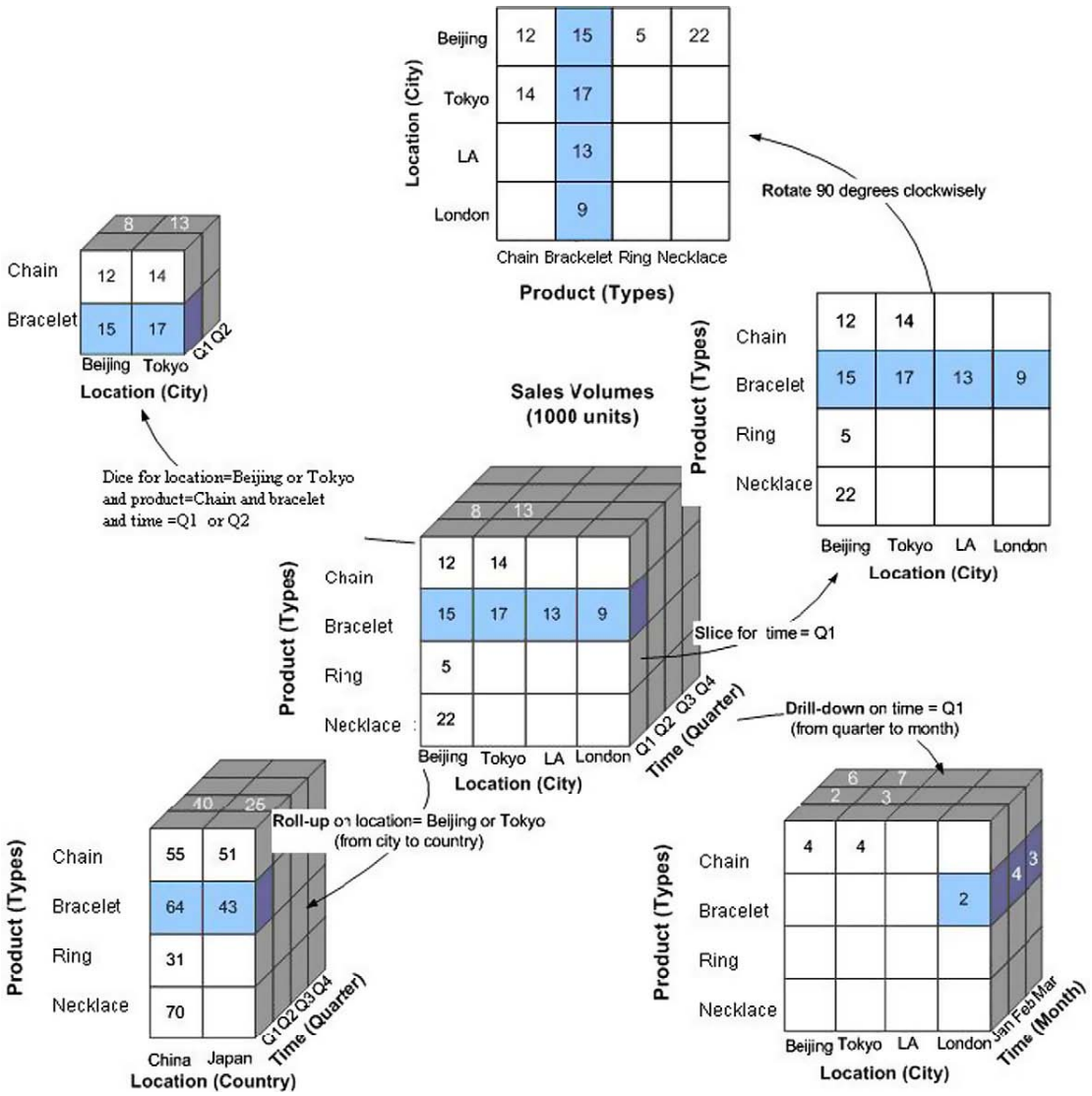


Figure 4.6: OLAP operations on a multidimensional data model of product sales. Source: Lee et al. (2011)

These operations translate multi-dimensional analysis into SQL statements and queries in fact tables; after that, managers view the results in different forms of graphical output (e.g. bar charts, pie charts, cross-tabulation tables) (Shi et al. 2007). An example of a multidimensional query is one that may allow the decision maker to retrieve data from the data cube in order to discover the sales volume and tax amount in the years 2005 and 2006 at the south west territory. The query used in this example was demonstrated by Lee et al. (2011) as:

"SELECT {[Measures] _ [Sales Volume], [Measures] _ [Tax Amount]} ON COLUMNS, {[Date] _ [Fiscal Time] _ [Fiscal Year] _ &[2005], [Date] _ [Fiscal Time] _ [Fiscal Year] _ &[2006]} ON ROWS FROM [Sales Analysis] WHERE ([Sales Territory] _ [Southwest])"

The OLAP council define OLAP as: “the category of software technology that enables analysts, managers and executives to gain insight into data through fast, consistent, interactive access to a wide variety of possible views of information which has been transformed from raw data to reflect the real dimensionality of the enterprise as understood by the user” (Ma et al. 2000). Reviewing the literature shows that there is a common agreement on the definition of OLAP that was introduced by the OLAP council (Ma et al. 2000; Lee et al. 2011). Nevertheless, “there is still no agreement on a conceptual model for DW and OLAP design that offers both a graphical representation and a formal definition” (Malinowski and Zimányi, 2006). But, the multidimensional data cube is considered to be the logical model that drives the development of OLAP applications, but even though, the operations that manipulate the data cube may vary considerably in different data models (Bose, 2006). Therefore, the operations of OLAP applications need special and customized support (Chow et al. 2005). Accordingly, the cost of querying and reporting is the most dominant cost of using DWHs (Gupta and Mumick, 2006). Goeke and Faley (2007) describe DWHs as large, expensive, and risky projects where the average installation cost of a DWH is $1.5 million and may exceed $50 million, and this doesn’t include the annual maintenance and operating costs.

4.4.3 Enhance data analysis

Data analysis is the process of extracting useful information out of raw data, this is where Alexander (2010, p. xxix) defines data analysis as “the process of systematically collecting, transforming, and analysing data in order to present meaningful conclusions.” Businesses from different sectors perform data analysis to support decision making, for instance data analysis could be used to make HR decisions (Meisinger, 2003), or to make marketing decisions (Gregory, 2011). Mastouri and Boumaiza (2011) define data analysis as “the process of gathering, modelling, and transforming data in ways that generate decisional information.” In view of that, a general description of data analysis is to turn data into information that answer questions, hence, identifying questions is considered to be the prerequisite for extracting useful information (Hand, 1998). As a result, the process of data analysis involves identifying questions and then extracting information. In this sense, Wallace (2002) defines data analysis as “the process of examining data files and information to detect and highlight transactions and patterns that show possible irregularity.”

The evolution of computer technologies and software packages made data analysis infinitely easier (Theodore and Gatchel, 2008). But Jarke et al. (1999) claim that data analysis is considered to be useful only if it results in an operational action. In view of that, the purpose of performing data analysis is described by Blumenstock et al. (2009) as discovering what needs changing and how to ensure that deficiencies are reduced. To do so, decision makers will need to look beyond the departmental reports by looking at numbers from different dimensions (Guan et al. 2002). Therefore, with the increasing data volumes in business, traditional data analysis has become insufficient and more sophisticated data analysis methods have become necessary (Rupnik et al. 2007).

Therefore, nowadays, business decisions are based upon detailed and accurate information that is the outcome of careful data analysis, which increased businesses' interest in utilising the features of data analysis from DWHs in order to make firm decisions (Corbitt, 2003). This was during the1990s, when businesses started using DWHs to store vast amounts of data (Gorla and Krehbiel 1999) and to facilitate a widespread information delivery (Ma et al. 2000). Additionally, DWHs equip decision makers with effective decision support capabilities to run reports and perform data analysis by integrating data from different sources into a single repository (Zhiyong et al. 2005). As a result, the use of DWHs eliminates the need to visit multiple locations to collect and analyse data; thus, the features of DWHs enhance data analysis in terms of reducing the required time to access data and perform data analysis (Rezaee et al. 2002).

A data analysis course always takes place with a predefined objective in mind, which identifies what is important in a problem, what counts and what doesn't count (Hand, 1998). In view of that, using DWHs enhances the orientation of data analysis towards the objective or the problem of the analysis where Pinet and Schneider (2010) state: "By combining data from different sources, it is possible to show the correlations between objects dealt with, for example, to show the links between a type of industrial installation and disease." In this way, DWHs provide a multidimensional view of data which offers the ability to compute aggregated data with lower levels of detail (facts) from subject specific data sets (dimensions) with higher levels of detail; this in turn facilitates a subject oriented data analysis, otherwise, the analysis may produce biased results and therefore erroneous

decisions (Mazón et al. 2009). In this case, the operations of OLAP applications provide decision makers with the ability to perform multidimensional queries to view data in different dimensions and at different detail levels (Lee et al. 2011).

But in terms of data analysis, OLAP operations are only capable of exploring the problem as it occurs for the analyst (Laha, and Mandal 2008, p. 158). And Omiecinski (2003) states that nowadays, identifying hidden or unknown interesting patterns by exploiting large data volumes has become a primary task in business. As a result and in addition to OLAP operations, businesses use knowledge discovery techniques to redefine problems in new and unforeseen ways (Dyche, 1999). Accordingly, data mining tools have become promising technologies for businesses to perform data analysis and discover novel, useful and hidden knowledge from massive data sets (Chen et al. 2002).

This is where data mining techniques use the data itself to discover interesting patterns while OLAP operations depend on predefined patterns, whereas in using OLAP operation the analyst defines the interesting patterns and then uses queries to verify or disprove them (Coskun Samli et al. 2002). Chen and Liu (2005) state, “data mining is a very useful technology that opens new opportunities for data analysis.” In this way, data mining techniques are capable of identifying the combination of causes that are liable for causing a problem (Laha, and Mandal 2008, p. 158) and this could be used to discover new knowledge about the business operations (Thierauf, 2001 p. xiii). As a result, data mining techniques have successfully infiltrated the business world, giving solutions to problems that were previously solved with traditional tools. Reviewing the literature indicates that the term data mining began to appear in business intelligence literature during the 1990s and research from different areas has characterised the term according to the thoughts and the needs of the researcher.

The common definition of data mining is discovering patterns in data; the following bullets include some of the common definitions for data mining in order to get closer to a general definition.

- “Analyzing data to assess known relationships as well as to find interesting patterns and unknown relationships” (Murray, et al. 2009).

- Finding hidden information in databases (Kokotos and Linardatos, 2011).

- "The search for valuable information in large volumes of data" (Chang, et al. 2010; Hansen and Nelson, 2002; Aggarwal et al. 20012).

- Discovering patterns in data by automatic or semi-automatic means (Lin, et al. 2011; Plessas-Leonidis et al. 2010; Druzovec et al. 2005; Xu et al. 2007; Orfila et al. 2007).

- “Extracting information that resides implicitly in the data” (Delgado et al. 2011).

- The extraction of useful information from data to 1) identify unknown and potentially interesting patterns (or item sets) hidden within data that is stored on databases, and 2) to identify the associations between the interesting patterns (Yun et al. 2012).

According to the definitions above, a general definition of data mining could be the process of extracting valuable information from large databases by automatic or semi-automatic means to identify interesting patterns and the associations between them. Still, this definition describes the process of data mining but doesn’t characterise the functions of data mining to identify what is interesting. In this matter, Maimon and Rokach (2005 p. 656) claim that what is interesting is ultimately subjective; it is thus difficult to specify a formal definition for the characteristics of interestingness when digging in large data sets. For that reason, the concept of data mining encompasses a range of different techniques that identify interestingness in data by using different methods (Adderley et al. 2007; Mennis and Guo, 2009). Most of these methods are relatively recent developments based on the area of artificial intelligence, so they require limited human involvement (Kuo and Shih, 2007). In this sense, the available definitions of data mining are specific to the different needs of different researchers; this is because different researchers may define different sets of techniques for data mining. Table 4.2 mentions some of the data mining techniques that were defined by different researchers.

Technique	Citations	Frq.	Technique	Citations	Frq.
Clustering	Camus and Brancaleon (2003); Montastruc et al. (2011); Zaïane (2002); Wilson et al. (2004) Dai et al. (2007)	5	**Link analysis**	Montastruc et al. (2011) Wilson et al. (2004)	2

Deviation detection	Montastruc et al. (2011) Wilson et al. (2004) Camus and Brancaleon (2003) Zaïane (2002)	4	**Disproportionality**	Montastruc et al. (2011) Wilson, et al. (2004)	2
Association	Zaïane (2002) Peacock (1998) Dai et al. (2007)	3	**Analysing changes**	Camus and Brancaleon (2003)	1
Classification	Camus and Brancaleon (2003) Dai, et al. (2007)	2	**Sequence analysis**	Zaïane (2002)	1
Data summarisation	Camus and Brancaleon (2003); Zaïane (2002)	2	**Decision trees**	Peacock (1998)	1
Neural networks	Peacock (1998); Camus and Brancaleon (2003)	2	**Genetic algorithms**	Peacock (1998)	1

Table 4.2: Some of the defined data mining techniques in the literature.

Therefore, there is still no agreement on a formal definition for data mining that describe the processes and functions of data mining (Shortland and Scarfe, 2007). The functions of data mining may differ according to the techniques used. But then again, some researchers have proposed some general functional definitions for data mining as shown in the following bullets.

- The use of statistical, pattern recognition and machine learning tools to support the analysis of data and discovery of patterns, trends and rules that lie within data (Rupnik et al. 2007).

- "The use of numerical analysis, visualization or statistical techniques to identify non-trivial numerical relationships within a dataset to derive a better understanding of the data and to predict future results" (Weaver, 2004).

The definitions above identify the functions of data mining according to a set of statistical techniques. Therefore, a universal definition that describes the functions of data mining will need to cover all the available statistical techniques for data mining, which is hard because these techniques are many and new techniques are emerging over time. Consequently, Corbitt (2003) divides the statistical techniques of data mining into two sets of tools known as discovery and verification tools. The discovery tools are used to discover new patterns in

data (Corbitt, 2003), and the verification tools are used to assess the validity of a particular numerical solution (Enright, 2006).

Data discovery tools are used to help businesspeople identify patterns within a large mass of data (Tan et al. 2003) and data discovery tools are used to find available data resources as well as screening and filtering tools to assist them in deciding which available data will be useful for analyses (Horsburgh et al. 2011). Data discovery techniques may include data visualisation, neural networks, cluster analysis and factor analysis (Corbitt, 2003). Although, data discovery tools work in a similar manner to statistical tools (Tan et al. 2003), the data verification tools use more familiar statistical techniques (Corbitt, 2003). Data verification tools are used to detect the potential defects in formally represented knowledge (Van-Engers and Glassee, 2001). The data verification tools calculate a predicted output for each data analysis course, and then the predicted outputs are compared to the actual outputs on a case-by-case basis (Catley et al. 2006).Data verification tools may include regression analysis, t-tests, correlations and forecasts (Corbitt, 2003). As a result, data discovery and data verification tools differ in terms of user participation. In this way, data discovery tools are self-managed tools with more user-friendly settings that reduce the participation of users in the analysis process. Tan (2003) states that “the user of a data discovery tool just needs to know how to run it to obtain satisfactory answers,” while the user of data verification tools must be a statistician to use them effectively.

4.5 Summary

In the UK, the nature of the industrial concentration in knowledge based-industries has encouraged the knowledge-based economy, where enterprises are more concerned with acquiring business knowledge in order to compete and survive in the market. This has increased the demand from enterprises in adopting IT/IS technologies to gather and analyse information. Therefore, this research suggests that exploiting the concept of business intelligence (BI) supports the performance of wholesale SMEs in the UK to enhance decision making that maintains/improves operational performance. This is where BI is mostly concerned with gathering, consolidating, analysing and providing access to data in a way that enhances knowledge creation. The roles of BI were clarified in this chapter by identifying the tools of BI and their features and functions in business.

As a result, this research studies the diffusion rather than the development of information technologies within wholesale SMEs. In this sense, the focus of the research is on studying the influence of adopting information technologies on improving the operational performance, rather than focusing on improving the performance of the defined information technologies. The research defines a unique combination of disciplines across the areas of business studies and information technology to propose a business intelligence model that encourages the use of information technologies to improve the operational performance of SMEs.

However, adopting information technologies may have different motivations than adopting BI tools. But rather than studying the development and motivation of adooting information technologies; this research studies the utilization of technology in the targeted sector according to the common needs and opportunities. This is a gap in the literature because the research could not find any similar studies that develop a BI model which considers the performance management cycle to respond to needs and opportunities of wholesale SMEs. Therefore, general models that concern the adoption of information technology were examined to derive the CSFs that ensure successful processes of adopting information technologies, which supports the diffusion of these technologies.

The tools of BI are usually deployed in business to make the best use of information in creating business knowledge that enhances decision making. These tools are any computer technology that could be used to enhance decision making in business. As discussed in section 4.3, the main computer technologies that support the roles of BI in business could be summarized as: data warehouses, OLAP applications, and data mining tools. The identified tools of BI are basically IS technologies; therefore, the factors that influence the adoption of IT/IS also influence the adoption of BI tools. Based on this assumption, the factors that influence the adoption of BI are identified in section 4.2.1 by reviewing some of the relevant models and frameworks that concern the process and success of adopting IT/IS. The identified factors are summarised in Table 4.3.

Publication	Method	Success factors
Nguyen, T. H. (2009)	Literature review	organizational (internal environment) Networking Top management External expertise IT capabilities
Delone & Mclean (1992)	Literature review	System quality. Information quality. Use of IS. User satisfaction. Individual impact. Organizational impact.
Levy, M. et al. (2011)	Mixed approach: Case study/questionnaire	IS investment alignment between IS and business strategies Path of alignment. Market position.
Ammenwerthet al. (2006)	Literature review	Individual - organizational. Task. Technology.
Macredi & Mijinyawa, (2011)	Case study	Economic benefit. Complexity. Compatibility. Information and communication channels. Innovation. Capital investment. Technology compatibility.

Table 4.3: Factors affect IT/IS adoption defined from relevant models in the literature.

Chapter Five: Summary and analysis of the literature survey.

5.0 Summary and analysis of the literature survey.

The literature survey is an essential part of this research. It involves investigating secondary data sources to distinguish disciplines from the literature that relate to the research topic (the adoption of BI tools to enhance decision making that improves operational performance management within wholesale SMEs in the UK). The secondary data sources in this research were obtained from books, academic publications (journals and research papers), conference proceedings, news, and commercial reports. In addition, for the purpose of recognising the potentials of the research problem, the researcher has participated in a similar project and attended various workshops and seminars to obtain the initial secondary data directly from experts, practitioners and researchers in the fields of IT/IS and business.

The task of the literature survey in this research is to use information gathered from several sources to formulate the foundations of the investigation. To ensure that all the relevant literature to the research problem has been recognised, and due to the fact that the logic of this research is deductive, the literature survey was the first step in this research in order to develop relevant hypotheses. But, because the main purpose of this research is to develop a model that is influenced by several factors; the hypotheses were replaced with the CSFs that influence the roles of the different disciplines in the development and application of the proposed model in this research.

Examining the problem of this research has revealed references across a broad range of disciplines, which could be summarised as: wholesale industry, SME sector, performance management and business intelligence. Therefore, the body of literature in this research is vast and scattered across different disciplines. In this matter, it is not the intention of this literature survey to provide any overview, assessment or summary of the relevant disciplines, but it focuses on the contributions or the roles of these disciplines to the research problem. In this sense, the literature survey in this research is designed to be broad but selective in order to pick the essentials from each discipline. Hence, to describe the secondary data investigation in this research, the term literature survey seems more appropriate than literature review. This is because the word 'survey' is defined as examining, recording or reporting the features of a specific area of interest (Oxford English Dictionary), while the word 'review' is defined as a critical assessment of something that has already happened or a formal examination of something with intention of instituting change (Oxford English Dictionary).

This literature survey is multidisciplinary; it aims to define two main perspectives (requirements and CSFs) across all the related disciplines that could play a role in supporting the operational performance of wholesale SMEs through the adoption of BI tools. These disciplines were defined through the chapters of the literature survey as wholesale industry, SME sector, performance management, and business intelligence. And in each discipline, the defined requirements and CSFs are meant to contribute to the development of a model that integrates the features of BI tools with roles of the performance management at the operational level within wholesale SMEs in the UK. Accordingly, the two main intentions of this literature survey are to provide the required background about the research problem through defining the requirements for the proposed model, and to identify the relevant CSFs that influence the development and adoption of the proposed model.

Therefore, this literature survey illustrates a systematic view of the research problem in each of the defined disciplines from two main perspectives: the requirements and CSFs that influence the model application and development. The requirements focus on formulating the required background on each related discipline to define the roles of the disciplines in the development of the proposed model, and the CSFs focus on identifying factors that influence the roles of the discipline in adopting and developing the proposed model. Addressing these perspectives for each related discipline aims to establish the required background for developing a performance management model which aligns the features of BI tools with the

roles of performance management activities at the operational level, to improve the performance management within wholesale SMEs in the UK. In turn, this will achieve the research objectives RO1, RO2, and RO3 as shown in figure 1.2.

Accordingly, the findings of the literature survey are classified into two categories: requirements and CSFs. The requirements category covers the elements of the required background which are SMEs' weaknesses and strengths, SMEs' threats and opportunities, the roles of performance management, the roles of business intelligence (BI), and the essential BI tools with their corresponding features. The CSFs category covers the CSFs that influence the problem of this research and they are obtained from the defined related disciplines.

The justification of this classification is based on the main purpose of the literature survey, which is to obtain the required knowledge to develop a model that: 1) supports performance management in wholesale SMEs through measuring, monitoring and analysing the operational performance, and 2) aligns the appropriate BI tools with the roles of performance management activities at the operational level in wholesale SMEs. A fishbone diagram in Figure 5.1 shows the comportment of the literature survey in utilising the requirements and the CSFs of each discipline to develop the proposed model in this research.

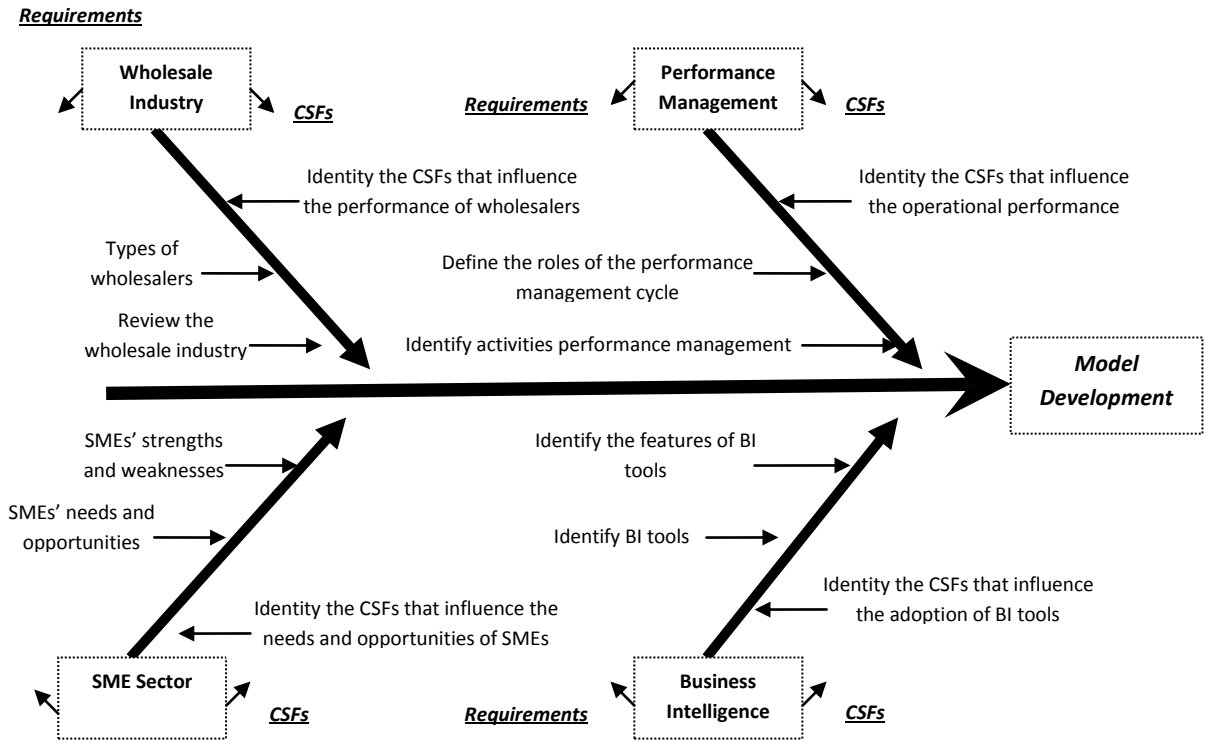


Figure 5.1: The process of the literature survey.

n in figure 5.1, the disciplines located on the left side of the diagram are concerned with defining the motivations for developing the proposed model by reviewing the needs in . And the disciplines located on the right side of the diagram are concerned with functional aspects of the proposed model by defining the roles and the features of the model. The multidisciplinary nature of the literature survey initiates two different sets of CSFs that may influence the development of the proposed model in different ways. In this sense, the CSFs are categorised into two separate sets of CSFs.

The first set generates the soft CSFs which concern the successful adoption of the proposed model in terms of absorbing threats and identifying opportunities. And the second set generates the hard CSFs which are directly related to the functions of the proposed model in terms of measuring and monitoring the operational performance.

Both of these sets integrate together with the requirements of the defined disciplines to develop a model that aims to improve the performance of wholesale SMEs. To explain this integration Figure 5.2 illustrates a conceptual model of the literature survey in developing a business intelligence model for wholesale SMEs. At the heart of this conceptual model is the

dual nature of the proposed model that combines the activities of performance management at the operational level with the features of the defined BI tools. The requirements are located at the bottom of the conceptual model and they contribute to the model development by means of defining the activities, the required BI tools, and threats and opportunities to be considered in defining the guideline information to improve performance.

The soft CSFs are to the left of the model and they contribute to the model development by defining the guideline information to take opportunities, ensure a successful adoption of the model, and measure the operational performance. And the hard CSFs are to the right of the conceptual model and they contribute to the development of the proposed model by defining the relevant factors in order to be measured through the proposed model to monitor and improve the operational performance.

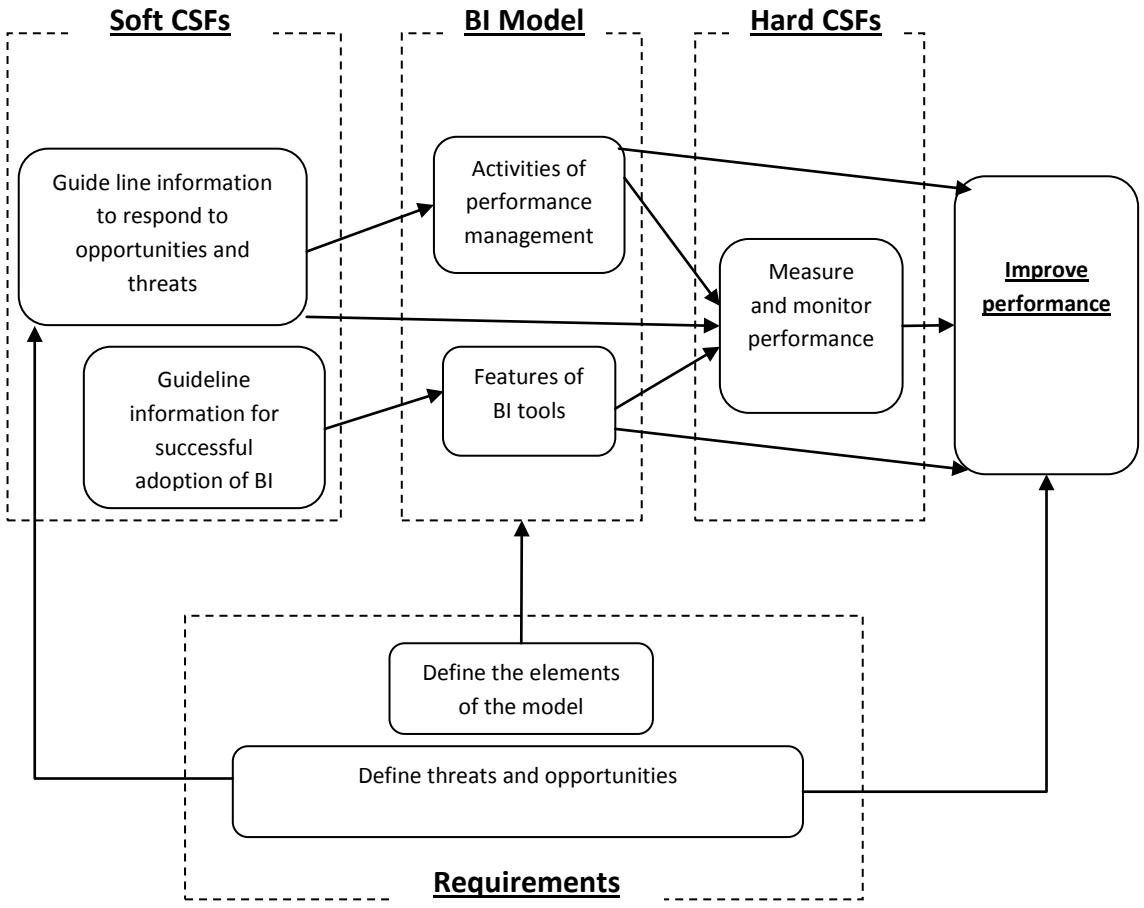


Figure 5.2: Conceptual model of the literature survey

E gs of the literature survey will in turn contribute to the design of an industrial questionnaire that aims to validate the defined CSFs, and to evaluate the defined needs and opportunities of SMEs in terms of their requirements and capabilities. In addition, the industrial survey also validates the proposed

model in this chapter based on the correlations between the model elements and the defined CSFs. The requirements and CSFs of the related disciplines are discussed separately in the following subsections. Then, based on the obtained knowledge from the literature survey, section 5.3 discusses the development of a preliminary version of the proposed model to be validated through the industrial survey in chapter seven.

5.1 Requirements

Most of the available literature on SMEs' characteristics when compared with large enterprises has focused on resource constraints (O'Regan and Sims, 2006; Oke et al. 2007; Taplin, 2005; Lo and Humphreys, 2000), managerial weaknesses (Chaston, 1994; Hankinson et al. 1997; Maltay, 2000; Wong & Merrilees, 2005), and organisational strengths as flexibility and quick response (Deshmukh, 2001; Julien, 1993; Nooteboom, 1994; Khalique, et al. 2011). And because of similar SMEs' characteristics when they are compared to large enterprises, the defined weaknesses and strengths of SMEs could be generalised for the majority of SMEs across different industries (Nootebbom, 1994; Julien, 1993; Dangayach and Deshmukh, 2001). Resource constraints may vary depending on the industry and type of resources; but, similar needs and similar opportunities could be generated from similar organisational weaknesses and strengths.

To this end, beside threats of constraints on human (Taplin, 2005), financial (Vos et al. 2007), and information resources (Walters et al. 2005; Caldeira and Dhillon, 2010), the managerial weaknesses generates training and development threats (Demougin and Siow, 1996; Laird, 1984, p. 11-13), and the organisational strengths facilitate globalisation (Jardine, 2008; Vasconcellos et al. 2011; Peel and Bridge, 1998) and innovation (Nootebbom, 1994; Simon 2002; O'Regan et al. 2006; Gray, 2006) opportunities. In this sense, the weaknesses of SMEs are translated into needs that aim to support resource availability, training capability, and development capability. And, the strengths of SMEs could be translated into opportunities that are supported by flexibility and quick response.

The wholesale industry could be described as an important economic entity that contributes to the performance of the national economy in the UK (Yip and Rugman, 2006). This is where wholesalers form important links in the distribution industry (Rosenbloom & Warshaw, 1989; Bucklin, 1993). In the UK, the wholesale industry has always been an important intermediary for producers to market their products (Moffat, 1992; Mustaffa and Potter, 2009). Therefore, wholesalers possess a pricing power in the market which imposes the retail prices (Coe and Hess, 2005).

This research targets SMEs operating within the wholesale industry. And to identify these firms, besides the definition of SMEs, the UK's standard industrial classification (SIC) scheme was used to target participating businesses in this research according to their type of economic activity (sector) (Hughes and Brook, 2009; Ang, 1995). The wholesale sector was defined in the 2007 SIC scheme in division 46 of section G. In addition to the SIC classification, wholesalers could be classified into three main types: merchant wholesalers, manufacturers' sales branches and merchandise agents (Kotler et al. 1995; Lusch & Vargo, 1998). In this way, the targeted firms using the SME definition and the UK's SIC scheme could be further classified according to the type of wholesalers.

To support the targeted sector (wholesale SMEs in the UK), this research extends prior previous research in three ways. First this research shed light on the importance of wholesale SMEs for the wellbeing of the economy in the UK. In view of this, the gap in the literature is identified and fulfilled in this research by signifying the wholesale SMEs as important economic entities which are influenced by similar CSFs that influence their success, operational performance management, and IT adoption. Therefore, the efforts of this research are focused on supporting the performance of this industry as a vital step that ensures the wellbeing of the economy. Chapter Three outlines the performance management discipline in order to explain the process of managing and improving performance and its influencing factors.

The performance management is defined in this research as a continuous management cycle of collecting, analysing and generating performance information to support decision making (Moynihan, 2008 p. 5), operations (Waal, 2002), and teams and individuals (Boselie and Wiele, 2002). And the performance management cycle consists of two phases,

categorised as soft and hard (Parker-Gore, 1996; O'Connor, 2007 p. 139). The activities of the soft phase are involved with improving and developing performance; and the activities of the hard phase are involved with performance measurement (Forslund and Jonsson, 2007; Fitt, 1992). As a result, as shown in figure 3.1, the activities of the performance management cycle are adopted from Deming (1986) as plan, act, monitor, and review, plan and act are the soft activities of the cycle, and the hard activities are monitor and review. And applying the performance management has different purposes at different organisational levels (strategic, operational, and individual) (Brudan, 2010).

Second, according to the purposes of performance management, this research argues that because of the different types of wholesalers, they may follow different strategies which influence different purposes of performance management at the strategic level. And also, because of the different strategies and individuals' characteristics, the purposes of performance management may differ between wholesalers at the team/individual level as well. As a result, because the roles of wholesalers are identified in the distribution channel; the process and the purpose of performance management could be similar for companies within the wholesale sector only at operational levels. Therefore, Chapter Three argues that the operational performance management of wholesale SMEs is influenced by similar CSFs, and these factors were identified as the factors that influence the operational performance. And because the process of performance management at the operational levels is associated with report making and analysis (Forslund, 2012); Chapter Four highlights the discipline of business intelligence as an enabler of an effective process of operational performance management by enhancing report making and analysis.

Although interest in business intelligence began in the late 1980s, an investigation of the literature on the evolution of business intelligence shows that BI appeared with the introduction of the first IT implementation that enhanced decision making in business. This is because business intelligence refers to using information systems in supporting decision making (Hedgebeth, 2007; Eick, 2000). And later, during the 1990s, the term business intelligence was formally defined and became a common interest for software providers. There is a common agreement in the literature on the definition of business intelligence as defined by Howard Dresner in 1989 (Chou et al. 2005; Karim, 2011). This definition defines BI as "a broad category of software and solutions for gathering, consolidating, analysing and

providing access to data in a way that lets enterprise users make better business decisions" (Karim, 2011).

According to the definition of BI; IT adoption in business is considered as the core of BI. This is where, tracing and identifying the tools of BI may involve all the information systems that could be used to generate knowledge that enhances decision making in business. In this research, the BI tools are defined according to their features in supporting the roles performance management activities at the operational level (report making and analysis) within wholesale SMEs in the UK. Accordingly, BI tools are identified in Chapter Four as the main concepts that appeared in the literature to support the business intelligence practice in terms of report making and analysis. These tools were defined as data warehouses DWHs, OLAP applications and data mining tools (Jing, 2006). This is because the features of the defined BI tools take effective roles in supporting performance management activities at the operational level. The data warehouses facilitate storing and sharing data with different applications, OLAP applications facilitate navigating through data from the data warehouse and reporting on data, and finally the data mining tools facilitate analyzing and reviewing data to find hidden knowledge in the data warehouse. OLTP applications were also recognized as the facilitator to use the defined BI tools; this is where OLTP applications facilitate the regular and systematic collection and access of data that is used by the defined BI tools.

Past literature addressing the use of the identified BI tools shows that because of technical requirements, the adoption of BI tools is a costly and risky action (Gupta and Mumick, 2006; Goeke and Faley, 2007). And the literature also shows that the features of BI tools are expected to enhance decision making that improves the operational performance management (Halpin and Morgan, 2008 p. 841). As a consequence, this paradigm indicates that BI tools should be adopted if the operational performance is to be maximised through monitoring and analysing the CSFs that influence the operational performance.

Accordingly, because wholesalers share similar operational requirements; this research suggests that adopting BI tools to improve the operational performance management in wholesale SMEs could be supported by a model which can provide the required platform to fulfil their needs and opportunities. In this matter, this research recommends utilising the

features of BI tools in the targeted sector to enhance the operational performance management. The proposed model in this research integrates the features of BI tools with performance management activities at the operational level. This is where the adoption of BI tools seems to fit the requirements of the performance management cycle at the operational level through collecting, processing and analysing data about the defined CSFs within wholesale SMEs.

Third, the available literature provides various models that deal with the adoption of BI tools from several perspectives, but none of the reviewed models have met the requirements of this research. This is where the literature survey reveals a variety of models that aim to describe successful IT implementations (e.g. Delone & Mclean, 1992; Ammenwerth et al. 2006, Nguyen, 2009; Levy et al. 2011; Macredi & Mijinyawa, 2011). These models don't encompass the purposes and constraints of adopting IT in a particular sector, nor do they deal with features and the factors that influence performance management activities. In other words, there have been no attempts to integrate the vast amount of operational performance factors in a compact model that makes use of BI tools in the performance management cycle within wholesale SMEs.

Consequently, the proposed model in this research must base itself on and link with the different needs and opportunities of wholesale SMEs, as well as taking into account the different factors and activities that influence the effectiveness of the model. This research is an attempt to provide both through the analysis of a multi-disciplinary literature survey to construct a model based on knowledge gained from the literature. Then, because there are no similar models in the literature, an industrial survey will aim to validate the preliminary version of the proposed model through an industrial questionnaire survey in the specific sector of the research.

The average cost of adopting BI tools was estimated by Goeke and Faley (2007) as $1.5 million and it may exceed $50 million, hence, the effective adoption of BI tools may be prevented in wholesale SMEs due to limitations on their financial resources. Therefore, the adoption of the proposed model may exceed the capabilities of the majority of wholesale SMEs in terms of financial resources and skill levels. This is where customising the adoption of BI tools according to the needs and opportunities of wholesale SMEs requires specific

skills and investments to carry out the replacement of their performance management activities with semi and fully automated performance management processes supported by the features of BI tools.

In this matter, it is suggested in this research that the cost of adopting BI tools could be reduced by generalising the customisation requirements of the defined BI tools for wholesale SMEs. This is where the limited financial resources coupled with the low skill levels in the majority of SMEs reduce the ability and capability of wholesale SMEs to customise the utilisation of BI tools to fulfil their needs. Therefore, a generic customisation of BI tools for the whole sector may eliminate skill and investment requirements for customising the adoption of the defined BI tools within wholesale SMEs. Based on this, table 5.1 includes some specific elements of particular importance in reviewing and considering the various requisites for the development of the proposed model. Moreover, figure 5.3 explains the relevance of the proposed model to improving the performance through responding to threats and opportunities.

Model elements	**Requirements**
Analysis of BI tools	
DWHs	Cost for implementation and maintenance, and data modeling skills
OLAP	Cost of querying and reporting
Data mining	Data analysis and customization skills
Analysis of performance management activities	
Systematic and regular collection of data	Staff Commitment and access to data
Converting data into CSFs	Implementation of Data warehouses
identifying success and failure areas	Implementation of OLAP applications
Comparing performance	Information resources, implementation of data mining tools.
Setting targets and goals	Change management and operations flexibility.
Table 5.1: Requirements for a business intelligence model	

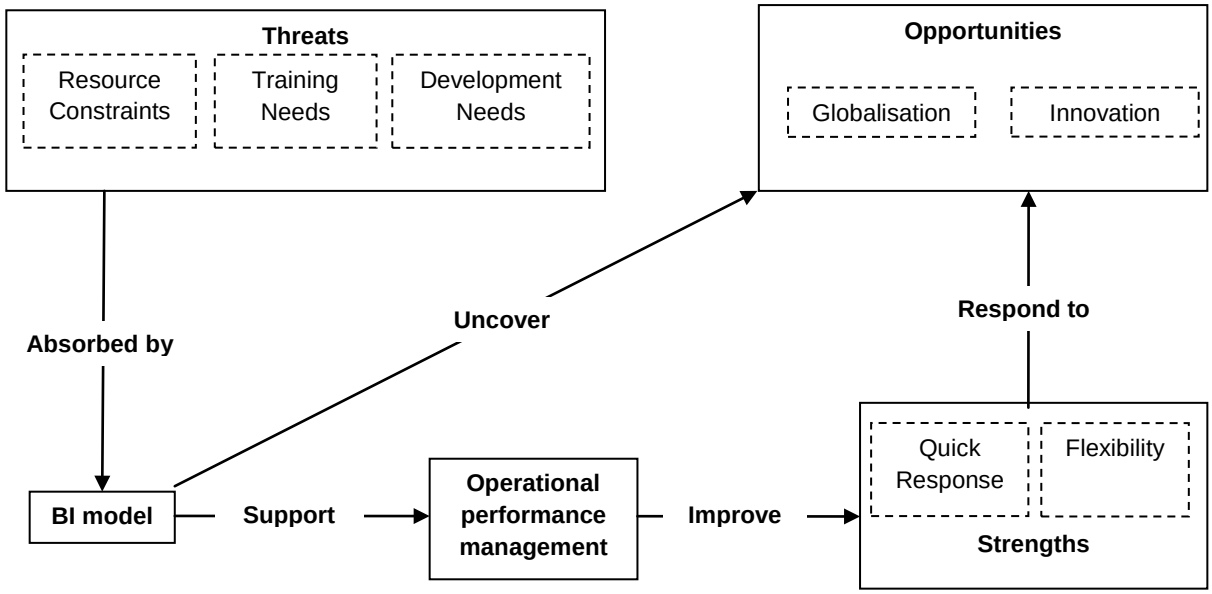


Figure 5.3: Requirements for the proposed model.

5.2 Analysing the Critical Success Factors (CFSs)

As discussed before, the focus of the proposed model in this research is to identify targets and goals for improving on the operational performance within wholesale SMEs through their organisational planning activities. In this matter, Daniel (1961) states that the organisational planning should focus on the success factors that influence the success of the company. The proposed model in this research aims to reinforce the process of monitoring and measuring the success factors of wholesale SMEs. To do this, the proposed model demonstrates the integration of performance management activities with business intelligence tools in planning and acting for improving the performance of wholesale SMEs by monitoring and measuring the success factors that influence the operational performance. As a result, in addition to the success factors that influence the operational performance, the success factors that ensure a successful adoption of the defined activities and tools should also be considered in the development and application of the proposed model.

In this sense, this section aims to identify the CSFs that influence the roles of four main disciplines in supporting the research problem (supporting the adoption of BI tools and performance management activities within wholesale SMEs in the UK to enhance decision

making that influences operational performance). These CSFs are categorised into four sets of factors according to the relevant disciplines (wholesale, SMEs, operational performance and IT/IS adoption). The links between these sets of CSFs are explained in figure 5.4; and the factors were identified through the chapters of the literature survey in tables 2.9, 3.1, and 4.3; which produced a total of 114 factors as shown in table 5.2.

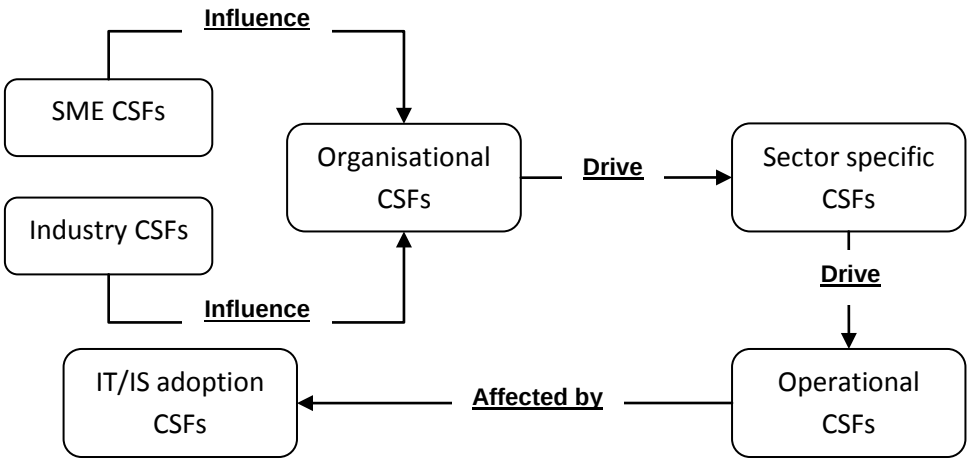


Figure 5.4: the links between the different sets of CSFs.

Wholesale Industry	SME Sector	Operational Performance	Business Intelligence
1. Customer buying habits. 2. Marketing mix. 3. Availability of middlemen and resources. 4. Competition. 5. Environmental factors. 6. Operational efficiency. 7. Socio-	23. Training capabilities. 24. Development capabilities. 25. Resources constraints. **Innovation**: 26. Innovation strategy.; 27. Human resource management.; 28. Creativity management.; 29. Portfolio management.; 30. Implementation; 31. R&D strategy; 32. Top **Globalization**: 47. Demographic.; 48. Socio-cultural.; 49. Politico-legal.; 50. Macroeconomic.; 51. Global; 52. Technological; 53. Competitive; 54. Management commitment; 55. Human capital; 56. Skill levels; 57. Training and	62. Deliveries lead times 63. Product/service Quality. 64. Inventory turnover rates 65. Flexibility 66. productivity 67. Cancelled and returned orders 68. Process management 69. Innovation 70. Data and reporting 71. Customers' satisfaction 72. Throughput	90. Compatibility. 91. Information and communication channels. 92. Innovation. 93. Capital investment. 94. Technology compatibility. 95. System quality. 96. Information quality. 97. Use of IS. 98. User satisfaction.

economic factors. 8. Customers 9. Computers. 10. Market changes. 11. Location. 12. Legal changes 13. Communication. 14. IT/IS adoption. 15. Volume discount.. 16. Trade-offs between transports. 17. Purchasing and warehousing costs. 18. Selection of suppliers. 19. Cost of new customers suppliers or services. 20. Market reseller strategies. 21. Transport services. 22. Liquidity.	management support. 33. Customer focus. 34. Capability of organizational learning. 35. Operational collaboration, skills and techniques. 36. Supplier relationship management, 37. Competitive strategy. 38. Change management. 39. Firm characteristics. 40. Process analysis. 41. Process reengineering 42. Information technology 43. New ways of work. 44. Technical aspects. 45. Process design. 46. Technology change.	Development 58. Industrial 59. Infrastructure. 60. Electrical power. 61. Telecommunication services.	73. Demand chain collaboration 74. New product/service 75. Dependability of departments 76. Business unit culture 77. Inventory management 78. Supplier quality management 79. cost of products relative to competitors 80. Space utilisation 81. Financial turnover 82. Manager profile. 83. Managerial qualities 84. Managerial qualities 85. Management style 86. speed of operations 87. Total assets 88. Cost of operations 89. Net sales	99. Individual impact. 100. Organisational impact. 101. IS investment. 102. alignment of IS with business strategies. 103. Path of alignment. 104. Market position. 105. Individual-organisational. 106. Task. 107. Technology. 108. Economic benefit. 109. Complexity. 110. organizational (internal environment. 111. Networking. 112. *Top management*. 113. External expertise. 114. IT capabilities.		

Table 5.2: The factors affecting the research problem.

As shown in table 5.2, too many CSFs affect the problem of this research, which makes addressing all the CSFs in the model development process time-consuming and very complicated. Therefore, to test the defined sets of factors in each discipline, it is important to omit unrelated and repeated ones, and then summarise the CSFs that influence the model development in this research.

To justify the process of identifying the CSFs, this identification was based on a model of identifying critical success factors that was used by Rockart (1982) to identify CSFs for IT executives. The purpose of this model was to gather information that supports the decision making within the company, which is similar to the purpose of the proposed model in this research. Reviewing Rockart's model shows that although CSFs may differ in different companies, but generic sets of CSFs may be summarised for companies of the same industry. This is due to similar occupational roles and common managerial behaviours. Rockart (1982) states that CSFs may differ in different companies according to size and competitive strategy, but still each industry has a generic set of CSFs, in addition occupational roles also have generic sets of CSFs.

To do this, the CSFs of each discipline are reviewed in relation to the CSFs of the other disciplines. The aim of this process is to define a summarised set of CSFs that considers all the identified factors in table 5.2. This process is carried out in the following paragraphs and tables by considering the defined factors in table 5.2 as the measures and then categorise these measures according to the CSFs that each category concern. In this sense, each category of measure may concern measures from the different disciplines in table 5.2. Therefore, the categorisation of the measures begins with the measures of the SME discipline. After that, the defined categories of measures will represent a set of CSFs which will be used to build up the summarisation of the other sets of measures from the different disciplines in order to generate a complete and general set of the CSFs that influence the development and adoption of the proposed model in this research.

Accordingly, the measures of the SME sector are categorised into eight categories or CSFs in order to create the first draft of the required set of CSFs. Table 5.3 shows the CSFs and the detailed measures that led to identifying each CSF.

CSFs	Measures
Human resource management.	Human capital; Skill levels; Change management; Human resource management; New ways of work; Training and development.

Research and development capability	Capability of organisational learning; Process design; Innovation strategy; R&D strategy; Process analysis; Process reengineering; Creativity management; Training capabilities; Development capabilities.
Operational performance	Operational collaboration, skills and techniques; Supplier relationship management.
Industrial Infrastructure	Infrastructure, Electrical power, Telecommunication services; Industrial factors; Demographics; resource availability.
Technology	Technology change; Technical aspects; Information technology; technology implementation.
Top management support.	Top management support; Management commitment
External environment.	Socio-cultural; Politico-legal; Macroeconomic; Global change; Customer focus.
Competitiveness.	Competitive strategy; Firm characteristics.

Table 5.3: CSFs of SMEs.

Because the SME sector is wide and highly assorted, this sector is further specified in order to narrow down the research and target wholesale SMEs in the UK. The wholesale industry is affected by specific measures that are not included in the measures of SMEs, such as volume discount, trade-offs between transports, and purchasing and warehousing costs. But, similar measures to the measures of SMEs were also identified for the wholesale industry. The analysis of the wholesale industry's measures has resulted in adding new measures to predefined CSFs.

This is where the analysis of the wholesale measures added new measures to four predefined CSFs and they are operational performance, industrial infrastructure, external environment, and competitiveness. Table 5.4 represents the changes made on table 5.3, and indicates the changes with the underlined measures and CSFs.

CSFs	**Measures**
Human resource management.	Human capital; Skill levels; Change management; Human resource management; New ways of work;

	Training and Development.
Research and development capability	Capability of organisational learning; Process design; Innovation strategy; R&D strategy; Process analysis; Process reengineering; Creativity management; Training capabilities; Development capabilities.
Operational performance	Operational collaboration, skills and techniques; Supplier relationship management. **Trade-offs between transports. Volume discount; Purchasing and warehousing costs; Cost of new customers, suppliers or services; Liquidity; Operational efficiency; Transport services; Selection of suppliers.**
Industrial Infrastructure	Infrastructure, Electrical power, Telecommunication services; Industrial factors; Demographics; resource availability. **Availability of middlemen.**
Technology	Technology change; Technical aspects; Information technology; technology Implementation.
Top management support.	Top management support; Management commitment
External environment.	Socio-cultural; Politico-legal; Macroeconomic; Global change; Customer focus; **Environmental factors. Customer buying habits. Socio-economic factors.. Market changes.**
Competitiveness	Competitive strategy; Firm characteristics**; Market reseller strategies; Marketing mix; Location; Number of competitors; Number of customers; Customer service**
Table 5.4: Merging the measures of wholesalers with the measures of SMEs.	

The assumption of this research comes from the point of view that enterprises from the same sector may share similar operations and processes, and therefore, they share similar operational performance measures. Therefore, the measures of operational performance are merged with the sector specific measures in order to rebuild and update the defined set of

CSFs. In order to effectively summarise the relevant CFS to the research problem, the predefined set of CSFs in table 5.4 are modified according to the factors of operational performance. This process has added new measures for some predefined CSFs and it also added three new CSFs.

The analysis of the operational performance measures added new measures to three predefined CSFs; these are research and development capability, top management support, and competitiveness. Moreover, some of the operational performance measures were not related to any of the predefined CSFs. Therefore, the analysis of this category has led to the addition of three new CSFs. Table 5.5 shows the new set of CSFs, and it indicates the changes on table 5.4 with the underlined measures and CSFs.

CSFs	Measures
Human resource management.	Human capital; Skill levels; Change management; Human resource management; New ways of work; Training and Development.
Research and development capability	Capability of organisational learning; Process design; Innovation strategy; R&D strategy; Process analysis; Process reengineering; Creativity management; Training capabilities; Development capabilities. **Data and reporting; Innovation.**
Operational performance	Operational collaboration, skills and techniques; Supplier relationship management. Selection of suppliers.
Industrial Infrastructure	Infrastructure, Electrical power, Telecommunication services; Industrial factors; Demographics; resource availability. Availability of middlemen.
Technology	Technology change; Technical aspects; Information technology; technology Implementation.
Top management support.	Top management support; Management commitment; **Management style; Manager profile; Managerial qualities**
External environment.	Socio-cultural; Politico-legal; Macroeconomic; Global change; Customer focus; Environmental factors. Customer buying

	habits. Socio-economic factors. Market changes.
Competitiveness	Market reseller strategies; Marketing mix; Location; Number of competitors; Number of customers; Customer service Competitive strategy**; Net sales; New product/service; Customers' satisfaction; Product/service Quality; Price performance against computers; cost of products comparing with competitors**.
Operations effectiveness	**Deliveries lead times; Flexibility; Productivity; Speed of operations; Process management; Demand chain collaboration; Supplier quality management; Number of Cancelled or returned orders. Trade-offs between transports; suppliers or services; Transport services; Inventory management**
Operations efficiency.	**Inventory turnover rates; Throughput, Cost of operations, Space utilisation, Financial turnover; Volume discount; Purchasing and warehousing costs; Cost of new customers, Liquidity; Operational efficiency. Return on investment; Payback period.**
Firm characteristics	**Dependability of departments; Total assets; Business unit culture; Flexibility.**
Table 5.5: merging the measures of wholesale SMEs with the measures of operational performance.	

Another assumption of this research is that the operational performance is considered as satisfactory if the measurement of the defined CSFs indicates so. Hence, it is important for managers of wholesale SMEs to be aware of the CSFs that influence the operational performance. Based on this assumption, the literature survey addresses the need for a performance management model which is supported by BI tools to enhance decision making that maintains/improves the operational performance. This is because BI tools are the main enablers that aid monitoring, measuring, and analysing of the CSFs to enhance decision making that influences the operational performance.

Accordingly, the measures that influence the adoption of BI tools were also analysed to modify and update the predefined set of CSFs. To better understand and forecast the diffusion trends in business intelligence, one must go beyond purely technological explanations and into non-technological factors (Tang, 1998). Based on this point of view,

the measures that influence the technical performance of the specified BI tools are excluded because they are purely technological factors which are quite remote from the aims and objectives of this research. But BI tools are wide ranging and they may include any software application that could be used to generate knowledge that enhances decision making. Therefore, the measures that influence the adoption of BI tools are identified in this research as the measures that influence the adoption of information systems in general.

The adoption of IT/IS in business has been studied across several disciplines, and therefore a huge variety of models were developed to support the adoption of technology for different purposes and from different perspectives. This research investigates a combination of relevant models to formulate a general view on the measures that influence the adoption of IT/IS. In order to effectively collect the information relevant to IT/IS adoption from the research participants, the selected models of IT/IS adoption were analysed to identify the factors which influence the process of adopting technology. After that, these measures are merged with the predefined CSFs in order to rebuild and update the proposed set of CSFs. To effectively summarise the relevant CFSs to the research problem, the predefined set of CSFs in table 5.5 is modified according to the measures of IT/IS adoption. This process has added new measures for some of the predefined CSFs and a new CSF was also added.

The analysis of the IT/IS adoption measures added new measures to three of the predefined CSFs and they are research and development capability, technological aspects, and firm characteristics. But some of the IT/IS adoption measures were not related to any of the predefined CSFs. Therefore, the analysis of this category has led to the addition of a new CSF. Table 5.6 shows the final set of CSFs, and it indicates the changes made from table 5.5 with the underlined factors.

CSFs	**Measures**
1-Human resource management.	Human capital; Skill levels; Change management; Human resource management; New ways of work; Training and Development.
2- Research and development capability	Capability of organisational learning; Process design; Innovation strategy; R&D strategy; Process analysis; Process reengineering;

	Creativity management; Training capabilities; Development capabilities. **Data and reporting; Innovation.**
3- Operational performance	Operational collaboration, skills and techniques; Supplier relationship management. Selection of suppliers.
4- Industrial Infrastructure	Infrastructure, Electrical power, Telecommunication services; Industrial factors; Demographics; resource availability. Availability of middlemen.
5- Technological aspects	Technology change; Information technology; technology Implementation. **IS investment; Alignment of ISs with business strategies; IT capabilities; Networking, External expertise; Technologies compatibility; Economic benefit.**
6- Top management support.	Top management support; Management commitment; Management style; Manager profile; Managerial qualities
7- External environment.	Socio-cultural; Politico-legal; Macroeconomic; Global change; Customer focus; Environmental factors. Customer buying habits. Socio-economic factors. Market changes.
8- Firm characteristics	Dependability of departments; Total assets; Business unit culture; Flexibility; **Market position.**
9- Operations effectiveness	Deliveries lead times; Flexibility; Productivity; Speed of operations; Process management; Demand chain collaboration; Supplier quality management; Number of Cancelled or returned orders. Trade-offs between transports; suppliers or services; Transport services; Inventory management
10- Operations efficiency.	Inventory turnover rates; Throughput, Cost of operations, Space utilisation, Financial turnover; Volume discount; Purchasing and warehousing costs; Cost of new customers, Liquidity; Operational efficiency. Return on investment; Payback period.
11- Competitiveness	Price performance against computers; cost of products relative to competitors; Number of competitors; Number of customers; Customer service; Net sales; New product/service; Customers' satisfaction; Product/service Quality.
12- Information and communication channels.	**System quality; Information quality; Use of IS; User satisfaction; Individual impact; Organisational impact.**

Table 5.6: Merging wholesale SMEs' and operational performance measures with the measures of IT/IS adoption.

5.3 Model development

As shown in table 5.6, analysing the key concepts and contents of the literature survey produced twelve CSFs which link and affect the development and adoption of the proposed model in this research. After discussing the requirements of the related disciplines with their associated key concepts, and defining their related groups of CSFs; a picture of the required model emerges. This is where this research suggests that utilising the features of BI supports the activities of the soft and the hard phases of the performance management cycle at the operational level. This is where in the hard phase, BI tools can facilitate the monitoring, measuring, and analysing of information about the identified CSFs. This in turn supports the activities in the soft phase in defining operational goals and targets that establish a standard of excellence in the operational performance within wholesale SMEs in the UK. Therefore, according to the literature analysis, the BI tools are considered as the main enablers of the proposed model; they were identified previously in this research as OLAP applications, data warehouses and data mining tools. This section introduces a preliminary version for a model of operational performance management which aligns the CSFs with the features of BI tools in the performance management cycle.

Analysis of the literature survey in the areas of wholesale, SMEs, performance management, and business intelligence resulted in defining the CSFs that influence the development of the proposed model. Because this is a multidisciplinary literature survey that was designed for two main purposes (defining requirements and CSFs), the produced CSFs had different characteristics that formulate different roles for subsets of CSFs in the development of the proposed model. Therefore, before attempting to develop the model, it is important to classify the CSFs according to their roles in the proposed model. This is where some of the defined CSFs have measurable and controllable measures, while the rest of measures are not. Therefore, the CSFs are further classified according to the measurability and controllability of their measures.

Due to the fact that the proposed model is based on monitoring and measuring the operational performance through the performance management activities and BI tools, the

roles of the defined set of CSFs is divided into two subsets. The first subset concerns the factors that influence a successful adoption of the defined activities and tools and it is referred to as the soft CSFs. And the second subset concerns the factors which are measurable and controllable and it is referred to as the hard CSFs. The hard CSFs are utilised in the proposed model to identify what to measure, monitor, and analyse in order to enhance decision making that improve the operational performance.

Four hard factors were identified according to the measurability and controllability of their measures; and they are: operational performance, operational efficiency, operational effectiveness, and competitiveness. At this stage of analysis, the measures in the CSF of operational performance are addressed through the measures of the CSF of operational effectiveness and CSF of operational efficiency. The rest of CSFs are the soft CSFs and they were identified as: HRM; R&D capability; top management support; technological aspects; firm characteristics; industrial infrastructure; and information and communication channels. As mentioned earlier, the measures of the soft factors are not measurable neither they are controllable. Hence, the analysis of the soft CSFs is used to provide the essential guidelines that ensure successful adoption and use of the proposed model. The guideline information is generated through summarising and analysing the measures of the soft CSFs as shown in Figure 5.5.

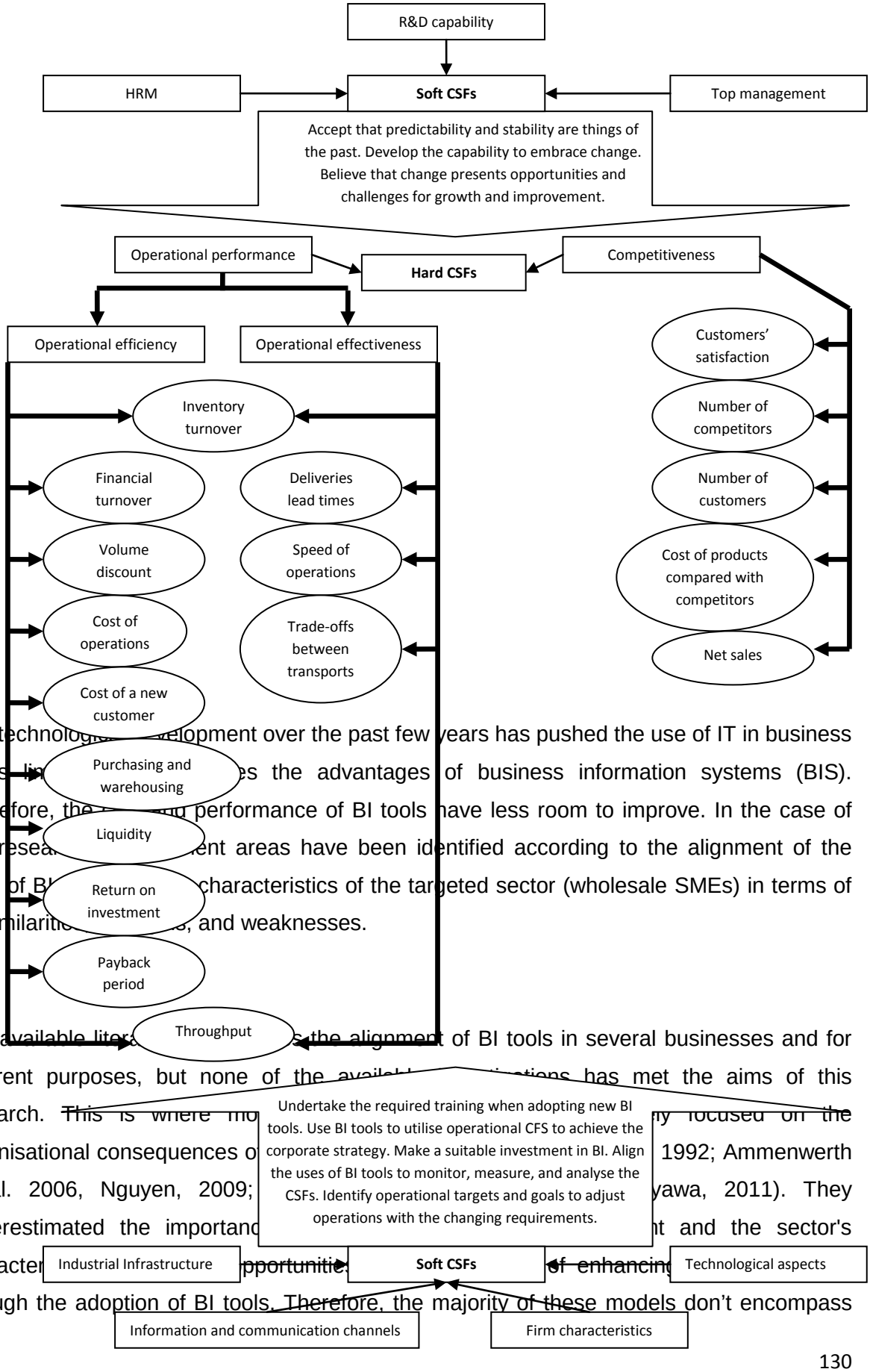


Figure 5.5: The classification process of the soft and hard factors.

The technological development over the past few years has pushed the use of IT in business to its limits. This reduces the advantages of business information systems (BIS). Therefore, the improvement performance of BI tools have less room to improve. In the case of this research, different areas have been identified according to the alignment of the uses of BI tools with the characteristics of the targeted sector (wholesale SMEs) in terms of its similarities, differences, and weaknesses.

The available literature discusses the alignment of BI tools in several businesses and for different purposes, but none of the available publications has met the aims of this research. This is where most of the literature mainly focused on the organisational consequences of BI (Watson et al. 1992; Ammenwerth et al. 2006, Nguyen, 2009; [illegible] yawa, 2011). They underestimated the importance of alignment and the sector's characteristics, opportunities of enhancing through the adoption of BI tools. Therefore, the majority of these models don't encompass

the purposes and constraints of adopting IT according to sector characteristics and technology features, nor do they deal with the process of measuring, monitoring, and analysing the CSFs that ensures a superior operational performance.

Therefore, the proposed model in this research includes the activities that could be supported by the features of BI tools to enhance the performance management activities at the operational level within wholesale SMEs in the UK. These activities are defined according to the activities of the performance management cycle at the operational level, the phases of the performance management cycle, and the feature of defined BI tools. Accordingly the proposed activities will aim to plan and act in the soft phase of the cycle, and monitor, and review the operational performance in the hard phase through utilising the features of the defined BI tools. These activities are performed by the user through the aid of BI tools, or only through the defined BI tools. Table 5.7 defines six activities to be included in the proposed model and classifies them in terms of the performance management activities and phases, and the performers of the activities.

Model's activities	**Performance management activates**	**Phase**	**Performed by**
Setting targets and goals	Plan	Soft	OLTP and end-user
Systematic and regular collection of data	Act	Soft	OLTP and end-user
Converting data into CSFs	Monitor	Hard	Data warehouse
Identifying success and failure areas	Monitor	Hard	OLAP and end-use
Assessing	Review	Hard	End-user

performance			
Comparing performance	Review	Hard	Data mining tools

Table 5.7: the activities of the proposed model

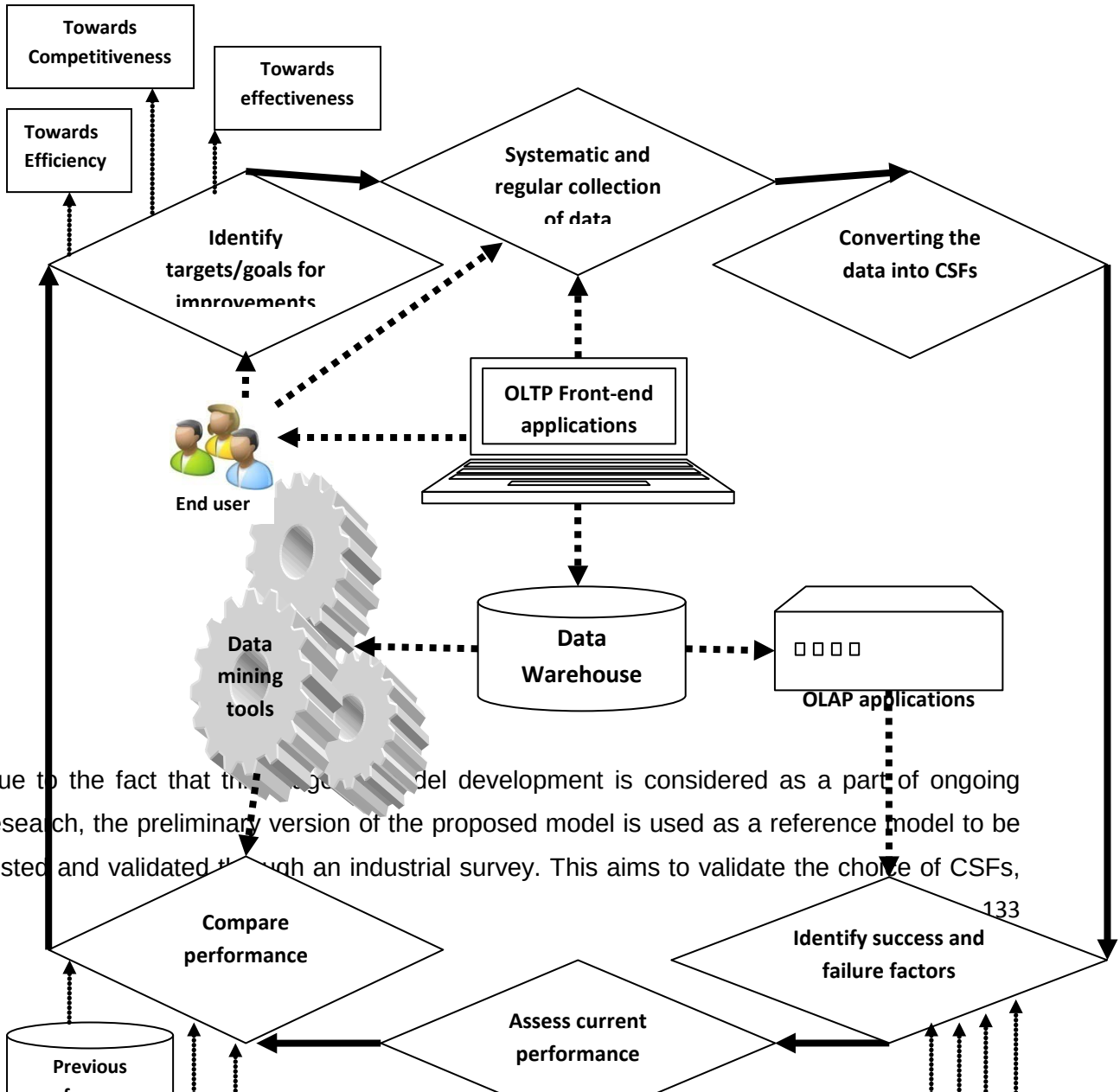
As a result, the proposed model is one of the first efforts to align the performance management activities with the features of BI tools to enhance decision making that supports the operational performance within wholesale SMEs in the UK. In this sense, the proposed model is required to deal with the multiple measures of operational performance. As shown in table 5.7, the adoption of BI tools seems to fit this requirement well. Moreover, because this is a performance management model, the model is also required to be a continuous managerial process. Therefore, in developing the required model, it is important to sort and sequence the activities of the proposed model in a performance management cycle to ensure continuity.

Accordingly, the next step of developing the proposed model is aligning the model's activities and BI tools for an effective monitoring, measuring and analysing of the hard CSFs in a continuous performance management cycle. To this end, the model could be developed based on the gained knowledge from the analysis of the literature survey. Figure 5.6 represents a preliminary version of the proposed model.

As discussed in previous chapters, the concept of performance management is considered in this research as the mediator for applying BI tools to support business operations. Hence, the development of the proposed model in this research should base on the defined roles of performance management in supporting business operations. In this sense, the development of the proposed model should reflect a continuous cycle that demonstrates the two phases of performance management which are soft (improving performance) and hard (measuring performance). The choice of the continuous cycle in the proposed model was due to the fact that the activities of the soft phase are considered as prerequisites for identifying what to be measured through the activities of the hard phase. At the same time, the activities of the hard phase are also prerequisites to provide the required information for planning what to improve through the activities of the soft phase. These phases are defined in the

development of the proposed model by defining the activities of improving (soft) and measuring (hard) the operational performance as shown in Table 5.7.

Accordingly, these activities should be ordered within the cycle of the proposed model according to the phases of performance management. This is because the activities of the hard phase provide information about the operational performance to be used in the soft phase to plan and act (set targets and goals, and define the types of data to be collected). And performing the activities of the soft phase may ascertain the focus of the hard activities which are supported by the features of BI tools. Therefore, the proposed model concerns the adoption of BI tools by aligning these features with the defined activities in table 5.7. Hence, the key purpose of developing the proposed model is to ensure a successful alignment of the defined BI tools to support the activities of performance management in a continuous and self-renewing cycle.



Due to the fact that the proposed model development is considered as a part of ongoing research, the preliminary version of the proposed model is used as a reference model to be tested and validated through an industrial survey. This aims to validate the choice of CSFs,

and to evaluate the defined needs and opportunities of SMEs in terms of their requirements and capabilities. The validation of the preliminary version of the proposed model is discussed in Chapter Seven, where a validated version of the proposed model is developed according to the results of the industrial survey.

5.4 Summary

This chapter summarises the results of the literature survey from two perspectives: requirements and CSFs. The requirements aim to provide the necessary background to the model development in terms of defining the needs and opportunities to be fulfilled through the proposed model, the activities of the proposed model, and the required BI tools to support performance management activities. After that, the CSFs section aims to define the factors that influence the development and adoption of the proposed model within wholesale SMEs in the UK. And in the following section, these factors are categorised according to their measurability and controllability into soft and hard factors. The soft CSFs are used to define the guideline information that ensures the success of adopting the proposed model, and the hard CSFs clarify what to measure, monitor, and analyse through the proposed model.

After that, the defined activities are ordered in a self-renewing performance management cycle and aligned with the features of the appropriate BI tools to function in the proposed model. This has generated a preliminary version of the proposed model in figure 5.6. This preliminary version provides the required material to collect and analyse the primary data in Chapter Seven in order to validate the proposed model. The validated version of the proposed model is discussed in Chapter Eight.

Chapter Six: Research methodology.

6.0 Research methodology

Methodology is the science of studying how the research is done, which aims to describe and analyse the methods that support solving the research problem by logically adopting a sequence of steps. Accordingly, this chapter describes the design of the research, and the process of the data collection and analysis. To do so, it is important to identify the purpose of the research according to the research aims (Hussey & Hussey, 1997, p. 10). As discussed in Chapter One, defining the research problem has led to the three research aims (RA1, RA2 and RA3). Based on these aims, two research questions (RQ1 and RQ2) were formulated. Accordingly, this research is used for two main purposes that provide the answer for RQ1 and generate guideline information that establishes the basis for answering RQ2. These purposes are 1) to explore the CSFs that influence the adoption of BI tools in relation to operational performance and IT adoption within wholesale SMEs in the UK, and 2) to explain how the needs and the opportunities of the UK's wholesale SMEs could be fulfilled through the adoption of a model that integrates the features of BI tools with activities of performance management. In turn, these purposes are attained through the achievement of the research objectives (RO1, RO2), and the development of a model that achieves RO3 and RO4 to answers RQ2.

Accordingly, the purpose of this research is described as exploratory; exploratory research helps the researcher to collect relevant information to understand phenomena in order to suggest a hypothesis (Hussey & Hussey, 1997 p. 10). In the case of this research, the exploratory research is adopted to understand the requirements and CSFs to propose a model that clarifies the effective adoption of BI tools within wholesale SMEs in the UK to support the operational performance. Therefore, the proposed model is considered as the hypothesis that this research suggests. Examples of exploratory research in the literature

include Christy and Wood (1999), who used exploratory research to study the possibilities in the research population; similarly, exploratory research was used by Ralston et al. (2001) to study the existence and the significance of the research problem.

However, the purpose of the research influences its design and implementation. The design of research is ordered in the research onion diagram that was developed in Saunders et al. (2007 p. 132) to describe the processes of different researches. This diagram involves a sequence of choices across five main perspectives. Based on these perspectives and their corresponding choices, the following sections aim to describe the design of this research; figure 6.1 illustrates these perspectives and choices.

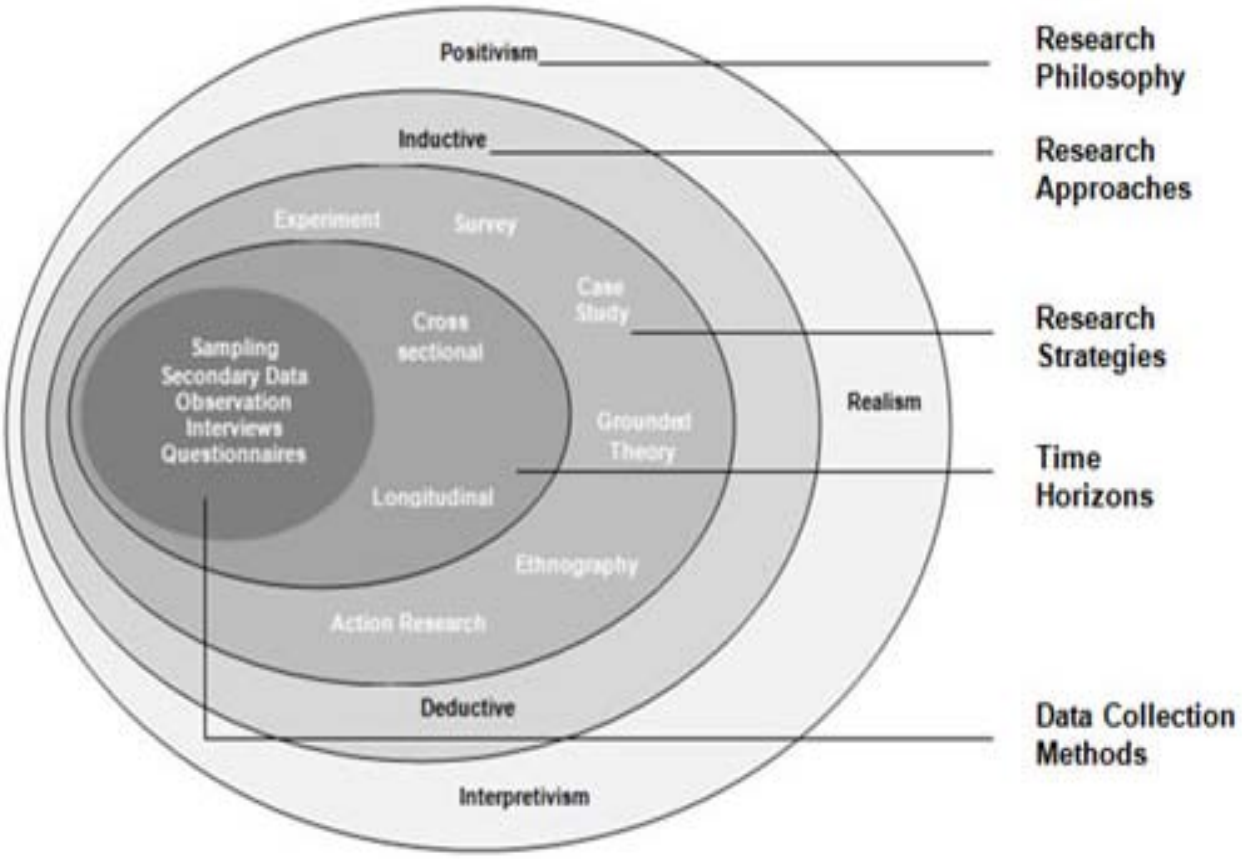


Figure 6.1: the research onion. Source: Saunders et al. (2003)

6.1 Research design

This section aims to describe the research design through following the sequence of perspectives as shown in the research onion in figure 5.1. Accordingly, the first perspective is the research philosophy. The research philosophy depends on the way the researcher thinks about the development of knowledge in a philosophical framework, that guides how scientific research should be conducted (Saunders et al. 2003, p.84). There are two main paradigms for business research: interpretivism and positivism. The interpretivism paradigm is underpinned by the belief that new theories can be discovered by researching new phenomena that was not investigated in previous literature, thus it is based on a qualitative approach because it assumes that phenomena cannot be measured in a numerical way. The positivism paradigm is underpinned by the belief that the discovery of theories is based on empirical or quantitative research because it assumes that activities of the phenomena can be quantified and measured.

This research aims to provide a deeper understanding on absorbing threats and responding to opportunities in a particular sector in order to enhance the performance of the whole sector. This is obtained in this research by recommending a performance management process that is supported by the features of BI tools. As a result, this research also encourages the adoption of BI tools to improve the performance of the targeted sector. Therefore, the paradigm of this research base on three key concepts and they are the 1) sector's threats and opportunities, 2) performance management and 3) Business intelligence. This is where the paradigm of this research is that the adoption of BI tools by wholesale SMEs takes part in 1) absorbing training needs, development needs and resource limitations, and 2) responding to innovation and globalization opportunities. To generalize this paradigm, the research identifies the factors that influence the operational environment of the sector, the SME characteristics, and the tools of business intelligence. Still, the difficulty resides in selecting a mediator to include these factors, characteristics and tools in a generic model designed for targeted sector. In this sense, the selected mediator should be able to link factors and characteristics with the use of the appropriate BI tools. Therefore, the mediator is required to provide a continuous management cycle that is developed in this research based on the performance management cycle defined in chapter three. Accordingly, figure 6.2 demonstrates the paradigm of this research in terms of reaching the goals of the research.

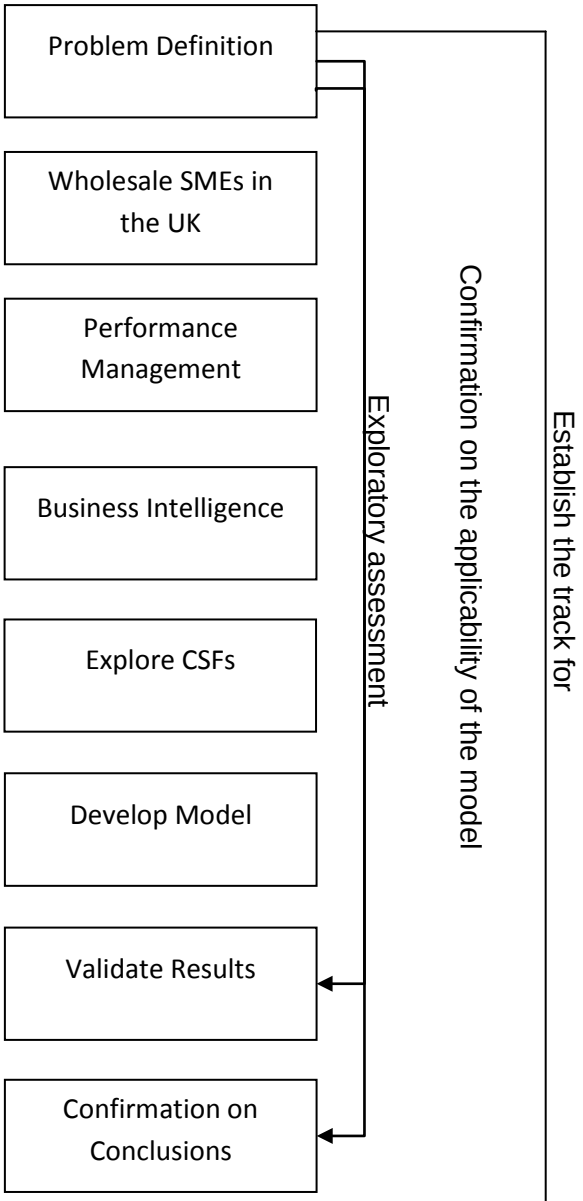


Figure 6.2: the paradigm of the research

As discussed before, the aim of this research is to investigate the alignment of BI tools with the CS[illegible]ional performance and IT adoption within wholesale SMEs in the UK[illegible] literature investigates the alignment of BI tools in several businesses, the available investigations are conducted for several purposes but none of these purposes met the need of this research, which is the development of a model that [illegible] of performance management at the operational level. Therefore, the philosophy of this research is considered to be interpretivism rather than positivism.

However, the approach of the exploratory research is referred to as the inductive logic where the general inferences are induced from particular instances (Hussey & Hussey, 1997 p. 13). This is where exploratory researches help researchers to collect primary data to understand the research problem and then suggest hypotheses (the performance factors in the case of this research).Therefore, an exploratory research was selected to identify the requirements and CSFs that influence the development and adoption of the proposed model, and the related needs and opportunities that could be fulfilled by using BI tools. This type of research is used when the research problem require deep understanding of the research variables through elite participants (e.g. SME managers/owners) who are able to provide more detailed information (Hussey & Hussey, 1997 p. 10).

Exploratory researches involve the collection of qualitative data using field studies or case study strategies and by means of participant observation, in-depth interviewing or elite interviewing (Marshall and Grossman, 1995). In addition, the inductive logic "provide(s) insightful empirical generalizations, but little theory", hence, they are typically associated with qualitative approaches (Bryman & Bell, 2007 p. 14). This is where qualitative approaches collect detailed data or rich/extensive information about the research problem (Ritchie & Lewis, 2003 pp. 3-5). Based on this point of view, the CSFs, tools, needs, and opportunities that influence the development and adoption of the proposed model in this research could be identified through a qualitative exploratory research through a field study by means of elite interviews with managers of wholesale SMEs in the UK.

But, after conducting and modifying three different interviews in three different companies, none of the interviews was considered as effective. This is because the limited knowledge of the interviewees (SME managers) in the research topic has only provided closed answers to open interview questions that aim to analyse the operational performance and technology adoption. In addition the lack of understanding the uses of BI tools has weakened the process of identifying the needs and opportunities that could be fulfilled by adopting BI tools.

In this matter, the logic of the exploratory research was reversed by following a deductive rather than an inductive logic. This is because the required detailed data that the participants failed to provide could be alternatively replaced by identifying the general views of experts in the area of this research through a literature survey. Then, the results of the literature survey

could be specified and validated in the sector of the research through a quantitative industrial survey. Although these changes may interfere with the available literature on exploratory researches, but reviewing the literature shows a wide use of the deductive logic in similar exploratory researches by the means of quantitative research methods.

For example, Levy (2008) implements a quantitative exploratory assessment on the factors that influence the online learning activities in order to identify the critical value factors for online learning. Similarly, this research implements a quantitative exploratory study to identify the CSFs that influence the performance of wholesale SMEs, where the measurement and monitoring of these CSFs through the use of BI tools enhances decision making that improve the operational performance. Another purpose of implementing the quantitative exploratory research is to identify the needs and opportunities of wholesale SMEs in the UK that could be fulfilled by using BI tools. In this sense, Thassanabanjong et al. (2009) adopt a quantitative exploratory research to identify training needs in Thai SMEs.

The process of collecting the primary and secondary data in this exploratory research was designed to attain the aims of the research. Accordingly, the secondary data was obtained to define the requirements and CSFs that influence the adoption and development of the proposed model in this research, which supports the achievement of RO1 and RO2. The defined requirements and CSFs are then used to support the development of a preliminary version of the proposed model which supports the achievement of RO3. This strategy of collecting the secondary data has been applied in various researches. For instance, Parzinger and Nath (1998) use a literature survey to identify the factors that influence a successful TQM implementation. And Vaidya et al. (2006) use a literature survey for two purposes: 1) identify the variables of several factors in order to propose a model of critical success factors, and 2) identify the major causes to develop the proposed model. Similarly, Gunasekaran (1999) develops a framework for agile manufacturing based on a literature survey. Moreover, the literature survey was used by Navon and Goldschmidt (2003) to identify candidate technologies for an automated data collection model.

Secondary data is the data that has been collected by others for other purposes than the purpose of the undertaken research problem (Hussey & Hussey, 1997 p. 149). Therefore, the secondary data is not enough to provide an accurate result, but secondary data is a

valuable source for new insights in the research problem that could be explored through the primary data. In this matter, collecting the primary data in this research aims to validate the findings of the secondary data. In addition, secondary data is considered as a subsequent and a prerequisite to start collecting the primary data (Aaker et al. 2007 pp. 110-111). This is where the secondary data is an important source for defining the material that influences the collection of the primary data.

The primary data is the facts and information that are collected in order to investigate the specific problem of the research (Rabianski, 2003). The aim of the primary data in this research is to validate the results of literature survey in the research's specific problem and sector in a quantitative manner. Therefore, the strategy for primary data collection in this research is the industrial survey. The industrial survey in this research is designed to confirm the results of the literature survey by validating the proposed model in RO3, achieving RO4, and confirming the achievement of RO1 and RO2 but within a smaller domain (research specific problem and sector). The process of collecting primary data is the main determinant of the research strategy, where the method of collecting the primary data is the main aspect that classifies the research approach into quantitative or qualitative (Cooper & Schindler, 2008 pp. 214-215).

According to Saunders' research onion, after defining the strategy of the research, the time horizon perspective comes into place. Time horizon is based on researchers' future expectations about the required time for the data collection. Time horizon can be classified into longitudinal and cross-sectional studies. The longitudinal study is based on the observation of changes and development in the research variables over time, whereas longitudinal researches are concerned with the correlation between the research variables. This is where when new relations between the research variables occur then changes in the research variables may be required. Longitudinal researches require a long time to understand and detect the relation between variables and the phenomena at hand, while the cross-sectional study is an observational or a descriptive study that focuses on understanding the phenomena. It aims to understand the relation between different variables and how they affect each other as they exist in a specific population at the same period of time.

Accordingly, the time horizon perspective in this research could be described as cross-sectional. This is where Saunders et al. (2003) states the rationale for choosing the cross-sectional study being that it is more appropriate for survey research where a survey research requires collecting data from a sizable population. Moreover, cross-sectional studies are more appropriate for most academic research projects because they are more time constrained.

As motioned earlier, to avoid the faults of the rejected qualitative field study, this research required a quantitative strategy. Based on this, a quantitative survey has been chosen to perform the data collection in this research. Quantitative surveys provide precise measurement of behaviour, knowledge, opinions, or attitudes. This measurement is achieved by obtaining answers to questions such as how many, how much, how often, why, when, and who (Cooper, & Schindler, 2008 p. 164). Moreover, in order to avoid the faults of interview study, open questions are also avoided in the data collection process. Hence, the questionnaire survey has been chosen in this research as the method of collecting the primary data. This is because questionnaires are the most suitable alternative to applying closed question surveys and they are the most common method for quantitative research.

In line with the choice of questionnaire survey as the data collection method, similar research was conducted. Pagani and Fine (2008) investigate the adoption of mobile computing through a quantitative questionnaire survey that aims to rate relevant factors, describe behaviours and roles of the participants, and test the research variables. Similarly, after conducting a literature survey about the factors of diffusion and adoption of technology, Pagani (2004) uses a quantitative questionnaire survey to confirm the results of a literature survey. The process of developing and implementing the industrial survey is further explained in the following section in order to describe the process of collecting and analysing the primary data through questionnaires in this research.

6.2 Industrial survey

As discussed in Chapter One, the principle aim of this research is to develop a model which establishes the basis for a new policy that aids the adoption of BI tools within wholesale

SMEs in the UK, in order to enhance decision making that influences operational performance. In line with this aim, the literature survey has resulted in a preliminary version of the proposed model which clarifies the utilisation of the CSFs by using BI tools in a performance management cycle. The preliminary version of the proposed model is illustrated in figure 5.2 and it outlines data collection, reporting on data, data storage, and converting data to useful information that enhances decision making to set targets and goals that maintain/improve operational performance.

This preliminary model is based on the results of the literature survey, which were obtained from secondary data that were collected for other purposes than the purpose of this research. Therefore, as discussed previously, the industrial survey aims to validate and generalise the results of the literature survey within the targeted population in this research. As explained previously, the combination of the literature survey with the industrial survey in this research is an example of the deductive logic of conducting research. This is where the literature survey was designed to provide the required material (theory) for implementing and designing the industrial survey, and to measure the statistical influence of the proposed model on the defined CSFs.

Due to the fact that the literature survey was a cross-disciplinary study, there is limited research that uses a similar combination of disciplines to establish the basis for supporting SMEs within the specified sector. Accordingly, the defined set of CSFs in the literature survey is unique and specific for the purpose of this research. Therefore, the results of this industrial survey will seek to explore new insights in the fields of supporting the adoption of BI tools within SMEs. As a result, the purpose of this industrial survey is considered as exploratory.

The associated research methods with exploratory studies are usually qualitative, but quantitative approaches are also possible. Since a qualitative interview survey has failed to gain the required information at this stage of the research, a quantitative survey has therefore been chosen to replace and overcome the shortcomings of the qualitative interview survey. In this sense, a quantitative questionnaire has been chosen as the method of data collection at this stage of the research. Accordingly, three stages of developing and implementing the literature survey are identified in the following bullet points:

- Developing the questionnaire survey.
- Identifying the sample from the target population.
- Analysing the primary data.

The stages of developing and implementing the industrial survey are discussed separately through the following subsections.

6.2.1 Questionnaire survey

The quantitative survey in this research aims to measure the attitudes of SME managers towards the adoption of BI tools, the CSFs that influence the operational performance and BI adoption, and the common needs and opportunities of SMEs. This is because quantitative surveys provide precise measurement of behaviour, knowledge, opinions, and attitudes by asking questions such as how many, how much, how often, why, when, and who (Cooper & Schindler, 2008 p. 164). To avoid the faults of the early interview survey, the open questions should be avoided in the data collection process. Therefore, a questionnaire survey is chosen to collect the primary data as it is the most suitable alternative for applying closed questions surveys.

Questionnaires may be classified according to the mode of data collection where each mode of data collection has different advantages and disadvantages. The two main modes of data collection in the questionnaire survey are self-completion and interviewer administrated, and telephone interview could be defined as a third mode that maximises the advantages of the other two modes (Meadows, 2003). Table 7.1 compares the self-completion and interviewer-administrated questionnaires according to their advantages and disadvantages.

Self-completion	**interviewer-administrated**
Lower cost and less time consuming.	Higher cost and more time consuming.

Easily cover a widely dispersed population.	Harder to a widely dispersed population.
Lower response rates	Higher response rate
Appropriate for less complex topics and need to be easy to complete without assistance.	Appropriate formore complex topics where detailed data could be collected.
Shorter and mostly depend on closed ended questions (less suitable for open ended).	A longer questionnaire and open ended questions can be used, in addition to filter questions.

Table 6.1: Modes of data collection. Source: Meadows (2003)

The targeted participants in this research are the managers of wholesale SMEs and they are considered to be busy people who avoid wasting any of their time. This is where contacting the participants to arrange filling the questionnaire has been frequently refused unless there was a personal connection involved. In order for the researcher to reach the targeted participants, face to face distribution was considered as the questionnaire distribution strategy. This seems to be an interviewer-administrated mode of data collection, but the questionnaire was designed to be easy to complete and not time consuming. Therefore, in this research, the mode of distributing the questionnaire combines the advantage of getting higher response rate from the interviewer-administrated questionnaire, and the advantage of developing an easy to complete and not time-consuming questionnaire from the self-administrated mode.

However, despite the mode of data collection, Meadows (2003) states “the practical value of a questionnaire depends on the reliability and the validity of the information it collects.” Reliability refers to how well the collected data produces relevant information, and validity refers to how well the questionnaire measures what it intendeds to measure. In this sense, reliable information may or may not be valid, but valid information is always reliable.

In the case of this research, the main aim of the questionnaire is to validate the results of the literature survey. Therefore, in order for the questionnaire to be reliable, the collected information must be relevant to the results of the literature survey. And in order for the questionnaire to be valid, the collected data must be able to validate and update the preliminary model that was proposed in the literature survey. To ensure the reliability and the validity of the questionnaire in this research, the following subsections follow the five phases of designing questionnaires as suggested by Aaker, et al. (2007 p. 325). These phases are explained through the following paragraphs.

Planning what to measure

Three main steps were taken in this research in order to plan what to measure in the questionnaire survey. The first step involves relating the objectives of the questionnaire with achieving the research objectives, which were identified in chapter one. After that, in the second step, an extensive literature survey has taken place to define a set of CSFs that influence the development and adoption of the proposed model; this provided the measures or the variables that will be considered in the questionnaire. The third step was developing a preliminary version of the proposed model to clarify the measurability of the questionnaire data.

Formatting the questions

Questionnaires measure three main variables and they are opinion, behaviour, and attribute (Dillman, 2000). Based on this classification, and following the guidelines provided by Saunders et al. (2007 p. 362), the questions of the questionnaire in this research will aim to measure: 1) opinions of SME managers by recording their feelings or beliefs towards the influence of the proposed model on the defined CSFs, 2) behaviours of SME managers which involve their ways of using information to make decisions, and 3) attributes of SMEs which involve managerial and organisational characteristics. Therefore, the different sections of the questionnaire have employed different combinations of question formats, depending on which variable is being measured. For instance, questionnaires may use different combinations of multiple responses, category, rank order, and scale questions.

The two main types of questions are open-ended and closed-ended questions. As discussed earlier, at this stage of the research, the questionnaire focuses on closed-ended questions. Closed questions have many advantages and they are described by Bryman and Bell, (2007 pp. 260-62) as:

- Easy to process answers.
- Enhance the comparability of answers.
- Clarify the meaning of questions for respondents.
- Easy for respondents to complete.
- Reduced possibility of variability in answers.

But closed questions also have several limitations; these limitations are included in table 6.2 with the appropriate solutions to deal with each limitation in -this research.

Limitations	Solutions
In the scale questions, there may be a loss of spontaneity in respondents' answers due to personal variations.	Scale questions were categorised into different sets according to their purpose. Simpler question formats were located before answering each set of scale question to explain the purpose of the question and prepare the participants to give accurate answers.
Multiple response and category questions may be irritating for respondents when they can't find the proper answer which they feel it applies to them.	An empty space is left for participants to put their answer if all the choices were not appropriate.
Rank order questions increase the required mental effort to answer the question.	The choices in the rank order questions were minimised to the least possible number by dividing the variables into different questions according to their relevance.

Table 6.2: limitations and solutions of the closed questions in this research.

Question wording

This step aims to ensure that the question wording is tuned into the language of participants, SME managers who are diverse in terms of age, education, and backgrounds. Question wording has a significant effect on the success of the communication process in the questionnaire (Brace, 2004). To ensure appropriate question wording, Foddy (1993) states that simplicity is desired in question wording, where difficult vocabulary, jargon and abbreviations may increase the probability of 'I don't know' as an answer, and therefore decrease the reliability of the questionnaires.

Moreover, complicated language may lead to answers that inaccurately reflect the participants' actual opinions or behaviours. Therefore, the wording of the questionnaire in this research will use a simple language that is appropriate for participants from different backgrounds. In addition, because the participants in this research are considered to be busy people, the questionnaire was designed to be less time consuming by including questions that are short and simple in an appropriate sequence.

Sequencing and layout decisions

The sequencing and layout decisions step also influences the communication process in the questionnaire, therefore the goal of this step is similar to the question wording step. This step aims to set the appropriate frame of mind for the participant to understand the research topic and provide accurate answers in accordance with the research topic. This could be achieved by arranging the questions in an appropriate sequence that ensures all the related disciplines are covered in a hierarchal manner that provides the required background to prepare the participants to accurately answer the questions.

Therefore, the questionnaire in this research arranges the questions into five sections starting with the firm characteristics (section A), followed by two sections (section B and section C) which involve performance management and business intelligence perceptions respectively and their related elements in the proposed model. And finally, managers' opinions on the importance of the defined CSFs are measured through scale questions in the last two sections (section D and section E) that involve soft CSFs and hard CSFs respectively.

Moreover, this sequence of questions organises the data collection process in a similar way to the literature survey, which will support the reliability and the validity of the collected data. This is where the first three sections aim to validate the requirements section in the literature survey, and the scale questions in the following sections aim to measure the statistical influence of the CSFs and the elements of the proposed model.

Pilot test

Before implementing the questionnaire, a pilot test is important to ensure avoiding all possible mistakes of collecting little or irrelevant data, and to ensure the required level of simplicity in the questionnaire. Due to the fact that there has been an unsuccessful attempt to collect data at this stage of the research, the researcher has established a background about the characteristics of the participants. This background has been useful for formatting, wording and sequencing the questions of the questionnaire. Because the chosen method of distributing the questionnaire is face-to-face, some changes may be applied on the spot and still generate a usable questionnaire from the pilot test. Therefore, the pilot test in this research has taken place during the implementation of the first three questionnaires.

Scale questions were applied in the questionnaire were initially based on a 5-point Likert scale. These questions aimed to validate the defined set of the CSFs that consists of soft and hard factors. The questions were tested through a pilot test with first three participants, and the results of this test seemed to be spurious claims. This was assumed because the majority of answers produced a single equivalent value (indifference) for the reason being that the participant was not sure if the tested variable is important or not. These were considered as biased answers because contradicting variables where more likely to get the same value. In this matter, 4-point Likert scale has replaced the 5-point Likret scale in order to strengthen the participants' answers by giving only significant values for each variable.

Furthermore, this research assumes that the requirements for successful performance management are similar across the majority of wholesale SMEs, but only at the operational level. Therefore, the questionnaire aims to validate this assumption by evaluating the similarity of participants' operational and strategic requirements. In this case, using scale questions may produce biased results. This is due to the different personal variations in

response style, for instance some respondents may not use the ‘very important’ choice at all, or they may give similar values for contradicting factors. In this case, rank order questions were seen as the most appropriate alternative for scale question when measuring the similarity of SMEs in prioritising their needs/requirements.

Ranking questions guarantees a unique value for each factor, but they require more mental effort to answer. In this matter, the number of elements in each ranking questions was reduced to a minimum, which decreases the necessary mental effort spent to answer the ranking questions. The final version of the developed questionnaire is included in Appendix A.

6.3 Research sample

The sample is the pool from which the research participants have been chosen, and determining the sample of the research is a critical step, where the final results and findings of the research are drawn from the collected data from the specified sample. Hair (2003 p. 209) defines a set of well-defined steps used to choose an appropriate sample for the research, and they are:

- Defining the target population.
- Choosing the sampling frame.
- Selecting the sampling method.
- Determining the sample size.
- Implementing the sampling plan.

The following subsections explain each of those steps, and show how each step has contributed in defining the sample for the industrial survey in this research.

6.3.1 Defining the target population

The sample is a small subset of the target population, and the elements of the target population are the objects that the industrial survey intends to measure their characteristics, opinions or behaviours. In this sense, the target population is the total collection of the elements that the research wishes to measure (Cooper and Schindler, 2008 p. 374). The factors that influence the choice of the target population are knowledge of the topic of interest, access to the population elements, the availability of elements and the required time frame (Hair 2003 p. 209). Therefore, the target population in this research was chosen based upon these factors; the following bullets explain how each factor was considered in defining the target population:

- **Knowledge of the topic of interest:** the required population elements (participants) in this research are supposed to be knowledgeable about operations in the enterprise, decision making and the uses of information.
- **Access to the population elements:** since that the method of distributing the questionnaire in this research is face-to-face; the population elements have to be close to the location of the study. Therefore, the participants were chosen from the North West region in the UK (the location of the research) in order to be easily accessible.
- **The availability of the population elements and the time frame:** the population elements in this research were randomly selected managers of wholesale SMEs. They are considered to be busy people and they normally do not respond to telephone or email questionnaires. In this matter, random visits were made to companies of the targeted sector. And after a few visits, a time frame when most of similar companies are not busy was recognised (Fridays afternoons).

6.3.2 Choosing the sample frame

The sample frame is the list of the elements from which the sample will be drawn (Cooper & Schindler, 2008 p. 374), examples for the sample frame are such as a list of the employees or the customers for a certain company, the telephone directory, or university registration lists. The sample frame in this research targets wholesale SMEs in the UK, and the sample frame were distinguished by using the UK's Standard Industrial Classification ‘SIC’ codes

system to identify the sector and its associates. But, the SIC scheme doesn't provide a list of companies, nor does it classify companies in term of size.

This research targets SMEs, and to identify and get the contact information for wholesale SMEs, an online companies' directory called data.com was used to define companies, addresses, telephone numbers and people. Moreover, the chosen data directory also offers companies' profiles that show their sector and size in terms of employee numbers and turnover. As a result, the sample frame was determined using a list of the sector associates according to the SIC scheme, and a list of the companies' names, sizes, and addresses within the specified industry from an online directory (data.com).

6.3.3 Selecting the sampling method

Sampling methods are divided into two categories and they are probability and non-probability sampling. Probability sampling methods select the elements of the sample using established statistical procedures that give each element in the sample the same chance of being selected, thereby minimising the selection bias. On the other hand, the non-probability sampling methods differ from the probability sampling methods in that the elements of the sample don't necessarily have the same chance of being selected (Hair 2003 pp. 211-217). Table 6.3 represents a comparison between probability and non-probability sampling methods.

Probability sampling methods	Non-probability sampling methods
The degree of confidence is measured, where statistical methods are used to measure the sampling error.	No statistical methods are used to measure the sampling error, therefore, the degree of confidence is estimated rather than measured (usually 0.95).
The obtained results from the sample are strongly related to the research problem; if the study is repeated again, the same results will be obtained.	No assurance that if the study is repeated, the same results will be obtained.
The target population elements have different	The target population elements should have a common characteristic that make them convenient to

characteristics.	the research problem.
Higher cost and more time consuming.	Lower cost and less timing consuming.
Table 6.3: Probability & non-probability sampling methods. Source: Davies, (2007 page 61-62).	

Selecting the sampling method for a certain study depends on the nature of the study, the objectives of the study, and the available time and budget for the study (Hair 2003 p. 211). This research is an academic research, and academic research is considered as primary exercises to research practice, therefore, the nature of this research encourages the use of the non-probability sampling methods (Davies, 2007 p. 62). Moreover, the sampling frame in this research targets the population of enterprises that share common characteristics in terms of size and sector, thus the divergence of the sample elements characteristics is not high, which makes non-probability sampling an appropriate option in this research.

There are several methods of non-probability sampling, Bryman and Bell (2007 pp. 197-202) describe the most frequently used types as shown in the following bullet points:

- **Convenience sampling:** selecting the sample elements (participants) who are available simply for the researcher to participate in his study.
- **Snowball sampling:** a small groupofinitial respondents who are related to the research topic are chosen, and these initial participants are then used to help in identifying other participants; it is appropriate for qualitative more than quantitative approaches.
- **Quota sampling:** similar to convenience sampling, but selecting the sample that reflects the population is in terms of relative proportions of elements in different categories, such as size, turnover, or strategy.

This research examines the requirements and the CSFs that influence the adoption of BI tools in the wholesale SMEs as whole, and it doesn't identify the proportions of industries within the SME sector nor the wholesale sector. Therefore, quota sampling is not required in this research. On the other hand, the snowball sampling is usually used for qualitative

researches where the population is very narrowed down. Therefore, the convenience sampling is the most appropriate sampling method for the purposes of this research.

6.3.4 Determining the sample size

There are several factors that should be taken into account when determining the sample size. These factors are the variability of elements in the target population, the available time and budget for the researcher, type of the required sample, and whether the findings need to be generalised or not. Where when generalising the findings, the degree of confidence in the sampling process must be known (Hair 2003 p. 218).

A statistical formula may be used to determine the required sample size for quantitative questionnaires, Hair (2003 p. 220) suggest a formula for determining the sample size; this formula uses three variables and they are: 1) the degree of confidence, 2) the specified level of precision (amount of acceptable error), and 3) the amount of variability (length of the scale). The formula is:

$$\textit{Sample size} = (DC * V / DP)^{2}$$

Where:

DC (degree of confidence) = the number of standard errors in the results.

V (variability) = the standard deviation of the population.

DP (desired precision) = the acceptable difference between the sample estimate and the population value.

The degree of variability is usually unknown and it depends on the questionnaire design; therefore the researcher should calculate it according to the method of measuring the research variables. In the case of this research, the findings from the quantitative questionnaires aim to examine the influences of the defined CSFs on the operational performance of wholesale SMEs. Each CSF in the questionnaire has been rated on a scale from 1 to 4, and this gives the range of 3 intervals (1 to 2, 2 to 3 and 3 to 4). Once we know

the range, we can estimate the standard deviation by dividing the number of intervals which is 3 by the mean of intervals which is 2.5; therefore, the standard deviation (variability) will be 3÷2.5 which equals to 1.2.

The degree of confidence is the number of standard errors in the research results, and since that we are using a scale to measure the influences on the employees, then the number of standard errors for each influence is estimated to be 1, for instance rating the variable as 1 instead of 2, or 3 instead of 4.

As mentioned before, the measurements in this study are made on a scale from 1 to 4, and the degree of confidence is 1 for a scale that contains 4 values; therefore, the desired precision is estimated to be 1/4, where the error in the precision could be plus or minus 1 value on the scale, which is equal to 0.25.

Then determining the sample size according to the previous equation will be:

$$Sample\ size = (1 \times 1.2 / 0.25)^2$$

$$= 23$$

6.3.5 Implementing the sampling plan

The questionnaires were distributed face to face to managers of wholesale SMEs. Reaching these companies was through making random visits to targeted companies and trying to conduct the questionnaire with one of the managers in that company. When managers refuse to participate, the researcher tried to arrange another appointment. Using business connections provided through personal connections provided a number of participants as well. As a result the questionnaires were distributed face-to-face and completed by 23

participants. Since that the questionnaires were distributed and filled face to face, the response rate of the questionnaires was 100%, and 23 usable questionnaires were collected. Based on guidelines provided by Wilkinson (2000, p. 22), figure 6.3 describes the plan of conducting the questionnaire survey in this research.

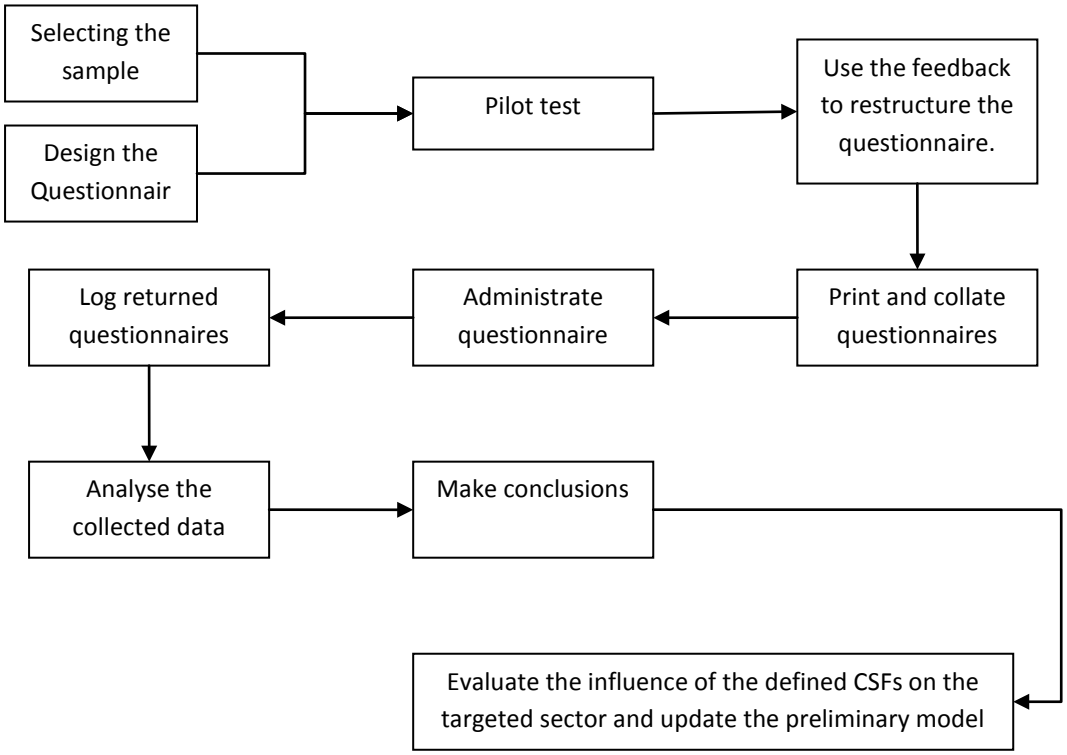


Figure 6.3: the plan of the questionnaire survey. Source: Wilkinson (2000) Page: 22.

6.4 Data analysis:

After the data collection stage, the data analysis takes place to analyse the primary data. This section aims to describe the process of analysing the collected primary data thorough the quantitative questionnaire survey. Because the questionnaire in this research has more than one intention and a combination of questions' formats, the analysis is classified according to the questions' formats which classify the analysis according to the variables being measured. This is where questionnaires measure attribute, behaviour and opinion variables. Accordingly, the scope of data analysis in this research takes three separated stages.

The first stage involves simple descriptive analysis that measures attribute variables; this aims to identify the characteristics of the participating SMEs, managers, and their managerial capabilities. In the second stage of data analysis, non-parametric data analysis was used to measure the behaviour variables, which aims to evaluate the similarity between the participating SMEs in terms of the defined requirements and CSFs. In turn, this aims to generalise the uses of the defined requirements and CSFs across wholesale SMEs in the UK. The third stage of data analysis involves measuring the opinion variables; these variables are measured using statistical tests. This is where; the spearman rank correlation was used to validate the defined set of CSFs. And after that, multiple linear regression (MLR) technique is used to test the statistical influence of the proposed model on the defined CSFs.

6.5 Summary

The methodology of this research was discussed through this chapter by considering the research design, data collection, sampling, and data analysis. The purpose of this research defines the research as an exploratory study which aims to explore new insights in the fields of BI adoption and performance management in SMEs. Based on the generated insights, this research aims to propose a unique model that aligns the features of BI tools with the activities of performance management within wholesale SMEs in the UK. Reviewing the literature shows that no similar models were developed for the same purposes and sector. Therefore, the philosophy of this research is defined as interpretivism because interpretivism researches aim to explore new phenomena that were not investigated in previous literature.

To do so, this research follows a deductive approach by conducting a literature survey that aims to identify the requirements and the CSFs that influence the development and adoption of the proposed model. Since a previous qualitative strategy has failed to gain research requirements, a quantitative strategy was followed to collect the required information and avoid the faults of a previous unsuccessful qualitative study. Accordingly, the industrial survey has been chosen as the research approach. This industrial survey is implemented through the use of self-completion questionnaires with SME managers.

The sample of this research has been identified according to three elements of the research, which are SME definition, the UK's SIC scheme, and the aims of the questionnaire survey. Based on this, the sample was defined as wholesale companies that are classified in the UK's SIC scheme in section G and within division 46. Moreover, according to the SME definition, the targeted wholesalers should employ fewer than 250 employees and have an annual turnover not exceeding 40 million. Because the questionnaire in this research involves scale questions, the required sample size was identified according to the number of points in the scale questions. Accordingly, 23 questionnaires are required from 23 different SMEs. The access to the sample was through random visits to companies and face to face distribution of the questionnaire.

And finally, the data analysis in this research is implemented using three different techniques for each type of variable (attribute, behaviour and opinion variables). These techniques are summarised as simple descriptive analysis to measure the attribute variables, non-parametric analysis to measure behaviour variables, and statistical tests to measure opinion variables. The following chapter discusses the process of data analysis in details, then generates the findings from the analysis, and applies changes to the preliminary version of the proposed model.

Chapter Seven: Analysis of the industrial survey

7.0 Analysis of the literature survey

After the data collection stage, this chapter aims to analyse the collected data through the questionnaire survey as discussed in Chapter Six and included in Appendix A. Because the questionnaire in this research has more than one intention and question format, the analysis is classified according to the attained intentions of the questionnaire data and the formats of the questions. The following subsection explains the scope of data analysis in this chapter, and then the data analysis is performed on three stages through the following subsection.

7.1 Scope of data analysis

The data analysis in this chapter intends to achieve the main aim of the industrial survey, which is validating the results of the literature survey. Therefore, after analysing the literature survey, gaps in the results were identified in order to ensure they were fulfilled through the questionnaire survey. Two main gaps were identified in the results of the literature survey. The first gap is because the CSFs were obtained using a multi-disciplinary study; these factors were originally defined for other purposes than the purpose of this research. Therefore, the influence of the defined CSFs on proposed model should be further validated in the targeted sector.

The results of the literature suggests that because of the similar characteristics of the targeted SMEs; the requirements and performance management activities are generalised for the development and adoption of the proposed model. But the literature survey does not confirm this assumption within the targeted sector (wholesale SMEs in the UK). Therefore, the second gap in the literature survey is to confirm the generalisation of the requirements and performance management activities in the proposed model and in the targeted sector.

As discussed in Chapter Six, to fill gaps in the results of the literature survey, the industrial survey implements a quantitative questionnaire survey that aims to validate the results of the literature survey by 1) measuring the statistical influence of the defined CSFs in the targeted sector, and 2) confirming the importance of the elements of the proposed model within wholesale SMEs in the UK. And since that questionnaires measure attribute, behaviour, and opinion variables. The analysis of the questionnaire survey in this research intends to measure the following:

1. Attributes: identify the characteristics the participating SMEs and managers.
2. Behaviour: confirm whether the model's requirements and performance management activities are similar across wholesale SMEs at operational levels.
3. Opinion: measure the statistical influence of the defined CSFs and the defined elements of the proposed model in the targeted sector.

To do so, the data from the questionnaire survey is analysed using statistical and non-statistical techniques in three stages. The first stage involves descriptive analysis that aim to clarify that the appropriate sample is targeted. The second stage involves analysing the behaviour of participants in order to evaluate the similarities between SMEs and generalise the requirements and activities of the proposed model. The third stage involves taking the opinions of participants to measure the statistical influence of the defined CSFs and model elements in the targeted sector. Based on this classification, the analysis of the questionnaire survey is divided into three sections according to the different stages of analysing the questionnaires' data. Each stage of data analysis is discussed separately in the following sections.

7.2 Participants' characteristics

As mentioned in Chapter Six, questionnaires measure attribute variables to identify managerial and organisational characteristics. The attributes' variables are measured in this questionnaire to define the characteristics of the targeted sample. To measure attribute variables, a set of multiple response and category questions were dedicated to identify the characteristics of the participating SMEs. And for the purposes of sequencing and laying out decisions in the questionnaire, these questions were distributed across the first three sections of the questionnaire (sections A, B and C) in order to prepare the participants for answering more complicated questions. The analysis of these questions is divided into three categories according to their topics of interest.

The first category contains Q1, Q2, and Q3 and it aims to provide a general description about the characteristics of the participating SMEs. The second category contains Q4 and

Q5 and it aims to describe the characteristics of the participating managers. The third category contains Q6, Q7, Q8, Q9 and Q17, and this category aims to describe the managerial capabilities in the participating SMEs. Based on this categorisation, the analysis of each category is separately included in the following subsections.

7.2.1 Characteristics of the participating SMEs

This category aims to identify the characteristics of the participating SMEs according to variables derived from the UK's SIC scheme and the SME definition that was clarified by the European Commission in 2005. The three variables are: 1) the speciality of the company, 2) number of employees, and 3) annual turnover.

The first question (Q1) is a category question that identifies six specialities in the targeted sample according to the UK's SIC scheme (2007). The majority of the sample was specialised in the wholesale of food, beverages and tobacco with eight participating SMEs representing 35% of the entire sample. Four respondents have indicated that their speciality is the wholesale of household goods, which represents 17% of the entire sample. Another four respondents specialised in the wholesale of machinery, equipment and supplies, representing 17% of the sample. Three respondents were operating in 'other specialised wholesale', which represents 13% of the entire sample for each group. And finally, two and two participants have indicated that they are wholesalers of information and communication equipment and non-specialised wholesale traders, which represents 9% and 9% of the entire sample. Figure 7.1 represents a pie chart that demonstrates the results of analysing Q1.

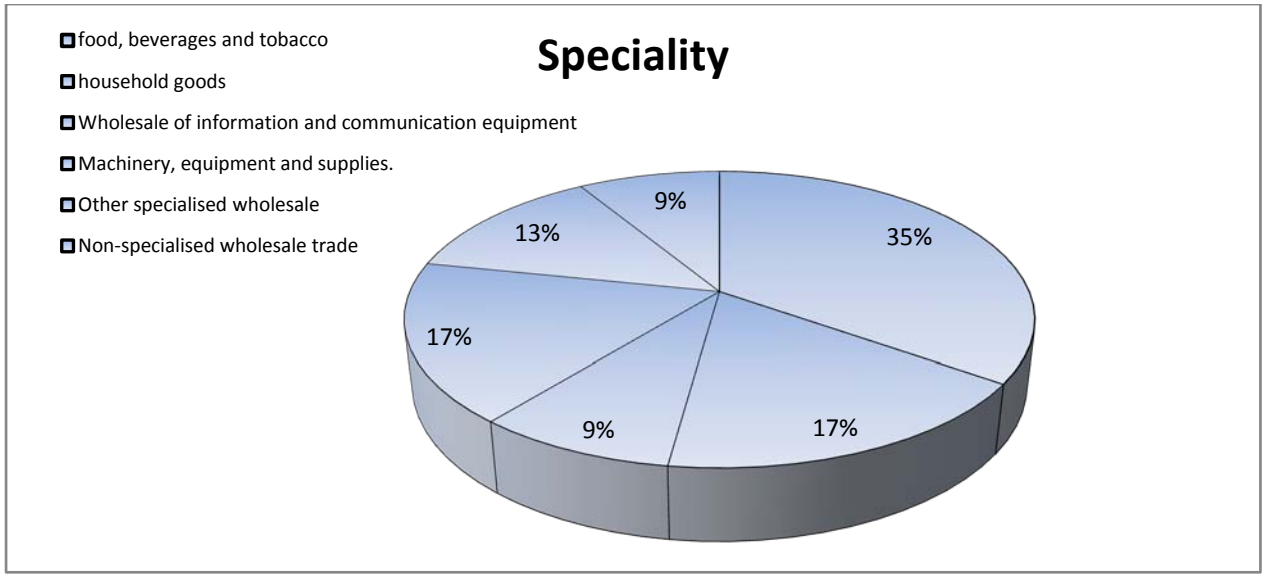


Figure 7.1: Participants speciality.

The second question (Q2) is a category question that categorises the sample elements according to the number of employees. The majority of participants were categorised as 'small' with eleven participating SMEs representing 48% of the entire sample. Six and six participants were categorised as 'micro' and 'medium', which represents 26% and 26% of the entire sample. Figure 7.2 represents a pie chart that demonstrates the results of analysing Q2.

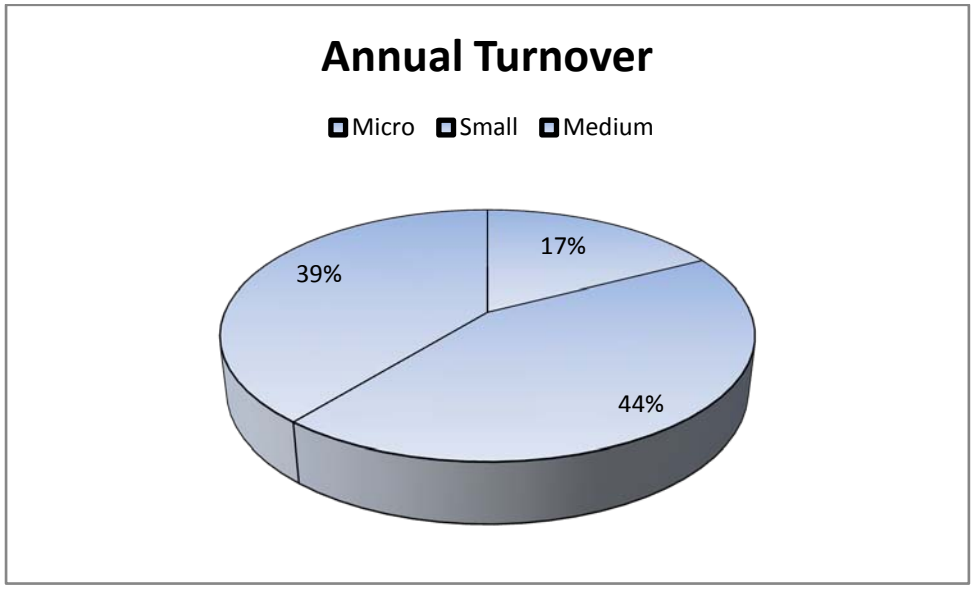


Figure 7.2: Head counts of the participating SMEs.

And the third question (Q3) is also a category question that categorises participating SMEs based on the annual turnover. In this question, ten SMEs were classified as small, which represents 43% of the entire sample. Nine participants were classified as medium, which represents 39% of the entire sample. Only four participants were classified as micro, which represent 17% of the entire sample. Figure 7.3 represents a pie chart that demonstrates the results of analysing Q2.

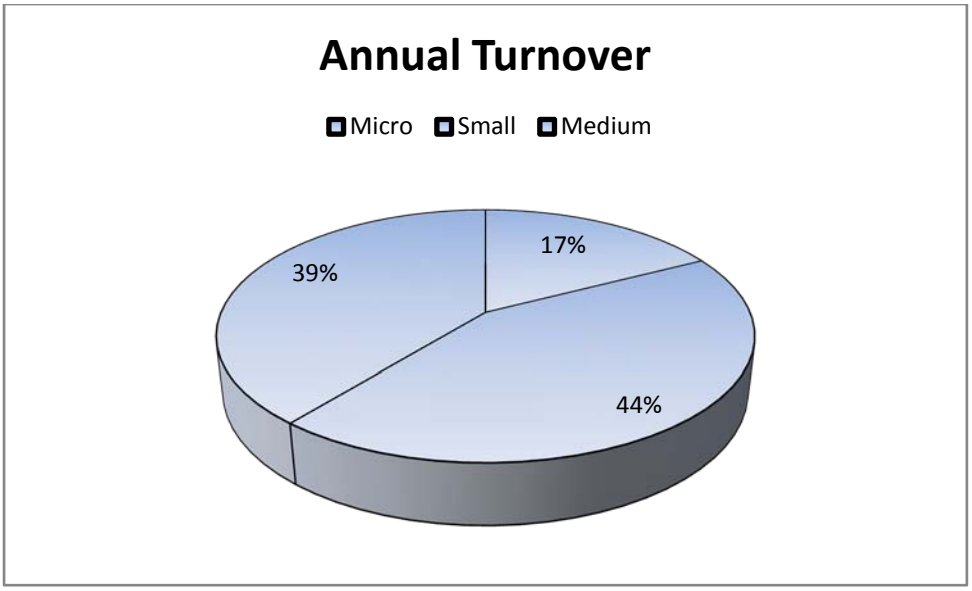


Figure 7.3: Annual turnover of the participating SMEs

7.2.2 Characteristics of the participating managers

The second category aims to describe the managerial profiles of the participating managers by asking two category questions that involve the job title and qualification. Accordingly, Q4 identifies three categories of managers in the participating sample: department managers, managing directors, and team leaders/supervisors. The results of this question returns eleven managing directors, nine department managers, and three team leaders/supervisors. This represents 48%, 39%, and 13% of the entire sample respectively. Figure 7.4 presents a pie chart that demonstrates the results of analysing Q4.

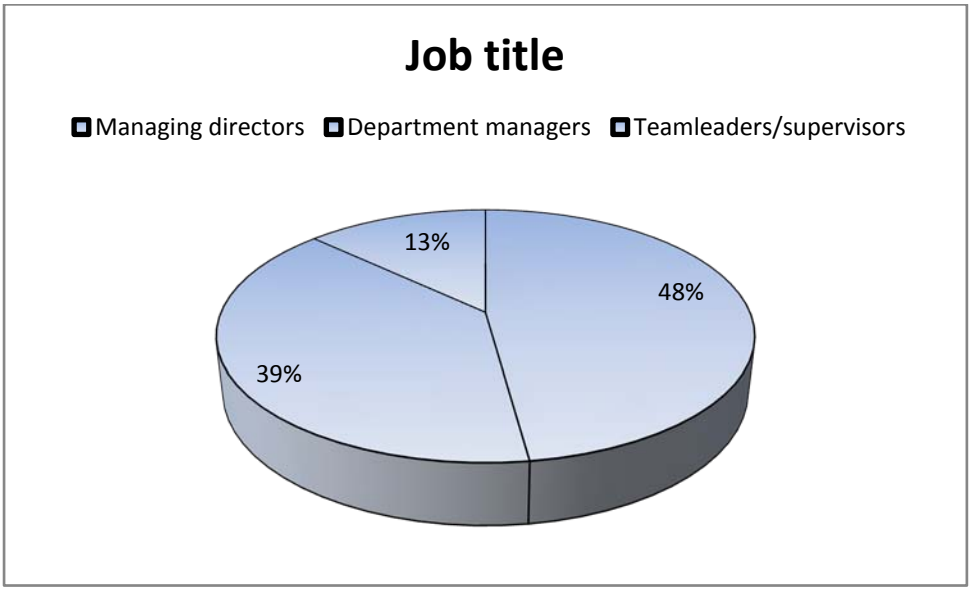


Figure 7.4: Job titles of the participating managers.

Q5 identifies the highest qualifications of these managers. Thirteen participants have chosen college/university as their highest qualification. Six managers have chosen high school as their highest qualification, only three managers have chosen postgraduate education as their highest qualification, and no managers have chosen professional courses as their highest qualification. This represents 59%, 27%, 14% and 0% of the entire sample respectively. Figure 7.5 presents a pie chart that demonstrates the results of this category question

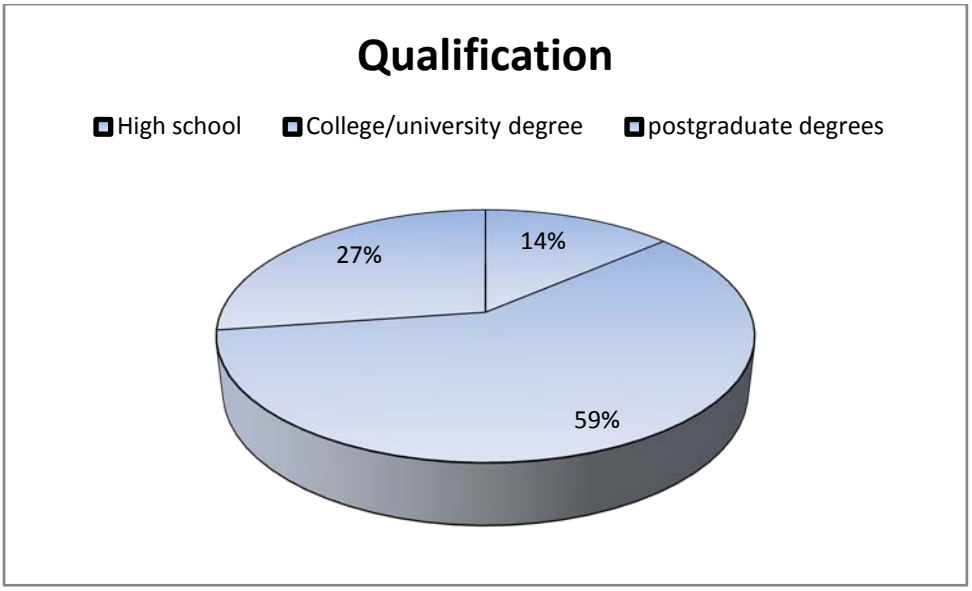


Figure 7.5: annual turnover of the participating SMEs.

7.2.3 Managerial capabilities in the participating SMEs

The third category aims to describe the managerial processes in the participating SMEs. The first question in this category (Q6) confirms the use of information systems in the targeted sector by indicating that twenty of the participating SMEs are using information systems to make decision, this represents 87% of the entire sample. Q7 aims to identify if business development is needed in the participating SMEs. As shown in Figure 7.6, the majority of participants have indicated that there could be business development needs but they are not aware of them, this has accumulated ten answers which count for 44% of the entire sample. Seven answers indicated that their companies need business development, which counts for 30% of the entire sample. And six answers indicated that business development is not needed, which represent 26% of the entire sample.

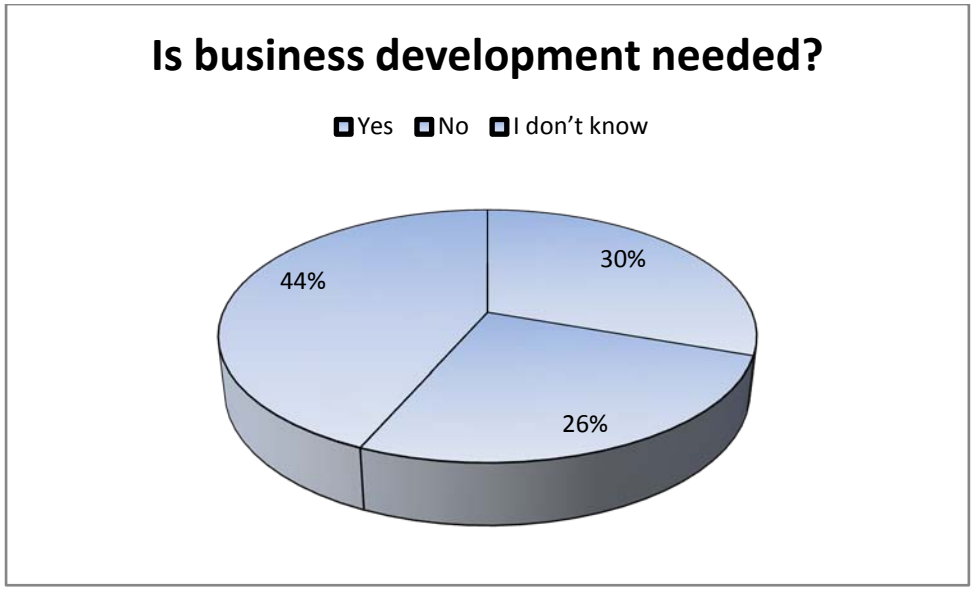


Figure 7.6: Is business development needed in the participating SMEs

Moreover, Q8 asks if the participating SME have a clear performance measurement plan. Ten participants have indicated that such a plan is not clarified in their companies, but they think that such a plan should be under consideration. This represents 44% of the entire sample. Nine participants have indicated that a performance management plan is clarified in their companies, representing 39% of the entire sample. Only four participants indicated that their companies don't clarify a performance measurement plan and such a plan is not needed. Figure 7.7 presents a pie chart that demonstrates the results of this category question

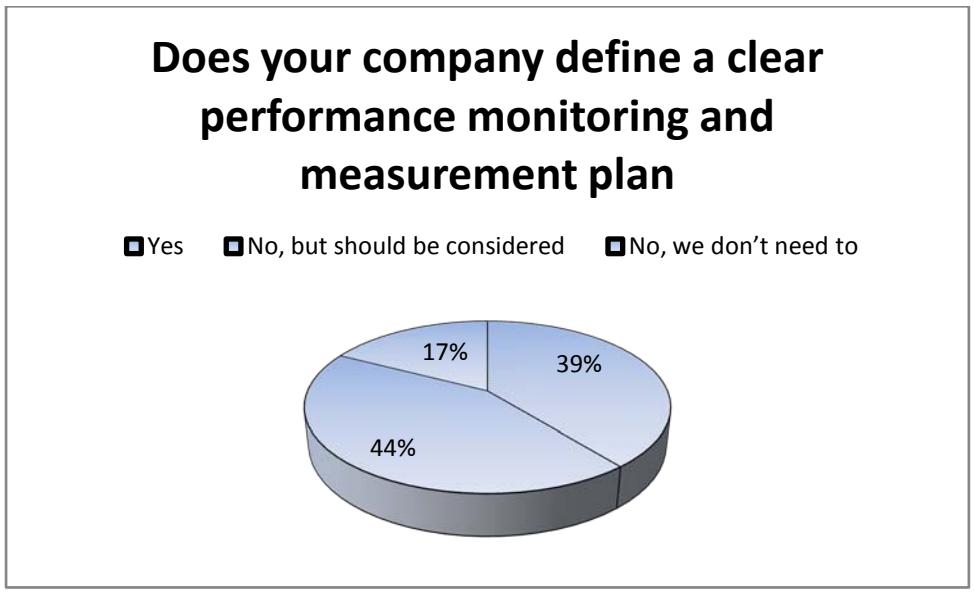


Figure 7.7: Do participating SMEs clarify performance measurement plans.

After that, Q9 aims to define the policy of performance management in the participating SMEs. Because companies may have more than one policy of performance management, this question has been chosen to be a multiple response question. The answers to this question are presented in Table 7.1.

Perception of performance management	Yes	No	Total
Employees' appraisals and bonus scheme	10	13	23
Periodic short-term meetings or motivational activities	19	4	23
A continuous management process	23	0	23
Table 7.1: policy of performance management			

The last question in this category is Q17; this question asks the participants if they think that adopting new and more advanced computer technology will enhance their operations' performance. The majority of answers (twelve answers) have indicated that they can't decide until technologies comes into place, nine participant think that adopting new and more sophisticated information systems will enhance their operations' performance, and only two participants think that adopting new information system will not affect their operation's performance. Figure 7.8 presents a pie chart that demonstrates the results of this category question.

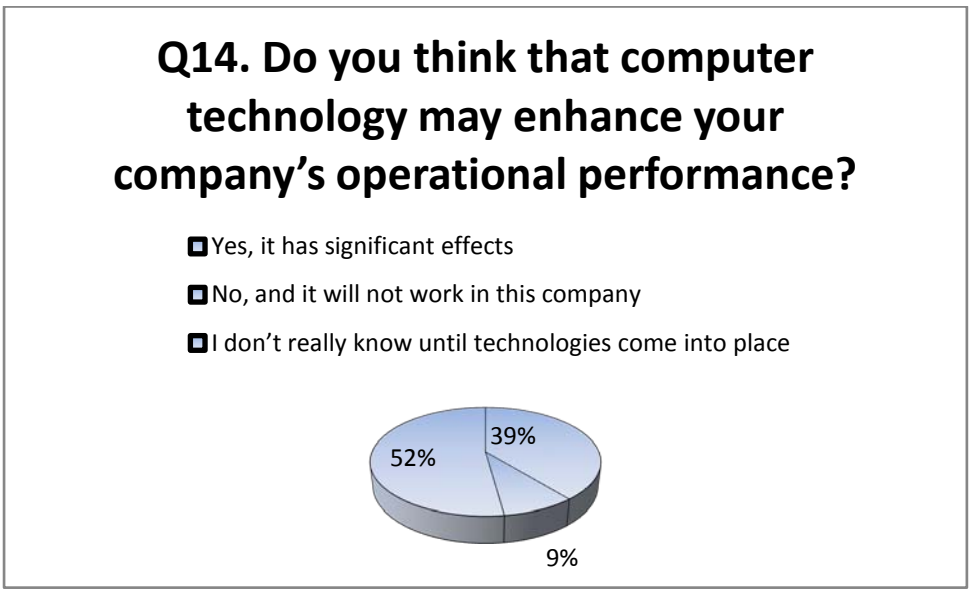


Figure 7.8: Will the adoption of more advanced IT systems enhance your company's operations' performances.

7.3 Behavioural characteristics

To confirm the assumption of the research that the requirements and performance management activities are similar across wholesale SMEs, behavioural variables are tested in this questionnaire. The questionnaire in this research aims to clarify the behaviours of the participating SMEs from requirements and activities perspectives. The first perspective is performance management and it is used to test whether the performance management activities are similar between participants at the operational level. And, since the operational performance management is mainly involved with report making and analysis, the second perspective (requirements) is considered as business intelligence; this is because BI involves the creation of business knowledge through report making and analysis to support the enterprise's performance.

Again, for the purposes of sequencing and laying out decisions in the questionnaire, the analysis of the behavioural characteristics was distributed across the second two sections of the questionnaire (section B and section C), and five questions (Questions 10, 11, 12, 18, and 19). The aim of this analysis is to evaluate the common priorities of the participating SMEs when defining performance, ensuring operations' success, measuring performance, and adopting information systems.

Moreover, this research assumes that the requirements for supporting a successful performance management through BI tools are similar across the majority of wholesale SMEs at the operational level. In this instance, scale questions may produce biased results. This is due to the different personal variations in response style, for instance some respondents may never use the highest or the lowest score of the scale, and they may give similar values for contradicting factors. In this case, rank order questions were identified as the most appropriate alternative.

This is where rank order questions guarantee a unique value for each factor, but answering such questions requires an increased mental effort. In this matter, the number of elements in each ranking question was reduced to a minimum, which decreases the mental effort spent to answer the ranking questions. This is why Q10, Q11, Q12 and Q18 have only included three variables and Q19 has included four variables.

There are numerous methods for analysing the rank order questions; researchers have used several parametric or non-parametric analysis methods. Examples of non-parametric methods of analysing the rank order questions are such as the Kruskal-Wallis nonparametric statistical test (Haunsperger, 2003). On the other hand, non-parametric data analysis could also be used to measure the variables of rank ordered questions.

In this research, rank order questions are used to confirm the assumption that the requirements and performance management activities are similar for the proposed model across the majority of wholesale SMEs. This is confirmed by comparing and analysing the priorities of the participating SMEs through a set of variables that reflect the activities of performance management and the requirements of the proposed model. Accordingly, the analyses of rank order questions in this research are multipurpose but require simple analysis. In this case, non-parametric analysis is more appropriate because they could be adjusted to ensure all the purposes of the analysis are achieved. The non-parametric analysis in this research is performed on three stages, which are:

- Coding the answers
- Dividing the sample into three subsamples
- Combining the results of two subsamples and comparing the results with results of the third subsample to calculate the variance in the participants' answers.

As explained by de Vaus (2004, pp. 11-16) the multiple-dichotomy method could be used for coding the ranking questions. When using such a method with ranking questions, the possible ranks should be treated as the categories for each variable. Based on this method the following tables demonstrate the analysis of the rank order questions from the questionnaire's sections B and C.

The first question (Q10) asks about the perceptions of performance in the participating SMEs by ranking three main perceptions. These perceptions were chosen to reflect the different goals of wholesale SMEs when they consider improving performance:1) eliminating operational defects, 2) increasing profits, and 3) gaining competitive edge. Table 7.2 illustrates the ranks and the variables in Q10.

Categories	Variables		
	Eliminating operational costs	Increasing profits	Gaining competitive advantage
Ranked 1st	8	14	2
Ranked 2nd	4	3	15
Ranked 3rd	11	6	6
Total	23	23	23

Table 7.2: perceptions of performance (Q10)

The second question (Q11) aims to evaluate the factors that influence the success of operations within the targeted sector. These factors are derived from the defined set of CSFs, and they are the hard CSFs (operations' efficiency, operations' effectiveness, and competitiveness). The ranking of these factors aims to examine if the operational performance has similar requirements across the majority of SMEs within the targeted sector. Table 7.3 illustrates the ranks and the variables in Q11.

Categories	Variables		
	Efficiency	Effectiveness	Competitiveness
Ranked 1st	5	17	1
Ranked 2nd	11	5	7
Ranked 3rd	7	1	15
Total	23	23	23

Table 7.3: Success of operations (Q11).

The third rank question (Q12) aims to prioritise data sources that could be used in making decisions to improve performance of SMEs within the targeted sector. The identification of these data sources was obtained from the defined requirements and set of CSFs in Chapter Five. Table 7.4 illustrates the ranks and the variables in Q12.

Categories	Variables		
	Customers' feedback	Financial indicators	Operational indicators
Ranked 1st	8	4	10
Ranked 2nd	6	8	10
Ranked 3rd	9	11	3
Total	23	23	23

Table 7.4: Data sources (Q12).

The fourth question (Q18) aims to prioritize the influences on wholesale SMEs to adopt information technology. The variables in this question were derived from the analysis of the literature survey results. Table 7.5 illustrates the ranks and the variables in Q18.

Categories	Variables		
	Operational Requirements	Reducing operational costs	Improving performance
Ranked 1st	15	0	8
Ranked 2nd	5	8	10
Ranked 3rd	3	15	5
Total	23	23	23

Table 7.5: Priorities to adopt information technology (Q18).

The last ranking question (Q19) involves the influences that hinder the adoption of information systems within wholesale SMEs. The variables in this question are also derived from the literature analysis. Table 7.6 illustrates the ranks and the variables in Q12.

Categories	Variables			
	Change resistance	Cost	Technical requirements	Training needs
Ranked 1st	8	10	2	3
Ranked 2nd	3	5	3	12

Ranked 3rd	3	5	9	6
Ranked 4th	9	3	9	2
Total	23	23	23	23

Table 7.6: Priorities hindering the adoption of information technology (Q19).

As mentioned above, the rank order questions are employed to validate the assumption of the research by evaluating the similarity of participants' priorities. In this sense, rank order questions were used to identify the common needs of the participating SMEs. To do so, the sample was divided into three subsamples. Because the sample elements were targeted using convenience non-probability sampling, selecting the elements of each subsample was performed randomly. Therefore, for each rank order question eight elements were selected in the first two subsamples and seven elements in the third subsample. The aim of this division is to compare the answers of participants in prioritising the needs and requirements for a successful performance management at operational levels through the adoption of information systems.

Each subsample is analysed separately. The results of the subsamples analysis are then compared with each other in order to calculate the variance in the similarities between participants. The aim of such analysis is to discriminate between the shared needs and requirements across the targeted sample to support the validation of the research assumptions. In other words, the main aim is to identify the similarity between participants' answers in prioritising as set of variables. The creation of the subsamples for questions 9, 10, 11, 12, 18, and 19 are demonstrated in tables B.1, B.3, B.5, B.7, and B.9 in appendix B.

To evaluate the similarity of answers, the percentage of each rank is calculated in each subsample for each variable. After that, the comparison takes place by combining the results of two subsamples; and then subtracting the combination's values from the values of the third subsample. The values of the combination are generated by calculating the average percentage from the values in the combined subsamples. The implementation of this analysis is demonstrated in tables B.2, B.4, B.4, B.6, B.8, and B.10 in Appendix B. After that, the average variance is calculated for each variable by calculating the average of values after subtraction for each variable. The variables that have the values of average variance closer to zero are considered as more common, as there is no variability in the answers of

the rank order questions. According to value of the average variance, these variables are ordered from the most similar to the least similar variables in the table 7.7.

Variable	Avg. variance
Operational requirements	.036
Technical requirements	.089
Gaining competitive advantage	.137
Eliminating operational costs	.142
Effectiveness	.159
Training needs	.162
Efficiency	.179
Improving performance	.190
Increasing profits	.197
Financial indicators	.226
Competitiveness	.227
Reducing operational costs	.286
Cost	.268
Change resistance	.273
Customers' feedback	.285
Operational indicators	.333

Table 7.7: The average variance of the identified variables in the rank order questions.

The results are evaluated by considering the average variance for each variable, where high variance indicates less agreement on the ranking/prioritising of the variable, and lower variance indicates an increased agreement on the ranking/prioritising of the variable. According to the comparison tables, the variance of the identified variables in table 7.7 shows a good level of agreement on the ranking of the variables. The variability ranges between .036 and .333, which indicates that the majority of participants have similar requirements and activities in the defined set of variables. Therefore, the majority of the

participating SMEs have similar requirements and performance management activities in the proposed model in this research.

7.4 The statistical influence of the CSFs on the proposed model

The defined set of CSFs in the literature survey consists of twelve CSFs with their associated measures. These CSFs were categorised in Chapter Five into soft and hard factors according to their measurability. Measurable CSFs are considered as the hard CSFs and the rest of the CSFs are considered as the soft CSFs. The soft CSFs included the majority of CSFs, therefore, a huge amount of measures were defined in this category. On the other hand, the hard (measurable) CSFs category includes fewer but more significant CSFs and measures. This is where the hard CSFs and their associated measures are directly engaged in the development, implementation and employment of the proposed model. The soft CSFs are only used to generate pre-implementation guideline information.

This questionnaire aims to apply statistical tests that validate the defined set of CSFs and measures by calculating the correlation coefficient to describe the relative importance of the measures to their CSFs. Therefore, in this test, CSFs are considered as the dependent variables and the measures are considered as the independent variables.

In order to gain more accurate results, the questionnaires aim to clarify and differentiate between the hard and the soft factors by including them in two separate sections (sections D and E) in the questionnaire. The two sections are discussed and evaluated in following subsections separately.

7.4.1 Soft CSFs (Section D)

This section consists of two sets of scale questions; the first set examines the defined soft CSFs, and the second set involves the measures of these CSFs. The measures in this category are considered to be too long to be tested with the busy participants in this research, and due to the fact that these measures are only used to inspire the pre-implementation guideline information in the proposed model. The suggested guideline information in figure 6.2 was used to replace the use of the measures in the second set of

questions. In this sense, each of the soft CSFs is considered as a dependent variable and the guideline information represents the set of independent variables for each CSF.

Therefore, the analysis of these questions will seek to measure the statistical influence of the guideline information (independent variables) on the soft CSFs (dependent variables). The dependent and independent variables are tested using ordinal scale questions; Lehman et al. (2005 p. 108) recommend the use of Spearman's rank correlation coefficient to evaluate the relative strength of such relationships (between each soft CSF and all the variables of the pre-implementation guideline information). Six soft CSFs were used to generate the guideline information and they are:

1. Information and communication channels.
2. Top management commitment.
3. Human resource management skills.
4. Technological capabilities.
5. External environment.
6. Research and development capabilities.

The pre-implementation guideline information is summarised in four independent variables, which are:

7. Using IS to monitor and measure operations' performance.
8. Ability to change in response to opportunities and challenges.
9. IT investment.
10. Flexibility of operations.

The Spearman's rank correlation coefficient was calculated using SPSS for the six soft factors separately. Table 7.8 summarises the correlations for each soft CSF with the variables of the pre-implementation guideline information based on the Spearman's rank correlation coefficient.

Dependent variables	Independent variables				
	Use of information systems	Change of operations	IT investment	Flexibility of operations	Average correlation
Information and communication channels.	.546**	.270	.254	-.156	.229
Research and development capabilities.	.392*	-.163	.424*	.088	.185
Top management commitment	.280	.052	-.150	.139	.080
Industrial infrastructure.	-.025	.419*	-.207	.076	.066
Human resource management skills.	-.151	-.209	.126	.296	.012
Technological capabilities.	-.390*	.240	-.336	.382*	-.041

Table 7.8: Spearman rank correlation coefficients between the soft CSFs and the guideline information for implementing the proposed model.

The results indicate that all the soft CSFs are significantly correlated (p>=0.05) with all the variables of the pre-implementation guideline information. However, the main aim was to validate the CSFs and not the guideline information; therefore, the correlation coefficient was calculated between each CSF and the guideline information as a whole by calculating the average of correlations for each CSF. This is presented in the last column of table 7.11. Accordingly, the average of correlations indicates to two insignificant CSFs: Human resource management skills (p=.012<.05) and Technological capabilities (p=.41<0.05). Therefore, these two soft CSFs are seen as insignificant to the implementation of the proposed model in this research.

7.3.2 Hard CSFs

The proposed model defines three dependent variables (CSFs), which are operations' effectiveness, operations' efficiency, and competitiveness. Three sets of independent variables were identified for each CSF separately as explained in figure 5.2. In the questionnaire, the independent variables and the dependent variables were included within scale questions in section E. In analysing these scale questions, the Spearman's rank correlation has been calculated for each hard CSF with its specified set of measures as explained in figure 5.2. Table 7.9 summarises the analysis of the hard CSFs based on the Spearman's rank correlation.

The proposed model suggests monitoring and measuring the measures of the hard CSFs to enhance decision making by identifying success and failure areas for the decision maker. In this sense, negative and positive correlations about the measures of the operational performance are needed to analyse data and enhance the decision making process. For this reason, negative and positive correlations between the CSFs and their measures have equal importance in this section. Therefore, in calculating the average of correlations for the hard CSFs, the value of correlation is considered as the difference between zero and the correlation value. In other words, negative values of correlation are treated as positive values.

Dependent variables			
Independent variables	Operations' efficiency	Operations' effectiveness	Competitiveness
Financial turnover	**.308**		
Volume discount	**.509**		
Cost of operations	**.306**		
Cost of a new customer	**.028**		
Purchasing and warehousing costs	**.245**		
Available Liquidity	**.109**		
Return on investments	**.147**		
Payback periods	**.188**		
Inventory turnover	**.121**	**-.146**	
Throughput	**-.004**	**-.141**	
Deliveries lead times		**-.027**	
Speed of operations		**-.206**	
Trade-offs between transports		**.147**	
Number of competitors			**.533**
Number of customers			**.124**
Customers' satisfaction			**-.079**
Price performance against competitors			**.370**
Operational costs compared to competitors			**.174**
Net sales			**.207**
Average correlation	**.197**	**.133**	**.248**

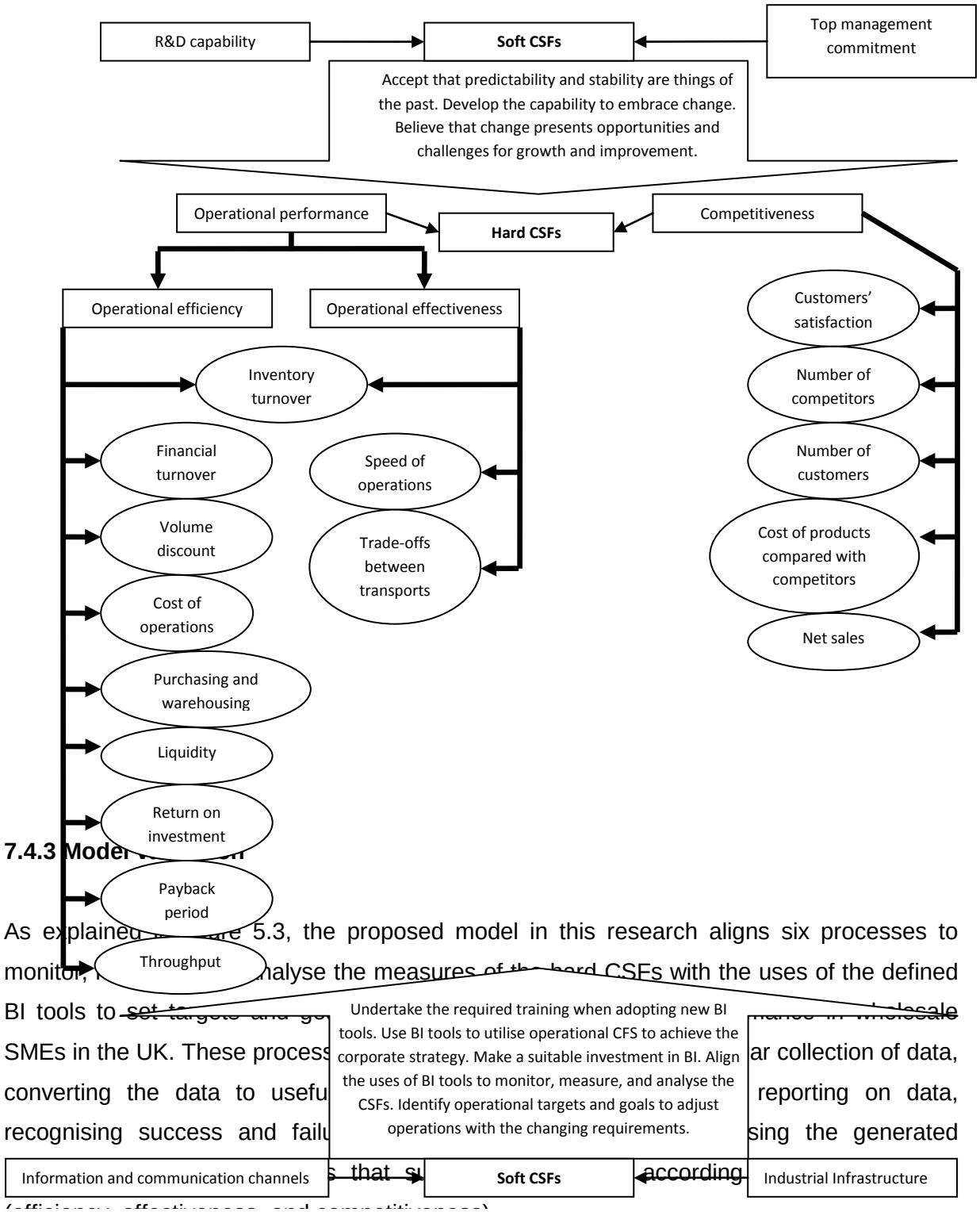
Table 7.9: Spearman rank correlation coefficients between the hard CSFs and their associated measures.

The results indicate that all the hard CSFs are significantly correlated (p>=0.05) with the majority of their defined measures. This is where table 7.9 shows three insignificant correlation values between the hard CSFs and their associated measures. These correlations are addressed in the following bullets:

- Throughput with efficiency = .004 (p=<.05)
- Cost of a new customer with efficiency = .028 (p=<.05)
- Deliveries lead times with effectiveness = .027 (p=<.05)

However, the main aim was to validate the hard CSFs and not their associated measure. Therefore, the correlation coefficient was calculated between each CSF and its related measures as a whole by calculating the average of correlations for each CSF. This is presented in the last row of table 7.9. Accordingly, the average of correlations indicates significant CSF values that range between (.248 and .133). Therefore, because of the correlation values, none of the hard CSFs was excluded from the proposed model, but three measures were identified as insignificant to their corresponding CSFs.

According to the analysis of the soft and hard CSFs, figure 5.2 has been updated to omit the unrelated CSFs and measures. Figure 7.9 illustrates the updated set of CSFs.



7.4.3 Model [illegible]

As explained [illegible] 5.3, the proposed model in this research aligns six processes to monitor, [illegible] analyse the measures of the hard CSFs with the uses of the defined BI tools to set targets and go[illegible] [illegible] SMEs in the UK. These process[illegible] [illegible]ar collection of data, converting the data to useful [illegible] reporting on data, recognising success and failu[illegible] [illegible]sing the generated [illegible]s that s[illegible] according [illegible]

Figure 7.9: The classification process of the soft and hard factors.

To validate the preliminary version of the proposed model, the multiple linear regressions (MLR) is used to predict the success or failure of the proposed model in supporting the

defined set of hard CSFs. In this sense, the processes are treated as the independent variables for the three hard CSFs (effectiveness, efficiency and competitiveness). Therefore, three MLR models are generated for the three hard CSF separately. The following equation represents the MLR:

$$y = \beta_0 + \beta_1 X_1 + \ldots \beta_n X_n$$

Where: y is the dependent variable being predicted by βn which is the partial regression coefficient for each independent variable (Xn), and β0 is a constant calculated for y. Xn represents the predictor variables which are the processes of the proposed model. ε is the error term or the residual that can't be explained by the model. Seven processes are tested in this regression model as the predictor variables, therefore, the regression equation will be applied for the prediction y = . β0 + β1 (x1) + β2(x2) + β3(x3) + β4(x4) + β5(x5) + β6(x6) + β7(x7)

In this sense, the regression equations of the three independent variables are shown in the following bullets:

- Operations' efficiency: y = 1.465 -.332 (x1) + .088 (x2) + .058 (x3) + .124 (x4) + 184 (x5) + .040 (x6) - .148 (x7)

- Operations' effectiveness = 1.788 + .060(x1) - .121(x2) - .114(x3) + .276(x4) + .034(x5) - .007(x6) - .037(x7).

- Competitiveness = 1.124 -.273(x1) + .088(x2) - .093(x3) + .261(x4) + .007(x7) + .121(x6) + .107(x7)

Table 7.10 summarizes the results of the MLR models that have been calculated using SPSS for each hard CSF with all the processes of the proposed model.

Dependent variables						
Independent variables		**Operations' efficiency**		**Operations' effectiveness**		**Competitiveness**	
		β	**Std. Error**	***β***	**Std. Error**	***β***	**Std. Error**
Constant		1.465	.644	1.788	.757	1.124	.733
Assessing performance (X1)		-.332	.312	.060	.366	-.273	.355
Comparing performance with competitors (X2)		.088	.185	-.121	.217	.088	.211
Comparing the current with previous performance (X3)		.058	.255	-.114	.300	-.093	.290
Identifying targets and goals (X4)		.124	.336	.276	.430	.261	.417
Collection of data (X5)		.184	.447	.034	.526	.007	.510
Reporting on data (X6)		.040	.374	-.007	.439	.121	.426
Analyse the data (X7)		-.148	.241	-.037	.283	.107	.275
MLR Summary	***R***	.368		.249		.345	
	R square	.135		.062		.119	
	Adjusted R Square	-.286		-.376		-.293	
	Std. Error of the Estimate	.664		.780		.756	

Table 7.10: Spearman rank correlation coefficients between the hard CSFs and their associated measures.

The appropriateness of the multiple regression models can be evaluated using the ANOVA table. Table 7.11 represents the results of the ANOVA tables for each hard CSF and the processes of the proposed model.

Model	Sum of Squares (SS)	df	Mean Square (MS)	Variation (F)	Sig.
Operations' efficiency					
Regression	1.036	7	.148	.336	.925
Residual	6.616	15	.441		
Total	7.652	22	**.348**		
Operations' effectiveness					
Regression	.605	7	.086	.142	.993
Residual	9.134	15	.609		
Total	9.739	22	**.443**		
Competitiveness					
Regression	1.156	7	.165	.0289	.948
Residual	8.583	15	.572		
Total	9.739	22	**.443**		

Table 7.11: ANOVA for each hard CSF and the process of the proposed model.

The variance is the variation (SS) divided by degrees of freedom (df), MS = SS / df. The three values of SS are calculated according to the different sample sizes specified by the value of df where the first sample size is: the number of parameters (=7), the second sample size is: the sample size – 1 - number of parameters (=15), and the third is sample size -1 (=22). The variance value F is calculated by dividing the MS of the first pair of sample sizes with MS of the second pair of sample sizes; F = MS(Regression) / MS(Residual). If the value F is not equal to zero, then there is a correlation between the processes and the specified CSF. As noticed in table 7.11, f is not equal to 0 for any of the CSFs, therefore, all CSFs are considered as significant for all the processes of the proposed model.

However, the MS (total) is not calculated in the ANOVA tables; MS(total) = SS(Total)/df (total). Therefore, the MS (total) for the three CSFs has been calculated in table 7.11 which represents the value of variance (s^2) for each CSF, where the square root of s^2 represents the sample deviation.

To validate the preliminary version of the proposed model in this research, the process that has the lowest β will be deleted and a new MLR model will be developed to evaluate if the model improves based on the total model variation (r^2) for each CSF. In this sense, if the value of r^2, after omitting the weakest process, decreases then the omitting of processes will continue to the next weakest variable. But if the value of r^2 increases or remains the same, then omitting the independent variables (model's processes) stops. As a result, the validated list of processes will stay in the model and the deleted ones will be omitted or replaced to generate a validated version of the proposed model.

However, r^2 represents that total variation that could be explained by the regression equation and it is r^2 = SS(total) – MS(residual) / MS(total). When omitting a variable, r^2 will decrease or remain the same, but will never increase. Therefore, in validating the model, it is important to calculate the adjusted r^2 which uses variance instead of variations. This is because the values of the adjusted r^2 may increase with decreasing the number of independent variables.

However, to select the independent variable that should be deleted, the variable with the largest p value is selected in order to get rid of the heavy weights in the variation. In this sense, the value of the independent variable to be omitted is selected as assessing performance, where as shown in table 7.10, assessing performance has the heaviest p value in the MLR models of all the CSFs. Table 7.12 compares between the MLR models before and after omitting the first independent variable (X1).

	CSF	Variables	R-Sq	R-Sq(adj)
Model 1	Operations' efficiency	X1,x2....x7	.368	.135
		X1, x2,...x6	.070	-.279
Mo	Operations' effectiveness	X1,x2....x7	.249	.345

		X1, x2,...x6	.060	-.292
Model 3	Competitiveness	X1,x2....x7	.119	-.293
		X1, x2,...x6	.084	-.259
Table 7.12: Omitting the first weakest variable (X1)				

As noticed in table 7.12, the value of r^2(adj) decreased after omitting X1; therefore, the second weakest independent variable is omitted. This value has been selected as X5 to generate another MLR models for each CSF as shown in table 7.13, then the value of r^2(adj) is compared between previous models in table 7.12 and the new models in table 7.13.

CSFs		**Variables**	**R-Sq**	**R-Sq(adj)**
Model 1	Operations' efficiency	X1, x2,...x6	.070	-.279
		X1, x2,...x5	.080	-.191
Model 2	Operations' effectiveness	X1, x2,...x6	.060	-.292
		X1, x2,...x5	.043	-.239
Model 3	Competitiveness	X1, x2,...x6	.084	-.259
		X1, x2,...x5	.066	-.209
Table 7.13: Omitting the second weakest variable (X1)				

As noticed in table 7.13, when omitting the second variable, the value of r^2(adj) increases, thus, no processes will be omitted. As a result, the process of assessing performance need to omitted from the preliminary version of the proposed model in order to produce validated version of the proposed model. And as shown in figure 5.3, the omitted process is performed only by the user and no BI tools are involved in it, therefore, omitting this process will not affect the roles of BI tools in the proposed model. Based on this, the preliminary version of the proposed model is slightly modified to generate a validated version of the proposed model as included in figure 7.10.

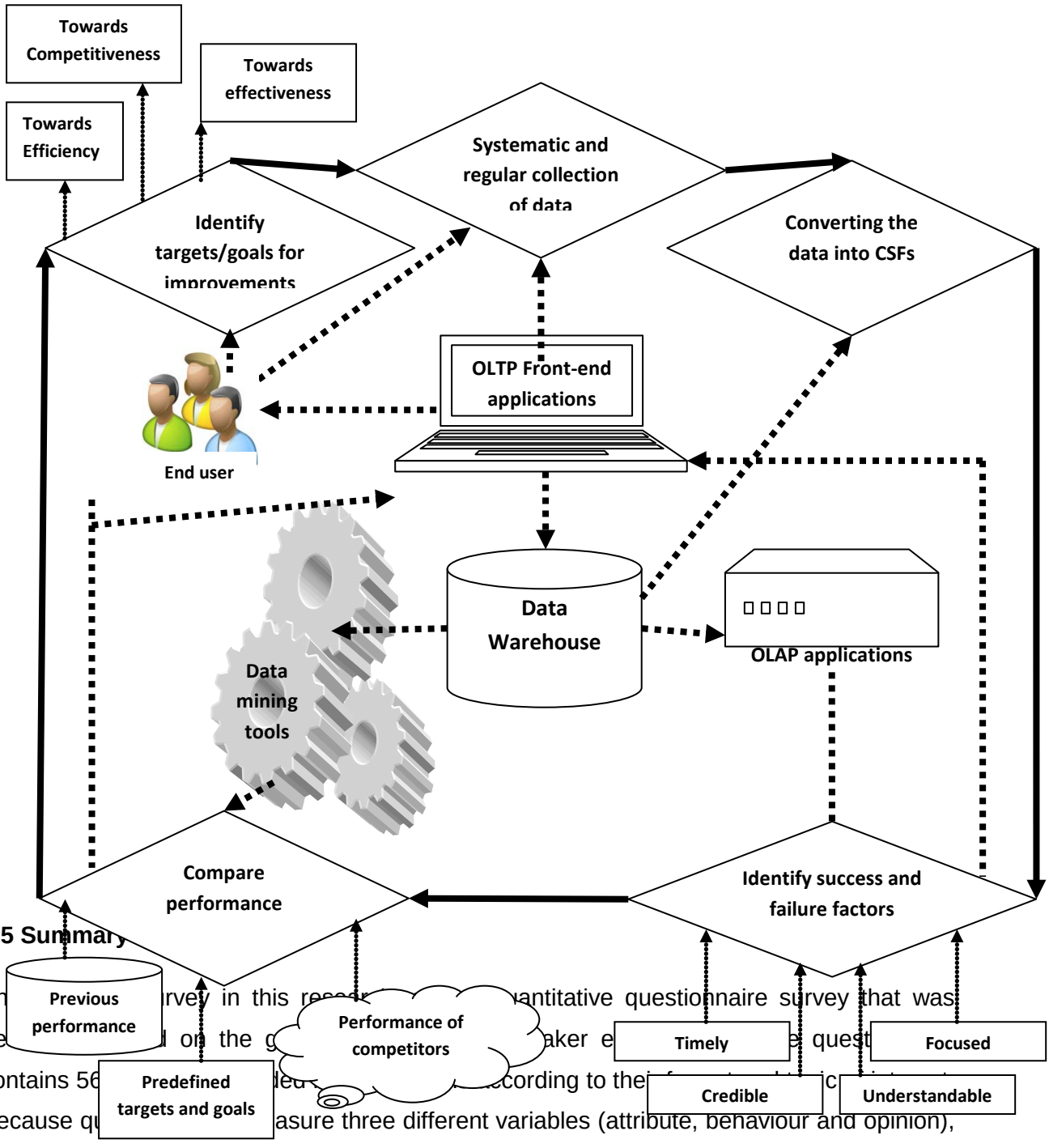


Figure 7.10: The validated version of the proposed performance management model

7.5 Summary

Th rvey in this re antitative questionnaire survey that was de l on the g aker e quest contains 56 ecording to the ic Because qu asure three different variables (attribute, behaviour and opinion), th es; each stage involved one type of variable.

The first stage involved measuring attributes using a simple descriptive analysis to describe the characteristics of the participating SMEs. This stage involved three categories of questions that were categorised according to their topic of interest. The second stage

involved measuring behaviours in the participating SMEs according to two perspectives (performance management and business intelligence); the format of questions in this stage was all the rank order questions. The implementation of five rank order questions has successfully measured sixteen variables using non-parametric analysis. The results prioritise the measured variables according to the level of agreement on their uses. The results of this analysis are shown in table 7.7 by ordering the variables from most to the least common variables. In general, the value of average variance in table 7.7 shows a good level of agreement on the ranking of the variables. This is because the average variance of the participants' answers ranges between .036 and .333, which indicates that the majority of participants have similar requirements and activities in the defined set of variables.

As a result, the results of the second stage show that there is a higher level of agreement on the operational requirements needs, which validates the assumption of the research that the requirements of performance management in wholesale SMEs are similar at operational levels. This analysis also confirms another assumption of the research which is that the requirements of BI tools are similar in wholesale SMEs. This is where the technical requirements were identified with the second highest level of agreement, as shown in table 7.7.

And the third stage of analysis has involved measuring the opinions of the participants. This stage aimed to measure the statistical influence of the CSFs and the elements of the proposed model within wholesale SMEs in the UK. This stage involved the analysis of the scale questions using parametric analysis tests (Spearman's rank correlation coefficient and MLR). The analysis divides the scale questions into three subsections according the purpose of the analysis. The first subsection aims to validate the soft CSFs according to their correlation with the pre-implementation guideline information that was provided in the proposed model. The second subsections aims to validate the hard (measurable) CSFs according to their identified measures. And the third subsection aims to validate the whole model by measuring the statistical influence of the model's elements on the measurable CSFs.

The analysis of the soft CSFs shows that the majority of the soft CSFs had significant correlations ($p>=.05$), and only two CSFs were identified as insignificant; they are Human

resource management skills (p=.012<.05) and Technological capabilities (p=.041<0.05). Therefore, these two soft factors were excluded from the validated version of the proposed model. The analysis of the hard CSFs has validated all the defined hard CSFs (efficiency, effectiveness, and competitiveness) in accordance with defined measures for each CSF. However, the analysis also defines three insignificant measures, which are throughput (p = .004 <.05) to efficiency, cost of a new customer for efficiency (p = .028 <.05), and deliveries lead times for effectiveness (p = .027 <.05). Therefore, these measures were also excluded from the proposed model. Figure 7.9 shows the updated set of CSFs in this research.

And in the final step of analysis (third subsection), the proposed model was validated by measuring the influence of the model elements on the measurable CSFs using MLR models. The results of the analysis have excluded one process from the proposed model, which is assessing performance. Therefore, the alignment of the process in the proposed model will require change to exclude the process of assessing performance, but keep the process of identifying success and failure in the model. Based on these results, there have been minor changes to the proposed model to generate a validated version of the proposed model as shown in figure 7.10.

Chapter eight: Discussion

8.0 Discussion

The available definitions of business intelligence show that this concept has emerged with the introduction of the first computer tool that supported decision making in business. This concept aims to enhance knowledge creation capabilities in businesses by utilizing computer tools to collect, process, analyze and share business information. Based on this, the field of performance management is seen in this research as the managerial area where the adoption of BI tools play important roles. Therefore, the main rationale behind the topic of

this research is to investigate the interactions between the concepts of business intelligence and performance management within wholesale SMEs in the UK. In this sense, this research aims to highlight the activities of performance management at the operational level as the core of the adoption of BI tools.

Accordingly, the research proposes a model that describes the adoption of BI tools in performance management activities to enhance the operational performance of wholesale SMEs in the UK. To develop the proposed model, a sequence of research objectives has been achieved throughout this thesis to provide answers to the research questions signifying the contributions of this research in accomplishing the aims of the thesis. This model could be described as a business intelligence model that underlines the concerns relating to the success of the operational performance management in wholesale SMEs in general.

Beside resource constraints in SMEs, such as scarcity of human and financial resources; an information defect has also been identified in wholesale SMEs. Accordingly, two main concerns may arise within these companies in the UK: the choice of information technology and the use of information technology. These are investigated separately in two research questions. This is where answering the first research question (RQ1) involves identifying the choice of technology within wholesale SMEs; and answering the second research question (RQ2) involves its use.

As explained in Chapter Five, to answer the research questions, the model development was based on the analysis of two main perspectives (requirements and CSFs) across a combination of disciplines. As a result, the comprehension for the development, function, and adoption of the proposed model has been recognized by linking requirements and CSFs from different disciplines. This has generated a combination of elements that provide the appropriate material for answering the research questions through the development of the proposed model. These elements are:

- Characteristics of the sector.
- The soft CSFs that influence the successful adoption of the proposed model.
- The hard CSFs that the proposed model aims to monitor and measure.
- The activities and tools that function in the proposed model.

These elements have been further validated through an industrial survey by means of quantitative questionnaires with managers of wholesale SMEs in the UK. And according to the roles of the defined elements in answering the RQs, this chapter aims to evaluate the reliability and validity of the collected data through the industrial survey in order to identify the contributions of the research to achieve the research aims (RA1, RA2, and RA3). This is achieved by discussing the findings of the research from three perspectives that provide the required answers for the research questions (RQ1 and RQ2) and identify the contributions of the research.

The first perspective involves the discussion of requirements for the development of the proposed model which answers the first research question (RQ1) through the achievement of first and second research objectives (RO1, and RO2). The second perspective involves the development of the proposed model to answer the second research question (RQ2) through the achievement of third and fourth research objectives (RO3, and RO4). And the third perspective involves the discussion of the contributions of this research to accomplish the research aims (RA1, RA2, and RA3). These perspectives are discussed separately in the following sections.

8.1 Requisites for developing the model

This research proposes a business intelligence model that emphasizes the importance of adopting BI tools to support performance management activities in monitoring and measuring the CSFs that influence the operational performance of wholesale SMEs in the UK. The proposed model aims to clarify

1) The adoption of BI tools,

2) The performance management activities, and

3) The CSFs that influence the operational performance in wholesale SMEs.

Accordingly, achieving the first aim of the proposed model answers the first research question (RQ1) which is: *What are the CSFs that influence an effective use of the appropriate business intelligence tools?* This question was answered through the achievement of the first two research objectives (RO1 and RO2) and they are:

- **RO1,** Investigate needs, opportunities, and BI tools.
- **RO2,** Identify the CSFs that influence the development, adoption, function of the proposed model.

Answering RQ1 by achieving RO1 and RO2 contributes to the development of the proposed model by defining the requisites for developing the proposed model through the investigation of the first three elements of the model development and they are discussed separately in the following subsections.

8.1.1 Characteristics of the sector.

This research highlights wholesale SMEs as influential economic entities offering a major contribution to the UK economy. This suggests supporting the performance of wholesale SMEs as a crucial step in safeguarding the wellbeing of the UK economy as a whole. The characteristics of the wholesale SMEs were analyzed in this research from two disciplines: the wholesale industry and the SME sector. A SWOT analysis on this sector has revealed the shared strengths and weaknesses across SMEs, which generates similar opportunities and threats. These were identified as managerial weaknesses that create training and development threats; and flexibility and quick response strengths that create innovation and globalization opportunities. As result, this has achieved the first research objective (RO1) which is: Investigate the needs and opportunities of wholesale SMEs in the UK and the required BI tools to enhance decision making in the performance management process.

The descriptive analysis in the industrial survey has described the managerial capabilities of the participating wholesale SMEs. In this analysis, the majority of the participants have indicated that they don't know if business development is required or not. This confirms that identifying training needs is a threat for the majority of wholesale SMEs. Moreover, the majority of the participants have indicated that they don't have a clear definition for a performance management policy but they need to consider defining it, which indicates

development needs as another threat for the majority of wholesale SMEs. 39% of participants indicated that they already have a clear performance management definition, and only 17% indicated that they don't need to define performance management in their companies. These results confirm that the concept of performance management is a managerial substance that reaches the heart of the managerial capabilities in the majority of wholesale SMEs.

In addition, 52% of the participants have indicated that they don't know how adopting technology could support their operational performance until the technology comes into place. In this matter, the research has identified the required BI tools that improve the activities of the operational performance management.

To support the operational performance management in the targeted sector, the next step of the research highlighted the concept of performance management in order to identify the required activities and BI tools that enhance the roles of performance management within wholesale SMEs in the UK. Therefore, the CSFs that influence the development, adoption and function of the proposed model were generated by merging the CSFs that influence the identified needs and opportunities, the operational performance, and the adoption of BI tools. In turn, this achieves the second research objective (RO2) which is: Identify the CSFs that influence the performance of wholesale SMEs in the UK from three main perspectives (sector; operational performance; and IT/IS adoption).

8.1.2 The soft CSFs that influence the successful adoption of the proposed model.

The soft CSFs were identified in this research as the factors that are beyond measure and control, but which still affect the development and adoption of the proposed model within the targeted sector. Hence, the roles of the soft CSFs in the development of the proposed model were addressed through defining guideline information for a successful adoption of the proposed model within wholesale SMEs in the UK. This guideline information was generated by analyzing and summarizing the measures of the soft CSFs. The soft CSFs were further validated in the industrial survey by measuring their importance according to the defined guideline information. The analysis of the industrial survey showed the insignificance of two

soft CSFs to the defined guideline information and they are human resource management skills and technological capabilities.

As a result, omitting the human resource management skills factor is justified because the proposed model is to be applied for the purpose of performance management at the operational level. Human resource management skills are more related to performance management at the individual level where the purpose is to align the goals of the individuals with the strategic vision. On the other hand, omitting the technological capability indicates that the business environment of wholesale SMEs is not technology intensive. This strengthens the importance of the main aim of this research, which is to support the adoption of BI tools within wholesale SMEs in the UK to discover the next step of the technological diffusion in this sector.

8.1.3 The hard CSFs that the proposed model aims to monitor and measure.

The hard CSFs are identified in this research as the measurable and controllable CSFs; they are operational effectiveness; operational efficiency; and competitiveness. The hard CSFs were validated in the industrial survey by measuring their importance according to their corresponding measures. The results of this analysis showed significance of all the hard CFSs, but three measures were seen as insignificant to their corresponding CSFs. This has confirmed the reliability of the research results by highlighting the throughput as an insignificant measure for the efficiency of operations, but it is still recognized as a significant measure for the effectiveness of operations. This supports the reliability of the research results because throughput is usually affected by the effectiveness of operations regardless of their cost. Moreover, the suggestion that the cost of new customers may affect the operations' efficiency was refused; this indicates that new customers are always desired regardless of the cost of servicing them. However, the results may show bias by considering the lead time for deliveries as an insignificant measure of operations' effectiveness, where clearly it should be.

8.2 The development of the proposed model

The proposed model in this research aligns the features of a set of BI tools with the roles of a set of performance management activities. This alignment aims to demonstrate the best use of BI tools in the targeted sector to enhance the process of performance management. Whilst the reviewed models of BI adoption focused on the success of the implementation, adoption, and sustainability of the adopted technology, it can still be difficult to align the interactions of the features of BI tools with the roles of performance management in wholesale SMEs. Therefore, the proposed model in this research suggests a continuous management cycle that illustrates the integration of the features of BI tools with the roles of performance management at the operational level. The choice of this cycle was confirmed through the industrial survey because all the participants in the industrial survey have defined performance management as a continuous management process.

This in turn answers the second research question (RQ2) which is: How can the adoption of BI tools best enhance the performance management? The answer to this question is realized through the achievement of the third research objective (RO3) which is: to develop a model that aligns the features of the defined BI tools in a performance management cycle. The cycle of the proposed model consists of a soft phase to plan and act for business development, influenced by the soft CSFs, and a hard phase to identify where development is needed by monitoring and measuring the operational performance, influenced by the hard CSFs. Each phase was represented in the proposed model through the identified performance management activities that integrate appropriate BI tools. The importance of these activities has been measured in the industrial survey to validate the proposed model. The identified activities and BI tools represent the fourth element of the model development, which completes all elements for the model development.

Although the development of the proposed model achieves RO3 and answers RQ2, the development of the proposed model was based on the requirements and CSFs that were defined through the analysis of secondary data which was originally collected for different purposes across different sectors and disciplines. Therefore, the elements of the proposed model were further validated through an extensive industrial survey measuring statistical influence of the defined elements in the targeted sector. In this sense, the defined elements for the model development are validated in wholesale SMEs through an industrial survey to achieve the fourth research Objective (RO4) which is: to implement a questionnaire survey that validates the proposed model in real life practices.

Through the analysis of the literature survey, this research has identified the use and choice of BI tools within wholesale SMEs in the UK to enhance decision making that improves the operational performance. Because the model was developed based on secondary data, the importance of the model in the targeted sector was recognized through the analysis of the primary data in the industrial survey. This is where the findings of the industrial survey confirmed the importance of the proposed model by measuring the statistical influence of the model's elements on the operational performance of wholesale SMEs.

As mentioned earlier, the activities of the proposed model integrate the features of BI tools with the roles of performance management at the operational level within wholesale SMEs in the UK. Due to the limited knowledge of participants in the uses and features of BI tools, the required features of BI tools were identified through the literature according to the defined roles and purposes of performance management. In this sense, the choice of BI tools could be further validated by validating the defined activities.

The sequence of the defined activities in the proposed model illustrates a performance management cycle that is supported by BI tools to collect; monitor; measure; and analyze the measures of the hard CSFs to support decision making that improves operational performance. The proposed model was further validated by measuring the importance of the defined activities to the hard CSFs. As a result of the statistical analysis, one activity – assessing performance - was omitted from the cycle of the proposed model. But the choice and use of BI tools has not been affected because the omitted activity was to be performed only by the user, without the aid of any of the defined BI tools. This confirms the rationale behind the proposed model, which is to include only the activities that integrate both the roles of performance management and the features of the defined BI tools.

8.3 Contributions

The unique aspect of this research comes from introducing a new model that describes the integration of the features of BI tools with the roles of performance management in

wholesale SMEs at the operational level. Reviewing the literature shows that there have been no similar efforts to develop a similar model that addresses the defined concepts and disciplines in this research. This is where a combination of disciplines has been discussed through the literature survey to identify the associated requirements and CSFs to the development, function, and adoption of the proposed model. This combination consists of four main disciplines, which are;

1. the SME sector,
2. wholesale industry,
3. performance management
4. Business intelligence.

This combination of disciplines has been used to answer the research questions which contribute to the accomplishment of the research aims.

Previous studies using similar theoretical frameworks in the targeted sector have either focused only on business intelligence in terms of adoption models and tools, or only on performance management as a managerial skill or technique. And only few focused on the important relationships between the concepts of BI and performance management. Although the present research refers to some IT adoption models that derive relevant soft CSFs for the development of the proposed model, but these models may not act as reference models for the development of the proposed model in this research. This is because this research follows a unique combination of concepts that provides a different and unique purpose for the proposed model to demonstrate the use of BI in the targeted sector.

Moreover, this research sheds Light on the importance of wholesale SMEs in the UK to ensure a wealthier economy by considering innovation and globalization opportunities for long term investments in this sector. The model development also defines strengths, weaknesses and threats of this sector through a SWOT on SMEs and an industry analysis on the wholesale industry. Accordingly, the development of the proposed model was also based on the requirements and CSFs of the defined threats and opportunities to harness the strengths and overcome the weaknesses via the proposed model.

This research advocates the adoption BI tools by identifying the appropriate uses and choices of BI tools to utilize strengths and overcome weaknesses within wholesale SMEs in the UK. Therefore, in response to the limitations of wholesale SMEs when attempting to adopt BI tools, this research explains the benefits and ways to adopt BI tools in their business processes to tackle opportunities and absorb threats. This research also points out some research implications by providing a further explanation on the integration of the concepts of business intelligence and performance management in this specific sector, the opportunities offered for this sector, and the required BI tools. This contributes to the achievement of the first research aim (RA1) -which is: to encourage the use of BI tools**-** by defining the benefits that encourage the adoption of BI tools in the targeted sector.

However, this research has concluded that the adoption of BI tools in wholesale SMEs is affected by the lack of the required resources. This may cause uncertainties about which BI tools to adopt and how to use them effectively. Therefore, another contribution to RA1 would be supporting the accomplishment of the second research aim (RA2) which is: to remove the barriers that hinder the adoption of BI tools. In this matter, the development of the proposed model is based on the research assumption that wholesale SMEs have similar requirements and purposes of performance management at the operational level. Accordingly, this research generalizes the proposed model for all the different types of wholesale SMEs. Hence, the development of the proposed model contributes to the accomplishment of the second research aim (RA2) which is: to remove the barriers that hinder the adoption of BI tools within wholesale SMEs in the UK. This is achieved by identifying the best choice and use of BI tools to remove uncertainties about choosing and using BI tools in the targeted sector.

Moreover, to remove uncertainties about choosing and using BI tools; the proposed model has defined the appropriate BI tools and the activities to use these tools effectively. In this way, the proposed model contributes to the accomplishment of the third research aim (RA3) which is: to establish the basis for a policy that aids the adoption of BI tools. This aim could be described as the main aim of this research. This is where RA1 aims to encourage the adoption of BI tools by developing a model that contributes to removing barriers that hinder the adoption, which is described in RA2. As a result, the proposed model is an attempt to remove the barriers by establishing the basis for a policy in the targeted sector, which is described in RA3.

The adoption of the proposed BI model will reveal more complex knowledge about the nature the operational performance within wholesale SMEs in the UK**.** This is where, in the wholesale industry, the demand is influenced by the purchasing cycles of retailers, and different products are demanded at different points in each cycle. Therefore, the available variety of products should be planned to be complete and acceptable, and to prevent stock building up. Accordingly, the proposed model is presented in a continuous cycle that could be repeated and timed according to the retailers' purchasing cycles. This constitutes a key contribution of the proposed model. This is where understanding customers' behaviour also allows SMEs to be able to explain their operational performance and identify ways for improvements.

Chapter Nine: Conclusions and further research avenues

9.0 Conclusions and further research avenues

The industrial survey has tested and validated the elements for the development of the proposed model and the derived conclusions. Still, it was focused on the validation of the model development rather than recording opinions, beliefs and insights about the applicability of the final model to its practical application. Moreover, the industrial survey has also ignored limitations of the proposed model in real life context. As such, this chapter aims to identify the conclusions of this research and confirm their use in the “real world”. This chapter also aims to evaluate the practical applicability of the proposed model.

This is discussed throughout this chapter in two separate sections, section 9.1 summarizes the conclusions of the research, and section 9.2 evaluates the applicability and practicality of the proposed model in real life situations. The conclusions of this research are confirmed through the model evaluation in section 9.2.1 by making a semi-structured interview with a manager of a wholesale SME with a proven track record of innovation. In addition, in order to extend the roles and uses of the proposed model, the interview also identifies the limitations of the proposed model in terms of its applicability and practicality in the interviewee's company. These limitations are used to identify further research avenues in section 9.2.1.

9.1 Conclusions

Through the implementation of the research methodology to achieve the research objectives, three main conclusions were derived. These conclusions are explained in the following paragraphs.

The analysis of the industrial survey shows that the majority of SMEs have training and development needs. In addition, the wholesale industry identifies three different types of wholesalers according to their strategies. Due to the differences in the personal and organizational characteristics, this may generate different needs of performance management both at strategic and individual levels. On the other hand, beside the general purpose of operational performance management which is report making and analysis, wholesale SMEs have similar operational requirements. Therefore, performance management needs at the operational level may remain the same in the majority of wholesale SMEs. As a result, the first conclusion of this research is:

The majority of wholesale SMEs share similar characteristics that generate similar managerial needs at the operational level.

Five key activities were identified in the proposed model to store, share, collect, process, and analyse data to aid the monitoring and measurement of the operational performance indicators, in order to plan and act to improve the operations' efficiency, effectiveness, and competitiveness. These activities are

1) systematic and regular collection of data,
2) converting the data into CSFs,
3) identifying success and failure areas,
4) comparing performance, and
5) identifying targets/goals for improvements.

Based on this, the second conclusion of this research is:

Integrating the features of BI tools with the roles of performance management is an effective way to organise and recognise the process of enhancing the operational performance within wholesale SMEs in the UK.

This is where the utilisation of the features of BI tools through the adoption of the proposed model encapsulates knowledge about the variables of operational performance, which supports decision makers in setting targets and goals that improve the operational performance. In addition, the cycle of the proposed model ensures the continuity of the performance management process. As a result, the third conclusion of this research is:

The adoption of the proposed model in this research can enhance decision making that improves the operational performance of wholesale SMEs in the UK.

9.2 model evaluation in real life situations

In this section, the conclusions are confirmed in a practical context by interviewing a manager of a wholesale SME that has a proven record of innovation as a result of taking global opportunities. The manager of the SMEs was targeted because he was the most

influential person in making decisions in his company. This is where the interview aims to recognize insights and ideas that will be helpful to confirm the research conclusions and evaluate the proposed model. Although, the interview evaluates the model in real-life situations; but, the intention of the interview is to assess and evaluate the context of the proposed model and not generalize the results in other situations. Therefore, instead of suggesting refinements on the proposed model, the interview was used to suggest further research avenues.

As a result, the aims of the interview are to

1) confirm on the conclusions of this research in real world practices, and
2) identify further research avenues.

The interview with a manager of a wholesale SME discussed relevant experiences, beliefs, concerns, needs, and constraints to the application of the proposed model in a practical situation. In pursuit of these aims; the interview used open questions but with detailed explanations allowing the interviewee to accurately evaluate the proposed model in real life situations.

The process of this interview divides the interview into four parts. The first part of the interview discusses the conclusions of this research by criticizing their practical application. This aims to confirm the conclusions of this research. The second part demonstrates the cycle of the proposed model but without the alignment of BI tools in it. This is to evaluate the importance of performance management in supporting decision making that maintain/improve the operational performance. Then, the third part demonstrates the cycle of the proposed model with the alignment of BI tools. This will prove that the adoption of the defined BI tools is essential to apply the proposed model. And the fourth part of the interview identifies requirements to apply the proposed model to a practical situation, this aims uncover the limitations that establishes the need for further research. The results of this interview were used to accomplish the interview aims defined above; each aim is discussed separately in the following subsections.

9.2.1 Confirmation on conclusions

The interview was held in a company called Multi-Brands UK, a specialist importer of various fast moving consumers' goods (FMCG) which it distributes both locally and globally. Their response to global opportunities is considered as an innovation. This process of innovation has focused on employing UK-based bi-lingual salesmen to maximize global sales opportunities via the internet and personal connections.

In the first part of the interview, the interviewee agreed that what we consider to be new or an improvement may not be beneficial in the long run, and so it won't result in innovation. In Multi Brands UK, innovation was achieved through taking global opportunities by improving the process of reaching new customers worldwide. Throughout this discussion, the requirements for innovative solutions in the operations of wholesale SMEs were criticized. The interviewee agreed with that because of the similar roles of wholesalers in the distribution channel, wholesalers have similar operational requirements to run innovative business operations. For instance, employing multi-lingual staff to hunt sales opportunities worldwide could be applied in the same way to hunt sales within the majority of wholesale SMEs. As a result, the interviewee confirmed the first research conclusion:

The managerial requirements may remain the same at the operational level across different wholesale SMEs.

The second part of interview focused on the performance management cycle of the proposed model without an alignment of BI tools. The interviewee showed interest in this cycle by indicating that this was a very useful and complete process to measure our performance. In addition, he commented that he can see innovation as a result of this is process, this because this model would make us more organized in setting deals and making offers, and it would also help us to find our way towards improvements in our business operations.

In terms of the hard CSFs, he argued that information about these factors is always important, but our focus is always on operational effectiveness. This is because we have already established our business operations in an appropriate way to ensure efficiency and competiveness. Therefore, our main focus is on operational effectiveness because searching for solutions and suggesting operational improvements is a continuous process.

He also added that, “you always have to improve yourself and this could be achieved through setting targets and goals”.

In the third part of the interview, the BI tools were added to the performance management cycle and features of the defined BI tools were explained for the interviewee. He confirmed that the adoption of BI tools is fundamental to make this model work in their company. As a result, he confirmed the second research conclusion which is:

Integrating the features of BI tools with the roles of performance management is an effective way to enhance the operational performance within wholesale SMEs.

As discussed above, the interviewee also described the implementation of the proposed model as innovation, because he could see the benefits of applying it when trying to develop more effective operations. Therefore, the interviewee has also confirmed the third research conclusion which is:

The adoption of the proposed model can enhance decision making that improves the operational performance.

9.2.2 Further research avenues

The fourth part of the interview focused on evaluating opinions, thoughts, and beliefs of the interviewee to identify relevant limitations to the applicability and practicality of the proposed model. In order to extend the scope and the functionality of the proposed model in this research, this section builds on the interview to identify future research avenues that would build on this research to facilitate better application and practicality of the proposed model. Four research avenues were derived and they are discussed in the following paragraphs.

A suggestion by the interviewee was to highlight a limitation of the model to include all the tools in one system in future, so instead of having several tools it will be better to put them all together. This makes it easier to train staff on just one tool. In this case, the author recommends the implementation of the proposed model on a service oriented architecture

(SOA). This is because SOAs allow the use of different features (services) provided by different IT resources (BI tools) as the building blocks of the architecture, where each service has a unique identity and could be managed individually. Therefore, a SOA can effectively group the defined BI tools and exchange their features between different applications to accomplish the aims of the proposed model. Therefore, the first research avenue could be:

- Defining the appropriate computer architecture to offer the improved features of the proposed model in wholesale SMEs.

However, since the proposed model is unique to the requirements and CSFs of wholesale SMEs, there has been no single software tool designed to offer the functions of the proposed model, based on the defined roles of performance management. In this case, it is important to develop a software tool that aligns the proposed model with the appropriate computer architecture (SOA) and with the characteristics of wholesale SMEs. The development of such a tool should cover all the defined activities in the proposed model, including the defined features of BI tools. Therefore, the second research avenue could be:

- Development of a software tool to support the functioning of the proposed model within wholesale SMEs in the UK.

Although the industrial survey results shows that only 17% of participants have chosen cost as a barrier to adopting new technologies, lowering cost has been mentioned in this interview. Due to resource constraints of SMEs, the implementation of the proposed model should be simple, low cost, support, and maintenance. The interviewee added that such a model should be provided through a trusted organization because it may involve confidential information. Therefore, it is essential to identify a trusted service provider to offer the implementation of the model within wholesale SMEs in the UK. It was desired by the interviewee that the service provider could be a governmental organization, or a trusted organization such as universities taking roles in supporting local businesses. Therefore, the third research avenue could be:

- Identifying the appropriate service provider to offer the implementation of the proposed model within wholesale SMEs in the UK

In most cases, the owner/manager of the SME is the main influence in taking technology adoption decisions; therefore, SMEs lack expertise to create a structured approach to such decisions which creates a barrier to the adoption of the proposed model. They normally choose applications that are fairly basic, generic, and simple to operate; this is because managers of SMEs are busy people and they really don't have time to take the required training on developing complex information skills.

In response to this matter, the development of the proposed model in this research has targeted wholesale SMEs in the UK. But the development of the model has also considered the characteristics of SMEs across different sectors. Therefore, there is an equivalent importance to adopting the proposed model in SMEs across different industries. As a result, a further research avenue could be to identify the same or similar models for SMEs in different industries. Therefore, the third research avenue could be:

- Application of the proposed model across different sectors

10.0 REFERENCES

Aaker, D., Kumar, V. & Day, G. (2007) "Marketing Research." 9th ed. New York: John Wiley & Sons, Inc.

Aaker, D.A. Kumar, V. Day, G.S. (2007) "Marketing Research." 9th Ed. Chichester: John Wiley.

Adderley, R. Townsley, M. and Bond, J. (2007) "Use of data mining techniques to model crime scene investigator performance."Knowledge-Based Systems.Vol.20 Iss.p.170-176.

Aggarwal, N. Kumar, A. Khatter, H. and Aggarwal, V. (2012) "Analysis the effect of data mining techniques on database." Advances in Engineering Software.Vol.47 Iss.1 p. 164-169.

Alexander, M. (2010) Excel Analyst's Guide to Access. Hoboken, NJ, USA: Wiley.

Allen, J. P. (2000) “Information systems as technological innovation”.Information Technology & peopole.Vol. 13.No. 3. pp: 210-221.

AlMabhouh, A. and Ahmad, A. (2010) "Identifying Quality Factors within Data Warehouse."Computer Research and Development.vol. 7 no. 10 pp.65-72.

Ammenwerth, E. Iller, C. and Mahler, C. (2006) "IT-adoption and the interaction of task, technology and individuals: a fit framework and a case study." BMC medical informatics and decision making.Vol.6 Iss.1 p. 3-10.

Ang, B.W. (1995) “Multilevel decomposition of industrial energy consumption.”Energy Economics.Vol.17 Iss.1 p.39-51.

Ar, I.M and Baki, B. (2011) "Antecedents and performance impacts of product versus process innovation: Empirical evidence from SMEs located in Turkish science and technology parks." European Journal of Innovation Management.Vol.14 Iss.2 p.172 – 206.

Archer, N. P. (2006). “supply chain and the enterprise”. Vol.19 No.3.pp 241-245”.

Arendt, L. (2008) “barriers to ICT adoption in SMEs: how to bridge the digital divide”. Journal of Systems & Information Technology.Vol. 10.No. 2. pp: 93-108.

Armstrong, M. (2006) “Performance management, key strategies and practical guidelines.”3rd Edition. London: United Kingdom. Kogan Page Limited.

Armstrong, M., Baron, A. (2005) "Managing Performance.Performance Management in Action." London: UK. Chartered Institute of Personnel and Development.

Aroge, S. and Hassan, M. (2011) “The Responsibility of Human Resource Management and Development Professionals in the Development of Low-Skilled Workers in the Nigeria Public Sector.”International Journal of Business & Management.Vol.6 Iss.11 p.227-233.

Backer, L.C. (2009) “RIGHTS AND ACCOUNTABILITY IN DEVELOPMENT ('RAID') v DAS AIR AND GLOBAL WITNESS v AFRIMEX[dagger]: SMALL STEPS TOWARDS AN AUTONOMOUS TRANSNATIONAL LEGAL SYSTEM FOR THE REGULATION OF MULTINATIONAL CORPORATIONS.” Melbourne journal of international law.Vol.10 Iss.1 p.258.

Bahri, M. St-Pierre, J. and Sakka, O. (2011) "Economic value added: a useful tool for SME performance management." International Journal of Productivity and Performance Management.Vol.60 Iss.6 p.603-621.

Bai, X. and Wand, H. (2010) “Empirical Analysis for Individual Performance Management and Psychological Boundary.”Management and Service Science (MASS), 2010 International Conference. Pp. 1-4.

Baker, S. Baker, K. (1993) "THE BEST LITTLE WAREHOUSE IN BUSINESS", Journal of Business Strategy, Vol. 20 Iss: 2, pp.32 – 39.
Ball. C.G. Sutherland, F. Kirkpatrick, A.W. Dixon, E. MacLean, A.R Mack, L.A. Feliciano, D.V. Rajani, R.R. Karmy-Jones, R. Buie, W.D. Temple, W.J. Rozycki, G.S. and Simeone, A. (2010) “Dramatic innovations in modern surgical subspecialties.” Canadian Journal of Surgery.Vol.53 Iss.5 p.335-341.
Balter, B. J. (2011) “TOWARD A MORE AGILE GOVERNMENT: THE CASE FOR REBOOTING FEDERAL IT PROCUREMENT.” Public Contract Law Journal.Vol. 41 Iss.1 p.149.
Beer, M. and Ruh, R.A (1976): ‘’Employee growth through Performance Management,”
Beke, J. (2011) “International Business Accounting Standardization and Hungarian Practice.”International Business Research.Vol.4 Iss.1 p.125-132.
Bhatt, G. D. (2000). “An empirical examination of the effects of information systems integration on business process improvement”.Vol. 20.No. 11. pp. 1331-1359.
Biazzo, S. and Bernardi, G. (2003) "Organisational self-assessment options: a classification and a conceptual map for SMEs." International Journal of Quality & Reliability Management.Vol.20 No.8 p.881-900.
Bill Merrilees, James H. Tiessen, (1999) "Building generalizable SME international marketing models using case studies", International Marketing Review, Vol. 16 Iss: 4/5, pp.326 – 344.
Birley, S. and Norburn, D. (1985) "Small vs. Large Companies: The Entrepreneurial Conundrum." Journal of Business Strategy.Vol.6 Iss.1 p.81 – 87.
BIS (Department for business, innovation and skills) (2011) “business population estimates for the UK and regions." Oct 21, 2011 Available at: http://www.bis.gov.uk/analysis/statistics/business-population-estimates [last reviewed, 11/3/2011].
Bis.gov.uk (2011) available at http://www.bis.gov.uk/search?keywords=innovation&type=all [last reviewed 11/06/2011].
Bititci, U. S. Carrie, A. S. And McDevitt, L. (1997) "Integrated performance measurement systems: a development guide", International Journal of Operations & Production Management, Vol. 17 Iss: 5, pp.522 – 534.
Bivio, (2012) “The bivio OLTP Platform (bOP)” available at: http://www.bivio.biz/bp/bOP [last reviewed 13/4/2012]
Blumenstock, A. Schweiggert, F. Müller, M. and Lanquillon, C. (2009) ”Rule cubes for causal investigations.” Knowledge and Information Systems. Vol.18 No.1 Pages 109-132.

Boocock, G. Lauder, D. And Presley, J. (1994) "THE ROLE OF THE TECs IN SUPPORTING SMEs IN ENGLAND", Journal of Small Business and Enterprise Development, Vol. 1 Iss: 1, pp.12 – 18.
Booth, A. (2006) "Counting what counts: performance measurement and evidence-based practice", Performance Measurement and Metrics, Vol. 7 Iss: 2, pp.63 – 74
Bose, R. (2006) "Understanding management data systems for enterprise performance management", Industrial Management & Data Systems, Vol. 106 Iss: 1, pp.43 – 59
Boselie, P. and Wiele, T. (2002) "Employee perceptions of HRM and TQM, and the effects on satisfaction and intention to leave", Managing Service Quality, Vol. 12 Iss: 3, pp.165 – 172.
Bouman, M. Dongen, R. Van, J. (2010) “Pentaho Kettle Solutions : Building Open Source ETL Solutions with Pentaho Data Integration Casters.” NJ:USA. Wiley.
Bourne, M. C. S., Neely, A. D., Mills, J. F. And Platts, K. W, (2003), “Implementing performance measurement systems: a literature review”, International Journal of Business Performance Management, Vol. 5, No. 1, 1-24.
Bourne, M. Franco-Santos, M. Pavlov, A. Lucianetti, L. Martinez, V. and Mura, M. (2008) “The Impact of Investors in People on People Management Practices and Firm Performance.” Centre for Business Performance: Cranfield School of Management. Available at: http://www.som.cranfield.ac.uk/som/dinamic-content/research/cbp/IIP_Impact_StudyReport.pdf [last reviewed 23/6/2012].
Brace, I. (2004) “Questionnaire Design. How to Plan, Structure and Write Survey Material for Effective Market Research.” London, UK: Kogan Page. In Lietz, P. (2010) “Research into questionnaire design.” International Journal Of Market Research. Vol.52 Iss.2 p.249-272.

Breslin, M. (2004) “Data Warehousing Battle of the Giants: Comparing the Basics of the Kimball and Inmon Models.” Business Intelligence journal.Vol. 9 No. 1 p. 6–20.
Broad, M. L. (2006) "Improving performance in complex organizations", Industrial and Commercial Training, Vol. 38 Iss: 6, pp.322 - 329
Brook, K. & Taylor, K. (2010) “Estimating regional exports of services trade for the UK.” Economic & Labour Market Review.Vol.4 Iss.10 p.74-88.
BROWN, G. (1993) "The skilling fields Gordon Brown on Labour's plan to overcome human wastage and make educated minds the critical national resource." The Guardian 1993, Feb 17.
Brudan, A. (2010) "Rediscovering performance management: systems, learning and integration", Measuring Business Excellence, Vol. 14 Iss: 1, pp.109 –123.

Bryman, A. & Bell, E. (2007).“Business Research Methods”.Second edition. New York: Oxford University Press Inc.

Buckley, P.J. (1997) “International Technology Transfer by Small and Medium Sized Enterprises.” Small Business Economics.Vol.9 Iss.1 p.67-78.

Bucklin, L.P. (1993) "Channel Change Agents in Developing Countries", International Journal of Physical Distribution & Logistics Management, Vol. 7 Iss: 1, pp.59 – 68

Byoungho Jin, (2006) "Performance implications of information technology implementation in an apparel supply chain", Supply Chain Management: An International Journal, Vol. 11 Iss: 4, pp.309 – 316.

Byoungho Jin, (2006) "Performance implications of information technology implementation in an apparel supply chain", Supply Chain Management: An International Journal, Vol. 11 Iss: 4, pp.309 – 316.

Caldeira, M. and Dhillon, G. (2010) "Are we really competent?: Assessing organizational ability in delivering IT benefits." Business Process Management Journal.Vol.16 Iss.1 p.5-28.

Camus, C. and Brancaleon, R. (2003)”Intellectual assets management: from patents to knowledge.” World Patent Information.Vol.25 Iss.2 p.155-159.

Caputo, A. C. Cucchiella, F. Fratocchi, L. Pelagagge, P. M. & Scacchia, F. (2002). “A methodological framework for innovation transfer to SMEs”. Industrial Management & Data Systems.Vol. 102.No. 5.Page.271-283.

Carpinetti, L. Gerolamo, M. and Galdámez, E. (2007) “Continuous Innovation and Performance Management of SME Clusters.”Creativity and Innovation Management.Vol.16 Iss.4 p.376-385.

Carr, C. and Garcia, C.E. (2003) “Globalisation and Strategic Choice: How Multinational and Local Company Perspectives Differ: A Spanish Case Study.” European Management Journal.Vol.21 Iss.6 p.671-685.

Catley, C. Frize, M. Walker, C.R. and Petriu, D.C. (2006) "Predicting High-Risk Preterm Birth Using Artificial Neural Networks."Information Technology in Biomedicine.vol.10 no.3 p.540-549.

Chailom, P. and Mumi, A. (2010) “THE EFFECTS OF INFORMATION TECHNOLOGY CAPABILITY, NETWORK COMPETENCY AND ORGANIZATIONAL LEARNING ON LOGISTICS INNOVATION, COMPETITIVE ADVANTAGE AND PERFORMANCE OF FOOD BUSINESSES IN THAILAND.” International Journal Of Business Strategy. Vol.10 Iss.3 p.71-85.

Chamberlin, G. (2010) “Output and expenditure in the last three UK recessions. “Economic & Labour Market Review.Vol.4 Iss.8, p.51-64.
Chan, D. C. (2006), "Core competencies and performance management in Canadian public libraries", Library Management, Vol. 27 Iss: 3, pp.144 – 153.
Chang, M.K. Cheung, W. Cheng, C. and Yueng, J.H.Y. (2008) “Understanding ERP system adoption from the user's perspective” International journal of production economics. Vol 113 Iss: 2 pg.928.
Chang, W.W. Yeh, W.C and Huang, P.C. (2010) “A hybrid immune-estimation distribution of algorithm for mining thyroid gland data.”Expert Systems with Applications.Vol.37 Iss.3, p.2066-2071.
Chaston, I. (1994). “Banker/Accountant, Inter-Relationship Management and Financial Advice Provision in the UK SME Sector”.Journal of Small Business and Enterprise Development.Vol. 1.Issue 2. Pp. 9-14.
Chau, V. S. (2008), "The relationship of strategic performance management to team strategy, company performance and organizational effectiveness", Team Performance Management, Vol. 14 Iss: 3/4, pp. 113 – 117
Checkland, P. & Holwell, S. (2004). Information systems and: information systems making sense of the field. West Sussex: England. Jhon Wiley & Sons Ltd.
Chen S.Y. and Liu, X. (2005) “data mining in practice.”Encyclopedia of information science and technology.Vol.2. p. 723-727.
Chen Y. Yuan Y. (2007). “The innovation strategy of firms: empirical evidence from the Chinese high-tech industry”. Vol2. No.2. pp 145-153.
Chen, C. Yan, X. Zhu, F. Han, J. and Yu, P. S. (2009) “Graph OLAP: a multi-dimensional framework for graph data analysis.” Knowledge and Information Systems.Vol. 21 No. 1 p. 41-63.
Chen, G.Q. Wei, Q. Liu, D. and Wets, G. (2002) “Simple association rules (SAR) and the SAR-based rule discovery.”Computer and Industrial Engineering.Vol.43 Iss.4 p.721–733.
Cheng-Min, F. & Chien-Yun, Y. (2007) “Application of Collaborative Transportation Management to Global Logistics: An Interview Case Study.” International Journal Of Management. Vol.24 Iss.4 p.623-636.
Chibelushi, C. & Costello, P (2009), “Challenges facing W. Midlands ICT-oriented SMEs”. Journal of Small Business and Enterprise Development.Vol. 16.Issue 2.Page.210-239.

Chiware, E.R.T. and Dick, A.L. (2008) "The use of ICTs in Namibia's SME sector to access business information services",Electronic Library, The, Vol. 26 Iss: 2, pp.145 – 157

Chou, D. C. Tripuramallu, H. B. And Chou, A. Y. (2005) "BI and ERP integration", Information Management & Computer Security, Vol. 13 Iss: 5, pp.340 – 349.

Chow, G. Heaver, T. D. Henriksson, L. E. (1994), "Logistics Performance: Definition and Measurement", International Journal of Physical Distribution & Logistics Management, Vol. 24 Iss: 1, pp.17 – 28.

Chow, H.K.H. Choy, K.L. Lee, W.B Chan, F.T.S and Lam, T.C (2005) "Design of a case-based logistics strategy system – an integrated approach." Expert Systems.Vol.22 Iss.4 p. 173-192.

Christy, R. and Wood, M. (1999) "Researching possibilities in marketing." Qualitative Market Research: An International Journal, Vol.2 Iss.3 p.189–197.

Chu, M.Y. (2003) “Blissful Data: Wisdom and Strategies for Providing Meaningful, Useful, and Accessible Data for All Employees.” Saranac Lake, NY, USA: AMACOM Books, Available at: http://site.ebrary.com/lib/uoh/Doc?id=10075608&ppg=45 [last reviewed, 12/3/2012].

Clementini, E. and Billen, R. (2006) “Modeling and Computing Ternary Projective Relations between Regions.”IEEE TRANSACTIONS ON KNOWLEDGE AND DATA ENGINEERING.VOL. 18 NO.6 p. 799-814.

Clifton, HD, Ince, DC. And Sutcliffe, AG. (2000), business information systems.6th edition. Essex: Pearson Education Limited.

Codd, E. (1969) “Derivability, Redundancy, and consistency of Relations Stored in Large Data Banks.” IBM research report RJ599, available at: http://dl.acm.org/citation.cfm?id=1558336 [last reviewed 14/4/2012]

Codd, E. Codd, S. and salley, C. (1993) “Providing OLAP (On-Line Analatical Processing) to User-Analyst: An IT Mandate.” available at: http://www.minet.uni-jena.de/dbis/lehre/ss2005/sem_dwh/lit/Cod93.pdf [last reviewed 15/4/2012].

Coe, N.M. and Hess, M. (2005) “The internationalization of retailing: implications for supply network restructuring in East Asia and Eastern Europe.” Journal of Economic Geography.Vol.5 Iss.4 p. 449 – 473.

Contini, B. and Revelli, R. (1997) “Gross flows vs. net flows in the labor market: What is there to be learned?” Labour Economics.Vol.4 Iss.3 p.245-263.

Cooper, D. & Schindler, P. (2003) "Business Research Methods." 8thed. New York: McGrew-Hill/Irwin.

Corbitt, T. (2003) “Business Intelligence and Data Mining.”Management Services.Vol. 47 Iss.11 p. 18-19.

Coskun-Samli, A. Pohlen, T. and Bozovic, N. (2002) “A Review of Data Mining Techniques as they Apply to Marketing: Generating Strategic Information to Develop Market Segments.” Marketing Review.Vol. 3 No. 2 p. 211-227.

D' Amboise, G. and Muldowney, M. (1988) “Management Theory for Small Business: Attempts and Requirements.” Academy Of Management Review.Vol.13 Iss.2 p.226-240.

Dahlberg, Jane S. (1967) “The New York Bureau of Municipal Research: Pioneer in Government Administration”. The American Historical Review. Vol. 72, No. 4, pp. 1512-1513

Dai, S. Gao, L. Zhu, Q. and Zhu, C. (2007) “A Novel Genetic Algorithm Based on Image Databases for Mining Association Rules.” 6th IEEE/ACIS International Conference on Computer and Information Science (ICIS 2007).p.977-980.

Dal, B. Tugwell, P. And Greatbanks, R. (2000) "Overall equipment effectiveness as a measure of operational improvement – A practical analysis", International Journal of Operations & Production Management, Vol. 20 Iss: 12, pp.1488 - 1502

Damanpour, F. (1991) “ORGANIZATIONAL INNOVATION: A META-ANALYSIS OF EFFECTS OF DETERMINANTS AND MODERATORS.” Academy Of Management Journal.Vol.34 Iss.3 p.555-590.

Damirchi, G., & Shafai, J. (2011) “A Framework To Innovation In Marketing Management By Utilizing Business Intelligence.” Interdisciplinary Journal Of Contemporary Research In Business. Vol. 3 No. 2 p. 1643-1653.

Dangayach, G.S. and Deshmukh, S.G. (2001) "Manufacturing strategy: Literature review and some issues." International Journal of Operations & Production Management.Vol.21 Iss.7 p.884-932.

Daniel, D.R. (1961) "Management information crisis." Harvard Business Review. Vol. 39. Iss. 5. p.111-21.

Das, C. And Tyagi, R. (1994) "WHOLESALER: A Decision Support System for Wholesale Procurement and Distribution", International Journal of Physical Distribution & Logistics Management, Vol. 24 Iss: 10, pp.4 - 12

data.gov.uk (2011) available at: http://data.gov.uk/search/apachesolr_search/innovation?page=19 [last reviewed 11/06/2011].

Date, C. J. (2009) “SQL and Relational Theory” CA: USA. O'Reilly Media, Inc. available at:

http://proquestcombo.safaribooksonline.com/book/databases/sql/9780596155865/copyright/iv [last reviewed 1/5/2012]
Datta, A. and Thomas, H. (1999), “The cube data model: a conceptual model and algebra for online analytical processing in data warehouses”, Decision Support Systems, Vol. 27 No. 3, pp. 289-301. cited by: Lau, et al. (2004).
David Naranjo-Gil (2007) “Top Management Team Heterogeneity, Strategic Change and Operational Performance” British Journal of Management.Vo.19, Iss.3 p.222–234.
Davies, M. B. (2007). “Doing a Successful Research Project: Using Qualitative or Quantitative methods”. Ney York: PALGRAVE MACMILLAN.
de Brentan, U. (2001). “Innovative versus incremental new business services: different keys for achieving success.” Journal of Product Innovation Management.Volume 18, Issue 3, Pages 169-187.
de Leeuwa, S. van den Bergb, J. (2011), “Improving operational performance by influencing shopfloor behavior via performance management practices.” Journal of Operations Management Volume 29, Issue 3, pp 224–235
de Waal, A. (2007), "Strategic performance management", Strategic Performance Management: A Managerial and Behavioural Approach, Palgrave Macmillan, Basingstoke (cited by Chau, V. S. 2008)
Delaney, K.J. (2003) “SAP Co-CEO Plattner to Step Down --- Co-Founder Will Give Up Management Duties to Take Helm at Supervisory Board.” Wall Street Journal. pp. A.1-A1 available at:
http://search.proquest.com.libaccess.hud.ac.uk/docview/308519329?accountid=11526 [last reviewed, 1/5/2012].
Delgado, S. Gonzalo, C. Martinez, E. and Arquero, A. (2011) “A combined measure for quantifying and qualifying the topology preservation of growing self-organizing maps.” Neurocomputing.vol.74 Iss.16 P.2624-2632.
DeLone, W.H. and McLean, E.R. (1992) “Information Systems Success: The Quest for the Dependent Variable.” Information Systems Research.Vol.3 Iss.1 p.60-95.
DeLone, W.H. and McLean, E.R. (2003) “The DeLone and McLean Model of Information Systems Success: A Ten-Year Update.” Journal of Management Information Systems.Vol.19 Iss.4 p.9–30.
Deming, W.E. (1986) "Out of the Crisis: Quality, Productivity and Competitive Position." Cambridge: USA. Cambridge University Press.
Demougin, D. and Siow, A. (1996) “Managerial husbandry and the dynamics of ongoing hierarchies.”European Economic Review.Vol.40 Iss.7 p.1483-1499.

Desai, M.S. Desai, K.J. and Ojode, L. (2004) "A global information technology model: business applications in developing economies (case studies)", Information Management & Computer Security, Vol. 12 Iss: 5, pp.401 – 410.

Desouza, K.C. and Awazu, Y. (2006) "Knowledge management at SMEs: five peculiarities", Journal of Knowledge Management, Vol. 10 Iss: 1, pp.32 - 43

Dillman, D.A. (2000) "Mail and internet surveys: the tailored design method." 2nd ed. New York: John Wiley and sons.

direct.gov.uk (2011) available at: http://www.direct.gov.uk/en/AdvancedSearch/Searchresults/index.htm?fullText=innovation [last reviewed 11/06/2011].

Dobbs, T. Stone, M. and Abbott, J. (2002) "UK data warehousing and business intelligence implementation", Qualitative Market Research: An International Journal, Vol. 5 Iss: 4, pp.235 – 238.

Dong, C (2011) “Research on Performance Management of Chinese SME.” International Journal Of Business & Management. Vol.6 Iss.4 p.263-265.

Doughty, S. (2011) “Brazil overtakes UK in world economic league.” Daily Mail Dec 29, 2011. available at: http://www.dailymail.co.uk/money/news/article-2079700/Brazil-overtakes-UK-world-economic-league.html [last reviewed 21/7/2012].

Drew, S. (2003) “Strategic Uses of E-Commerce by SMEs in the East of England.” European Management Journal.Vol.21. Iss.1 p.79-88.

Dringus, L. (1999) “Interview: Online With Dr. John A. Scigliano, Part 2.” The Internet and Higher Education.Vol.2 Iss.2–3 p.177-183.

Druzovec, M. Welzer, T. and Brumen, B. (2005). “Agent Oriented Approach to Handling Medical Data.” Journal of Medical Systems. Vol. 29, No. 1 p. 45-57.

Dumond, J. (1994) "Making Best Use of Performance Measures and Information", International Journal of Operations & Production Management, Vol. 14 Iss: 9, pp.16 – 31

Duncan, H. (2011) “Finally some good news (but not until 2050): British economy will be biggest in Europe in four decades, say experts.” Daily Mail Dec 31, 2011. available at: http://www.dailymail.co.uk/news/article-2080402/UK-economy-biggest-Europe-4-decades-say-experts.html [last reviewed, 21/7/2012].

Duncan, R. (1990) "A survey of parallel computer architectures," Computer.Vol.23 Iss.2 p.5-16.

Dyche, J. (1999) “The big bang of BUSINESS INTELLIGENCE.” Telephony.Vol.236 iss.6 p.78.

Eccles, R.G. (1991) "The Performance Measurement Manifesto." Harvard Business Review. Vol.69 Iss.1 p.131-137.
Eick, S. G. (2000) “Visual Discovery and Analysis” IEEE TRANSACTIONS ON VISUALIZATION AND COMPUTER GRAPHICS, VOL. 6, NO. 1, pp. 44-58.
Enright, W.H. (2006) “Verifying approximate solutions to differential equations.” Journal of Computational and Applied Mathematics.Vol.185 Iss.2 p.203-211.
European Commission (1996) “Commission Recommendation of 3 April 1996 concerning the definition of SMEs.” Official Jurnal of the European Communities. No. L 107/4 available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1996:107:0004:0009:EN:PDF [last reviewed: 23/5/2012].
European Union Commission (2005) available at: http://europa.eu.int/comm/enterprise/enterprise_policy [last reviewed 24/2/4009]
Exploredia (2012) available at: http://exploredia.com/top-10-largest-economies-in-the-world-2011/ [last reviewed 20/7/2012].
Felstead, A. and Green, F. (1996) "Training and the business cycle." p.255-84.in Booth, A. Snower, D. (1996) “Acquiring Skills, market failures, their symptoms and policy responses” Cambridge: UK. The Centre of Economic Policy Research. available at: http://books.google.co.uk/books?id=bW6jtiXRtdcC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false [last reviewed 12/5/2012].
Fiora, B. (1998) "Ethical business intelligence is NOT Mission Impossible", Strategy & Leadership, Vol. 26 Iss: 1, pp.40 – 41
Fitt, D. (1992), "Performance management – where is it going?", in Mitrani, A., Dalziel, M., Fitt, D. (Eds),Competency Based Human Resource Management, Kogan Page, London, pp.95-109.
Foddy, W. (1993) “Constructing Questions for Interviews and Questionnaires.” Theory and Practice in Social Research. Cambridge, UK: Cambridge University Press. In Lietz, P. (2010) “Research into questionnaire design.” International Journal Of Market Research. Vol.52 Iss.2 p.249-272.

Folkes, CH. (2004) “Knowledge Mapping: Map Types, Contexts and Uses” Open University working paper. cited by Beránková, M. Kvasnièka, R. and Houška, M. (2010) “Towards the Definition of Knowledge Interoperability” 2nd International Conference on Software Technology and Engineering(ICSTE. available at: http://ieeexplore.ieee.org.libaccess.hud.ac.uk/stamp/stamp.jsp?tp=&arnumber=5608843 [last reviewed 3-/4/2012]

Folmer, E. Welie, M. V. and Bosch, J. (2006) “Bridging patterns: An approach to bridge gaps between SE and HCI.” Information and Software Technology.Vol. 48 Issue 2 p. 69-89.

Forslund, H. (2012), "Performance management in supply chains; logistics service providers’ perspective", International Journal of Physical Distribution & Logistics Management, Vol. 42 Iss: 3

Forslund, H. Jonsson, P. (2007), "Dyadic integration of the performance management process: A delivery service case study", International Journal of Physical Distribution & Logistics Management, Vol. 37 Iss: 7, pp.546 – 567

Forsman, L. (1998) “Proactive management of distributed organisational computing: Prevention always pays, doesn't it?” AI & Society.Vol.12 Iss.4 P.328-345.

Franco-Santos, M. Kennerley, M. Micheli, P. Martinez, V. Mason, S. Marr, B. Gray, D. Neely, A. (2007) “TOWARDS A DEFINITION OFA BUSINESS PERFORMANCE MEASUREMENT SYSTEM” international journal of operations and production management. Vol. 27.No. 8. pp. 784-801.

Franks, J. (1998). “The virtual organization.” Work Study. Vol.47 No.4. pp 130-134

Freeman, C. and Perez, C. (1988) “Structural crises of adjustment, business cycles and investment behaviour” in Maruta, R. (2012) “Transforming knowledge workers into innovation workers to improve corporate productivity.”Knowledge-Based Systems.Vol.30 p.35-47.

Fryer, K. Antony, J. Ogden, S. (2009), "Performance management in the public sector", International Journal of Public Sector Management, Vol. 22 Iss: 6, pp.478 - 498

Fuld, L. (1991), "A Recipe for Business Intelligence Success", Journal of Business Strategy, Vol. 12 Iss: 1, pp.12 – 17

G.D. Karagiannopoulos, N. Georgopoulos, K. Nikolopoulos, (2005) "Fathoming Porter's five forces model in the internet era", info, Vol. 7 Iss: 6, pp.66 - 76

Galindo, P.V. Vaz, T.N and Nijkamp, P. (2011) “Institutional capacity to dynamically innovate: An application to the Portuguese case.” Technological Forecasting and Social Change.Vol.78 Iss.1 p.3-12.

Garattini, L. and Tediosi, F. (2000) “A comparative analysis of generics markets in five European countries.” Health Policy.Vol.51 Iss.3 p.149-162.

Garengo, P. and Bititci, U. (2007) "Towards a contingency approach to performance measurement: an empirical study in Scottish SMEs." International Journal of Operations & Production Management.Vol.27 Iss.8 p.802-825.

Garengo, P. Biazzo, S. and Bititci, U.S. (2005) "Performance measurement systems in SMEs: a review for a research agenda." International Journal of Management Reviews.Vol.7 No.1 p.25-47.
Garner, C. (2006) “Viewpoint: Science Cities: refreshing the concept for 21st-century places.” The Town Planning Review.Vol.77 Iss.5 P.I-VI.
Gavin, P. (2005) “Oracle data warehouse tuning for 10g” Oxford: UK, Elsevier Inc. available at: http://webcat.hud.ac.uk/ipac20/ipac.jsp?index=ISBN&term=9781555583354&profile=cls [last reviewed, 22/4/2012].
Ghalayini, A. M. Noble, J. S. (1996), "The changing basis of performance measurement", International Journal of Operations & Production Management, Vol. 16 Iss: 8, pp.63 - 80
Ghobadian, A. and Gallear, D (1997) "TQM and organization size."International Journal of Operations & Production Management.Vol.17 Iss.2, p.121-163.
Gilmore, A. Gallagher, D. and Henry, S. (2007) "E-marketing and SMEs: operational lessons for the future." European Business Review.Vol.19 Iss.3 p.234-247.
Godin, B. (2006) “The Knowledge-Based Economy: Conceptual Framework or Buzzword?” The Journal of Technology Transfer.Vol.31 Iss.1 p.17-30.
Goeke, R, and Faley, R (2007) “LEVERAGING THE FLEXIBILITY OF YOUR DATA WAREHOUSE.” Communications Of The ACM. Vol 50, Iss. 10, pp. 107-111.
Gorla, N. & Krehbiel, S. (1999) “Summers Rubber Company Designs Its Data Warehouse.” Interfaces.Vol.29 Iss.2 p.104-117.
Govender, V. and Mooney, G.(2011) “People’s policies for the health of the poor globally.”The International Journal of Health Planning and Management.Vol.27 Iss.2 p.e92–e103.
Graham, J. (2004) “Developing a Performance-Based Culture.” Journal for Quality & Participation. Vol. 27, Issue 1. pp. 4
Gray, C. (2006). “Absorptive capacity, knowledge management and innovation in entrepreneurial small firms”.International Journal of Entrepreneurial Behaviour & Research.Vol. 12.No. 6.Page. 1355-2554.
Gregory, S. (2011) “Mobile data revolution: from sleeping aid to wake-up call.” Campaign (UK). Iss.23 p. 20.
Griffin, R. K. (1998) “Data Warehousing: The latest strategic weapon for the lodging industry?” The Cornell Hotel and Restaurant Administration Quarterly.Vol. 39 Issue 4 p. 28-35.

Guan, J. Nunez, W. and Welsh, J.F. (2002) "Institutional strategy and information support: the role of data warehousing in higher education." Campus-Wide Information Systems.Vol. 19 Iss.5 p.168 – 174.

Gunasekaran, A. (1999) “Agile manufacturing: A framework for research and development.” International Journal of Production Economics.Vol.62 Iss.1–2 p.87-105.

Gupta, H. and Mumick, I. S. (2006) “Incremental maintenance of aggregate and outerjoin expressions.”Information Systems. Vol. 31 Issue 6 p. 435-464.

Gustin, C, Daugherty, P. and Stank, T. (1995) "THE EFFECTS OF INFORMATION AVAILABILITY ON LOGISTICS INTEGRATION." Journal Of Business Logistics. Vol.16 Iss.1 pp.1-21.

Ha, s. h. and Park, s. c. (1998) “Application of data mining tools to hotel data mart on the Intranet for database marketing.” Expert Systems with Applications. Vol. 15 Issue 1 P. 1-31.

Haag, S. Cummings, M. and Phillips, A. (2007).Management Information Systems for the information age.6th edition. New York: McGraw-Hill/Irwin.

Haase, H. and Franco, M. (2011) "Information sources for environmental scanning: do industry and firm size matter?" Management Decision.Vol.49 Iss.10 p.1642 – 1657.

Hair, J.F. (2003).“Essentials of Business Research Methods”. Hoboken, N.J:USA. John Willy & Sons Inc.

Hall, M. J. B. (2009) “the sub-prime crisis in the credit crunch and bank “failure”: an assessment of the UK authorities’ response”. Journal of financial regulations and compliance.Vol. 17.Issue. 4. pp: 427-452.

Halpin, T. A. and Morgan, A. J (2008) “Information modeling and relational databases” 2nd edition. MA, USA: Morgan Kaufman Publishers.

Hand, D.J. (1998) “Intelligent data analysis: Issues and opportunities.” Intelligent Data Analysis, Vol.2 Iss.1–4 p. 67-79.

Hankinson, A. Bartlett, D & Ducheneaut, B. (1997).“The factors in the small profiles of small-medium enterprises owner-manager that influence the business performance”.International Journal of Entrepreneurial Behaviour & Research.Vol. 3.No. 3. pp:168-175.

Hansen, J.V. and Nelson, R.D. (2002) “Data mining of time series using stacked generalizers.”Neurocomputing.Vol.43 Iss.1–4 p.173-184.

Harinath, S. and Quinn, S. R. (2006) “Professional SQL server analysis services 2005 with MDX” Indiana: USA. Wiley Publishing Inc. available at:

http://webcat.hud.ac.uk/ipac20/ipac.jsp?index=ISBN&term=9780764579189&profile=cls [last reviewed, 30/4/2012]
Harris R.G. (1993) “Globalization, trade, and income Canadian.”Journal of Economics.Vol.26 p.755–776.
Hatch, T. Stratton, W. Lawson, R. and Desroches, D. (2009) "Decision support—Do you have it?." Journal Of Corporate Accounting & Finance (Wiley). Vol.20 Iss.5 p.63-71.
Haunsperger, D.B. (2003) "Aggregated statistical rankings are arbitrary."Social Choice and Welfare. Vo.20 Iss.2 pp. 261-272.
Hayes, F. (2002) “The Story So Far.”Computerworld.Vol. 36 No. 16 p. 28.
Hayter; R. Patchell, J. and Rees, K. (1999) “Business segmentation and location revisited: Innovation and the terra incognita of large firms.” Regional Studies.Vol.33 Iss.5 p.425 - 442.
Hedgebeth, (2007) “Data-driven decision making for the enterprise: an overview of business intelligence applications.” VINE: The journal of information and knowledge management systems. Vol. 37.No. 4. pp 414-420.
Henry, P. (2007) “Africana Political Philosophy and the Crisis of the Postcolony.”Socialism and Democracy.Vol.21 Iss.3. p.36-59.
Herring, J.P. (1988), "Building a Business Intelligence System", Journal of Business Strategy, Vol. 9 Iss: 3, pp.4 - 9, To compete more effectively with global challengers, U.S. companies must begin to develop corporate intelligence systems.
Herring, J.P. (1991) "Senior Management Must Champion Business Intelligence Programs", Journal of Business Strategy, Vol. 12 Iss: 5, pp.48 – 52
Herrmann, D.K. (1999) "Tracking systems as a catalyst for incremental innovation", Management Decision, Vol. 37 Iss: 10, pp.786 – 791.
Herschel, R. T. and Jones, N. E. (2005) "Knowledge management and business intelligence: the importance of integration", Journal of Knowledge Management, Vol. 9 Iss: 4, pp.45 – 55
Hewitt, F. (1995) "Business process innovation in the mid-1990s", Integrated Manufacturing Systems, Vol. 6 Iss: 2, pp.18 – 26.
Hill, J. and Scott, T. (2004) "A consideration of the roles of business intelligence and e-business in management and marketing decision making in knowledge-based and high-tech start-ups", Qualitative Market Research: An International Journal, Vol. 7 Iss: 1, pp.48 – 57.
Hill, R. and Stewart, J. (2000) "Human resource development in small organizations."Journal of European Industrial Training.Vol.24 Iss.2/3/4 p.105 – 117.

Hillage, J. Atkinson, J. Barry, J. Dewson, S. Stevens, M. Walsh, K. and Kettley, P. (2001) “Developing the University for Industry Concept: An Evaluation of ADAPT Round 3 Projects.” Institute for Employment. Studies.Research Report No.304 available at: http://www.employment-studies.co.uk/pdflibrary/rr304.pdf [last reviewed 8/6/2012].

Hirschheim, R.K. (2012) “A Glorious and Not-So-Short History of the Information Systems Field.” Journal Of The Association For Information Systems. Vol.13 Iss.4 p.188-235.

Hoganson, K. (2001). “Alternative curriculum models for integrating computer science and information systems analysis, recommendations, pitfalls, opportunities, accreditations, and trends”. Vol. 17 No. 2. pp 313-325.

Holm, M.J. (2003), "SMVer for fuld kraft!", Ledelse & Erhvervsøkonomi, Vol. 67 No.3, pp.154-64. In Pedersen, S.G. Zachariassen, F. and Arlbjørn, J.S. (2012) "Centralisation vs de-centralisation of warehousing: A small and medium-sized enterprise perspective", Journal of Small Business and Enterprise Development, Vol. 19 Iss.2 p.352–369.

Horsburgh, J.S. Tarboton, D.G Maidment, D.R. and Zaslavsky, I. (2011) “Components of an environmental observatory information system.”Computers and Geosciences.Vol.37 Iss.2 p.207-218.

Houthoofd, N. Desmidt, S. And Fidalgo, E.G. (2010) "Analyzing firm performance heterogeneity: the relative effect of business domain", Management Decision, Vol. 48 Iss: 6, pp.996 – 1009.

Hughes, J. and Brook, K. (2009) “Implementation of SIC 2007 across the Government Statistical Service (GSS).” Economic & Labour Market Review.Vol.3 Iss.8 p.67–69.

Hussey, J. & Hussey, R. (2003) Business Research: a Practical Guide for Undergraduate and Postgraduate Students. Palgrave: Aldershot

Inkinen, T, Tapaninen, U, and Pulli, H. (2009) "Electronic information transfer in a transport chain."Industrial Management & Data Systems.Vol.109 Iss.6 p.809-824.

Jain, T. (2003) “Art and Science of Documentation Management.” Bristol, GBR: Intellect Ltd. Available at: http://site.ebrary.com/lib/uoh/Doc?id=10023459&ppg=39 [last reviewed, 21/4/2012].

Jalonen, H. (2012) “The Uncertainty of Innovation: A Systematic Review of the Literature.” Journal Of Management Research. Vol.4 Iss.1 p.1-47.

Jantan, M. & Ndubisi, N. O. (2003). “Year: Viability of e-commerce as an alternative distribution channel”. Vol. 16 No. 6. pp 427-439.

Jardine, A (2008) “SMEs are big business.” Marketing (00253650). p. 26-28, available at: http://rc4ht3qs8p.search.serialssolutions.com/?ctx_ver=Z39.88-

2004&ctx_enc=info%3Aofi%2Fenc%3AUTF-8&rfr_id=info:sid/summon.serialssolutions.com&rft_val_fmt=info:ofi/fmt:kev:mtx:journal&rft.genre=article&rft.atitle=SMEs+are+big+business&rft.jtitle=Marketing&rft.au=Alexandra+Jardine&rft.date=2008-07-16&rft.issn=0025-3650&rft.spage=26&rft.externalDBID=MAR&rft.externalDocID=1525734371 [last viewed 20/7/2012].

Jarke, M. Jeusfeld, M.A. Quix, C. and Vassiliadis, P. (1999) “Architecture and quality in data warehouses: An extended repository approach.” Information Systems. Vol.24 Iss.3 Pages 229-253.

Jing, G. (2006) “ORACLE DELIVERS NEW BUSINESS INTELLIGENCE SUITE.” The Manila Times. Manila: Austrailia. available at: http://search.proquest.com.libaccess.hud.ac.uk/docview/380844440?accountid=11526 [last reviewed, 27/4/2012].

Johne, A. (1999). “Successful market innovation”.European Journal of Innovation Management.Vol. 2.No. 1.page. 6-11.

Jorgenson, D.W. and Vu, K.M. (2011) “The rise of developing Asia and the new economic order.”Journal of Policy Modeling.Vol.33 Iss.5 p.698-716.

Jukic, N. (2006) “Modeling strategies and alternatives for data warehousing projects.” Communications of the ACM - Supporting exploratory search.Vol. 49 Issue 4 p. 83-88.

Julien, P. (1993) “Small Businesses As A Research Subject: Some Reflections on Knowledge of Small Businesses and Its Effects on Economic Theory.” Small Business Economics.Vol.5 Iss.2 p.157-166.

Kafouros, M.I. Buckley, P.J. Sharp, J.A. and Wang, C. (2008) “The role of internationalization in explaining innovation performance.”Technovation.Vol.28 Iss.1–2 p.63-74.

Kamal, M. M. (2006). “IT innovation adoption in the government sector: identifying the critical success factors”. Journal of enterprise Information Management.Vol. 19.No. 2. pp: 192-222.

Kaplan and Norton (1992), “The Balanced Scorecard--Measures That Drive Performance.” Harvard Business Review; Vol. 70 Issue 1, p71-79.

Karim, A. J. (2011) “The value of Competitive Business Intelligence System (CBIS) to Stimulate Competitiveness in Global Market” International Journal of Business and Social Science Vol. 2 No. 19 pp 196-203.

Karuppan, C.M. and Kepes, S. (2006) "The strategic pursuit of mix flexibility through operators' involvement in decision making", International Journal of Operations & Production Management, Vol. 26 Iss: 9, pp.1039 – 1064.

Kepczyk, R. H. (2005) “Tech's Top 10.”California CPA.Vol. 73 No. 9 p. 20-21.
Kermani, F. (2010) “Pharma takes control of distribution chains.” Pharmaceutical Technology Europe.Vol.22 Iss.8 p. 10-11.
Khalique, M. Shaari, J. Isa, A. and Ageel, A. (2011) “Role of Intellectual Capital on the Organizational Performance of Electrical and Electronic SMEs in Pakistan.” International Journal Of Business & Management. Vol.6 Iss.9 p.253-257.
Khanna, A. (2008) “Straight through processing for financial services the complete guide.” CA: USA. Elsevier Inc. available at: http://webcat.hud.ac.uk/ipac20/ipac.jsp?session=1336A6392L09V.5072&profile=cls&uri=search=BAW~!Khanna,%20Ayesha.&ri=2&aspect=subtab33&menu=search&source=~!horizon [last reviewed, 30/4/2012].
Kidger, P. J. (2002) “Management structure in multinational enterprises responding to globalisation”. Employee Relations.Vol. 24. No.1. pp 69-85.
Knol, W.H.C. and Stroeken, J.H.M. (2001), "The diffusion and adoption of information technology in small- and medium-sized enterprises through IT scenarios", Technology Analysis & Strategic Management, Vol. 13 No.2, pp.227-46.
Kokotos, D.X. and Linardatos, D.S. (2011) “An application of data mining tools for the study of shipping safety in restricted waters.” Safety Science.Vol.49 Iss.2 P.192-197.
Kotler, P. Grayson, K.A. and Hibbard J.D. (1995) " Management of channel systems " available at: http://www.britannica.com/EBchecked/topic/365730/marketing/27248/Wholesalers?anchor=ref394034) (http://www.britannica.com/EBchecked/topic/643010/wholesaling [last reviewed 1/1/2013]
Kula, Ekrem Tatoglu, (2003) "An exploratory study of Internet adoption by SMEs in t market economy", European Business Review, Vol. 15 Iss: 5, pp.324 - 333)
Kuo, R.J. and Shih, C.W. (2007) “Association rule mining through the ant colony system for National Health Insurance Research Database in Taiwan.”Computers & Mathematics with Applications.Vol.54 Iss.11–12 p.1303-1318.
Labs, W. (2005) "Process control performance management." Food Engineering.Vol.77 No.10 p.97-104.
Laha, D. and Mandal, P. (2008) “Handbook of computational intelligence in manufacturing and production management.” London: UK. Information Science Reference.
Laird, D. (1984) “Approaches to Training and Development.” 2nd Edition. New York: NY. Wiley.

Lau, H. C. W. Ning, A. Ip, W. H. and Choy, K. L. (2004) "A decision support system to facilitate resources allocation: an OLAP-based neural network approach", Journal of Manufacturing Technology Management, Vol. 15 Iss: 8, pp.771 – 778.
Lebas, M.J. (1995), “Performance Measurement and Performance Management”, International Journal of Production Economics, Vol. 41, No. 1-3, pp. 23-35.
Lee, C.K.M. Ho, W. Ho, G.T.S. and Lau, H.C.W. (2011) “Design and development of logistics workflow systems for demand management with RFID.”Expert Systems with Applications.Vol. 38 Iss.5 p. 5428-5437.
Lee, J. (2006) “Richard Goodwin, Ontology management for large-scale enterprise systems.” Electronic Commerce Research and Applications.Vol.5 Iss.1 P.2-15.
Lee, S. Park, G. Yoon, B. and Park, J. (2010) “Open innovation in SMEs—An intermediated network model.” Research Policy.Vol.39 Iss.2 p.290-300.
Lega, F. and Vendramini, E. (2008), "Budgeting and performance management in the Italian National Health System (INHS): Assessment and constructive criticism", Journal of Health Organization and Management, Vol. 22 Iss: 1, pp.11 – 22
Lenin V.I. (1939) “Imperialism: the highest stage of capitalism, a popular outline.” in Otusanya, O.J. (2011) “The role of multinational companies in tax evasion and tax avoidance: The case of Nigeria.” Critical Perspectives on Accounting.Vol.22 Iss.3 p.316-332.
Levy, Y. (2008) “An empirical development of critical value factors (CVF) of online learning activities: An application of activity theory and cognitive value theory.” Computers & Education.Vol.51 Iss.4 p.1664-1675.
Liao, J. Welsch, H. and Stoica, M. (2008) “Environmental Turbulence and Scanning Behavior: The Moderating Effects of Organizational Maturity.” Journal of Small Business Strategy.Vol.19 No.1 P.15-29.
Liedtke, M. (2003) “PeopleSoft buys J.D. Edwards to beat slump.” The Associated Press.available at: http://community.seattletimes.nwsource.com/archive/?date=20030603&slug=peoplesoft03 [last reviewed 1/5/2012]
Lim, W. M. (2009). “Alternative models framing UK independent hoteliers' adoption of technology”. International journal of contemporary hospitality management.Vol. 21.No. 5. pp: 610-618.
Lin, F. Po, R. and Orellan, C.V.C (2011) “Mining purchasing decision rules from service encounter data of retail chain stores.”Information Systems and e-Business Management.Vol.9 Iss.2, p.193 – 221.

Little, R.G. and Gibson, M.L. (2003) "Perceived influences on implementing data warehousing," Software Engineering. vol.29, no.4, pp. 290- 296.
Liu, Y. Lee, Y. and Chen, A.N.K (2011) “Evaluating the effects of task–individual–technology fit in multi-DSS models context: A two-phase view.” Decision Support Systems. Vol.51 Iss.3 p.688-700.
Lo, V. Humphreys P. (2000) "Project management benchmarks for SMEs implementing ISO 9000." Benchmarking: An International Journal.Vol. 7 Iss.4 p.247 – 260.
Lonnqvist, A. and Pirttimaki, V. (2006), “The Measurement of Business Intelligence.”Information Systems Management.Vol. 23 Iss.1 pp. 32.
Love, J.H. and Ashcroft, B. (1999) “Market Versus Corporate Structure in Plant-Level Innovation Performance.” Small Business Economics.Vol.13 Iss.2 p.97-109.
Luhn, H. P. (1958) “A Business Intelligence System.” IBM Journal of Research and Development, vol. 2 no. 4 pp. 314-319.
Luján-Mora, S. Trujillo, J. and Song, I. (2004) “A UML profile for multidimensional modeling in data warehouses.” Knowledge Engineering, Vol. 59, Iss. 3 p. 725-769.
Lusch, R.F. Vargo, S.L. (1998) "Multiplex retailers versus wholesalers: A test of the total value of purchasing model", International Journal of Physical Distribution & Logistics Management, Vol. 28 Iss: 8, pp.581 – 598
Ma, C. Chou, D.C. and Yen, D.C. (2000) "Data warehousing, technology assessment and management."Industrial Management & Data Systems.Vol. 100 Iss.3 p.125–135.
Maimon, O.Z. and Rokach, L. (2005) “Data mining and knowledge discovery handbook.” New York: USA. Springer Science + Business Media Inc.
Malinowski, E. and Zimányi, E. (2006) “Hierarchies in a multidimensional model: From conceptual modeling to logical representation, Data & Knowledge Engineering.” Vol. 59, Issue 2, P. 348-377.
Mallen, B. (1996). “Selecting channels of distribution: a multi-stage process”.Vol. 26 No. 5. pp 5-21.
Management Today, (2006) " WORDS-WORTH: INTELLIGENCE " p.15, Business Source Complete, EBSCOhost, viewed 1 May 2012.
Manikas, I. And Terry, L.A. (2010) "A case study assessment of the operational performance of a multiple fresh produce distribution centre in the UK", British Food Journal, Vol. 112 Iss: 6, pp.653 – 667.
Marr, B. Amd Schiuma, G. (2003) "Business performance measurement – past, present and future", Management Decision, Vol. 41 Iss: 8, pp.680 – 687.
Marren, P. (2004) ""“The father of business intelligence”", Journal of Business Strategy, Vol. 25 Iss: 6, pp. –

Marshall, C. and Grossman, G.B. (1995) “Designing Qualitative Research.” 2nd ed.. Thousand Oaks: Sage Publications. in Sapienza, A.M. (2005) “From the inside: scientists' own experience of good (and bad) management.” R&D Management.Vo.35 Iss.5 p.473-482.

Martin, R. (2012) “Regional economic resilience, hysteresis and recessionary shocks.”Journal of Economic Geography. Vol.12 Iss.1 p.1-32 .

Martínez-Sánchez, A. Vela-Jiménez, M.A. de Luis-Carnicer, P.and Pérez-Pérez, M. (2007) "Managerial perceptions of workplace flexibility and firm performance", International Journal of Operations & Production Management, Vol. 27 Iss: 7, pp.714 – 734,

Martins, R. Manquinho, V. and Lynce, I. (2012) “An overview of parallel SAT solving.” Constraints. Volume 17, Number 3, Pages 304-347.

Mastouri, M. & Boumaiza, S. (2011) “Process-based CRM: A Pilot Study.” International Journal Of Business & Social Science. Vol. 2 Iss.13 p. 176-188.

Matlay, H. (2009) "Entrepreneurship education in the UK: A critical analysis of stakeholder involvement and expectations." Journal of Small Business and Enterprise Development.Vol.16 Iss.2 p.355-368.

Mazón, J.N. Lechtenbörger, J. and Trujillo, J. (2009) “A survey on summarizability issues in multidimensional modelling.” Data & Knowledge Engineering, Vol. 68 Iss. 12 Pages 1452-1469.

Mazzarol, T. Choo, C. (2003) "A study of the factors influencing the operating location decisions of small firms", Property Management, Vol. 21 Iss: 2, pp.190 – 208

McNamee, P. O'Reilly, D. Shiels, H. and McFerran, B. (2003) "Using strategic information for small firms as a means of redressing the disadvantages of peripherality."Benchmarking: An International Journal.Vol.10 Iss.6 p.559 - 580.

McPherson, M. (2008) "HRM practices and systems within South-Asian small businesses."International Journal of Entrepreneurial Behaviour & Research.Vol.14 Iss.6 p.414 – 439.

Meadows, K.A. (2003) “So you want to do research? 5: Questionnaire design.” British Journal of Community Nursing.Vol.8 Iss.12 p.562 – 570.

Meisinger, S. (2003) “Acquiring Technology Savvy Pays off for HR.” HR Magazine. Vol. 48 No. 12 p. 12.

Mennis, J. and Guo, D. (2009) “Spatial data mining and geographic knowledge discovery—An introduction.” Computers, Environment and Urban Systems.Vol.33 Iss.6 p.403-408.

Merle P. M. (1995), analysis and design of business information systems.2nd edition. New Jersey: Prentice-Hall, Inc.

Metaxiotis, K. (2009) "Exploring the rationales for ERP and knowledge management integration in SMEs." Journal of Enterprise Information Management.Vol.22 Iss.1/2 p.51 – 62.

Metaxiotis, K. Psarras, J. and Papastefanatos, S. (2002) "Knowledge and information management in e-learning environments; the user agent architecture", Information Management & Computer Security, Vol. 10 Iss: 4, pp.165 – 170.

Miller J. (2012), "#11 – Short Cycle Budgeting and Business Performance Measures" Available at: http://www.performancemanagementedge.com/ [last reviewed 9/4/2012]

Miller, J. (20012) "Big data." Performance Management Edge, available at: http://www.performancemanagementedge.com/2012/10/23-big-data/ [last reviewd: 1/9/2012].

Milner, C. (1998) "The Globalization of the World Economy: Developing and Newly Industrializing Countries. in Book reviews. (2000) De Economist.Vol.148 Iss.1 p.107-136.

Mitra, J. (2000). "Making connections: innovation and collective learning in small businesses".Education + training.Vol. 42.No. 4/5. pp: 228-237.

Moffat, L.A.R. (1992) "Consumer Electronic Products: Trends in European Distribution." International Journal of Physical Distribution & Logistics Management.Vol. 22 Iss.7 p.13 – 24.

Montastruc, J.L. Sommet, A. Bagheri, H. and Lapeyre-Mestre, M. (2011) "Benefits and strengths of the disproportionality analysis for identification of adverse drug reactions in a pharmacovigilance database." British Journal of Clinical Pharmacology.Vol.72 Iss.6 p.905–908.

Montoya, S. Graham, J. D. (2007), "Modernizing the Fidrral Government: paying for Performance." Santa Monica, CA: USA. RAND Corporation. Available at: http://site.ebrary.com/lib/uoh/Doc?id=10227036&ppg=24 [last reviewed 15/4/2011].

Morrison, P. D. & Roberts, J. H. (1998), "journal of business research". Issue 41. pp 223-229. New York, Elsevier Science Inc.

Moynihan, D. P. (2008) "The Dynamics of Performance Management: Constructing Information and Reform." Washington, DC: USA. Georgetown University Press.

Mukhtar, S.M. (1998) "Business Characteristics of Male and Female Small and Medium Enterprises in the UK: Implications for Gender-based Entrepreneurialism and Business

Competence Development.” Implications for Gender British Journal of Management.Vol.9 Iss.1 p.41-51.
Mulhern, A. (1994). “The SME sector, the single market and the appropriateness of DGXXIII policies”.Journal of Small Business and enterprise development.Vol. 1.Issue 1. . pp. 3-11.
Mullins, R. Duan, Y. and Hamblin, D. (2001) "A pan-European survey leading to the development of WITS."Internet Research.Vol.11 Iss.4 p.333 – 340.
Munck, R. (1988) “Capital Restructuring and Labour Recomposition Under A Military Regime: Argentina (1976-1983)” in Knutsen, H.M. (2007) “Globalisation and the garment industry in Sri Lanka.” Journal of Contemporary Asia.Vol.33 Iss.2 p.225.
Murray, G.R. Riley, C. and Scime, A. (2009) “Pre-Election Polling: Identifying Likely Voters Using Iterative Expert Data Mining.” Public Opin Q. Vol.73 Iss.1 p.159-171.
Mustaffa, N.H. and Potter, A. (2009) "Healthcare supply chain management in Malaysia: a case study." Supply Chain Management: An International Journal. Vol. 14 Iss: 3 p.234–243.
Narula, R. (2004) “R&D collaboration by SMEs: new opportunities and limitations in the face of globalisation.” Technovation.Vol.24 Iss.2 p.153-161.
National Research Council (2006), “Performance Measurement : Accelerating Improvement.” Washington, DC, USA: National Academies Press.
Navon, R. and Goldschmidt, E. (2003) “Monitoring labor inputs: automated-data-collection model and enabling technologies.” Automation in Construction.Vol.12 Iss.2 p.185-199.
Neely, A. (1999) "The performance measurement revolution: why now and what next?", International Journal of Operations & Production Management, Vol. 19 Iss: 2, pp.205 – 228.
Neely, A. Gregory, M. And Platts, K. (2005) "Performance measurement system design: A literature review and research agenda", International Journal of Operations & Production Management, Vol. 25 Iss: 12, pp.1228 – 1263.
Nguyen, T.H. (2009) "Information technology adoption in SMEs: an integrated framework", International Journal of Entrepreneurial Behaviour & Research, Vol. 15 Iss: 2, pp.162 – 186.
Nieto, M. and Santamaría, L. (2010) “Technological Collaboration: Bridging the Innovation Gap between Small and Large Firms.” Journal of Small Business Management.Vol.48 Iss.1 p.44-69.
Nooteboom, B. (1994) "Innovation and Diffusion in Small Firms: Theory and Evidence." Small Business Economics.Vol.6 Iss.5 p.327-347.

Noudoostbeni, A. Ismail, N. Jenatabadi, H. and Yasin, N. (2010) “An Effective End-User Knowledge Concern Training Method in Enterprise Resource Planning (ERP) Based on Critical Factors (CFs) in Malaysian SMEs.” International Journal Of Business & Management. Vol.5 Iss.7 p.63-76.

Oakeshott, I. 2011. “Mexico could shunt Britain off world stage.” Sunday Times Nov 6, 2011, pp. 20.

O'Brien, V. F. and Fuld, L. M. (1991) "Business intelligence and the new Europe", Strategy & Leadership, Vol. 19 Iss: 4, pp.29 – 34.

O'Connor, S. (2007). “Change Management in Academic Libraries.”Library Management.Vol. 29.Number 1 and 2. Bradford: UK. Emerald publishing group ltd.

Oke, A. (2007) "Innovation types and innovation management practices in service companies", International Journal of Operations & Production Management, Vol. 27 Iss: 6, pp.564 – 587.

Oke, A. Burke, G. And Myers, A. (2007) "Innovation types and performance in growing UK SMEs", International Journal of Operations & Production Management, Vol. 27 Iss: 7, pp.735 – 753.

Omiecinski, E.R. (2003) “Alternative interest measures for mining associations in databases.” Knowledge and Data Engineering. Vol.15 Iss.1 P. 57-69.

ONS (Office for National Statistics) (2012) “Annual Business Survey, 2010, Revised Results.” Jun 14, 2012. Available at: http://www.ons.gov.uk/ons/dcp171778_266774.pdf [last reviewed 23/7/3012].

ONS (Office for National Statitics) by Prosser, L. (2009) “UK Standard Industrial Classification of Economic Activities 2007 (SIC 2007).” Available at: http://www.ons.gov.uk/ons/guide-method/classifications/current-standard-classifications/standard-industrial-classification/sic2007---explanatory-notes.pdf [last reviewed, 23/7/2012].

O'Regan, N. Ghobadian, A. and Sims, M. (2006) “Fast tracking innovation in manufacturing SMEs.”Technovation.Vol.26 Iss.2 p.251-261.

Orfila, A. Carbó, J. and Ribagorda, A. (2007) “Autonomous decision on intrusion detection with trained BDI agents.”Computer Communications.Vol.31 Iss.9 p.1803-1813.

Otero-Neira, C. Tapio , M. & Fernández, M. J. (2009). “An international comparative case study”. Marketing Intelligence & planning. Vol. 27.No. 2. pp: 216-232.

Otley, D. (1999) “Performance management: a framework for management control systems research” Management Accounting Research. Vol. 10, Issue 4. pp. 363–382

Owens, J. D. (2007). “innovation and performance in the SME sector: Why do some UK SMEs find the implementation of new product development process problematical”. Management Decision.Vol. 45.No. 2. pp: 235-251.
Pagani, M. (2004) “DETERMINANTS OF ADOPTION OF THIRD GENERATION MOBILE MULTIMEDIA SERVICES.”Journal of Interactive Marketing.VOL.18 Iss.3 p.46-59.
Pagani, M. and Fine, C.H (2008) “Value network dynamics in 3G–4G wireless communications: A systems thinking approach to strategic value assessment.” Journal of Business Research.Vol.61 Iss.11 p.1102-1112.
Pahner, U. Hameyer, K. and Belmans, R. (1999) “A parallel implementation of a parametric optimization environment-numerical optimization of an inductor for traction drive systems.”IEEE Transactions on Energy Conversion.Vol.14 Iss.4 p.1329-1334.
Pamela J. Zelbst, Kenneth W. Green Jr, Victor E. Sower, (2010) "Impact of RFID technology utilization on operational performance", Management Research Review, Vol. 33 Iss: 10, pp.994 – 1004.
Pant, S. Sim, H.T. and Hsu, C. (2001) “A framework for developing Web information systems plans: illustration with Samsung Heavy Industries Co., Ltd.” Information & Management.Vol.38 Iss.6 p.385-408.
Parker, C. Anthony-Winter, T.And Tabernacle, D. (2003). “Learning by stealth: introducing smaller retailers to the benefits of training and education in Barnet”. International Journal of Retail & Distribution Management.VOL. 31.Issue 9. pp. 470-476.
Parker, R. (2000) ”Small is not Necessarily Beautiful: An Evaluation of Policy Support for Small and Medium-sized Enterprises in Australia.” Australian Journal of Political Science.Vol.35 Iss.2 p.239-253.
*Parker, C. (2000) "Performance measurement", Work Study, Vol. 49 Iss: 2, pp.63 – 66.
Parker-Gore, S. (1996) "Perception is reality: using 360-degree appraisal against behavioural competences to effect organizational change and improve management performance", Career Development International, Vol. 1 Iss: 3, pp.24 – 27
Parzinger, M.J. and Nath, R. (1998) “TQM implementation factors for software development: an empirical study.” Software Quality Journal.Vol.7 Iss.3 p.239 – 260.
Peacock, P.R. (1998) “Data Mining in Marketing: Part 1. (cover story).” Marketing Management.Vol.6 Iss.4 p.8-18.
Peansupap, V. and Walker, D. (2005) "Factors affecting ICT diffusion: A case study of three large Australian construction contractors." Engineering, Construction and Architectural Management.Vol.12 Iss.1 p.21-37.

Pearlson, K. E. & Saunders, C. S. (2006). Managing and Using Information Systems: A Strategic Approach. 3rd edition. New Jersey: John Wiley & Sons Inc.
Peel, M.J. and Bridge, J. (1998) “How planning and capital budgeting improve SME performance.” Long Range Planning.Vol.31 Iss.6 p.848-856.
Perez. C. (1997) “The Social and Political Challenge of the Present Paradigm Shift. Paper prepared for the Norwegian Investorforom, based on the presentation at the Workshop Evolutionary economics and spatial income inequality”.in Knutsen, H.M. (2007) “Globalisation and the garment industry in Sri Lanka.” Journal of Contemporary Asia.Vol.33 Iss.2 p.225.
Pil, F.K. and Holweg, M. (2003) "Exploring scale: the advantages of thinking small." MIT Sloan Management Review.Vol.44 Iss.2 pp.33-9.
Pineda, R. Lerner, L. Miller, M. and Phillips, S. (1998) “An investigation of factors affecting the information-search activities of small business managers.” Journal of Small Business Management.Vo.36 No.1 p. 60-71.
Pinet, F. and Schneider, M. (2010) “Precise design of environmental data warehouses” Operational Research.Vol.10 No.3 p. 349-369.
Pissarides, F. (1999) “Is lack of funds the main obstacle to growth? EBRD's experience with small- and medium-sized businesses in central and eastern Europe.”Journal of Business Venturing.Vol.14 Iss.5–6 p.519-539.
Plessas-Leonidis, S. Leopoulos, V. and Kirytopoulos, K. (2010) "Revealing sales trends through data mining."Computer and Automation Engineering (ICCAE).vol.1 p.682-687.
Powell, S. (2004) "The challenges of performance measurement", Management Decision. Vol.42 Iss.8 p.1017-1023.
Powell, S. (2004), "The challenges of performance measurement", Management Decision, Vol. 42 Iss: 8, pp.1017 – 1023.
Prange, C. P. & Schlegelmilch, B. B. (2010) “Heading for the next innovation archetype”. Journal of business strategy.Vol. 31.No. 1. pp: 46-55.
Proudlock, M. (1999) “IT strategies: best practice guidelines for professional SMEs”. Journal of Small business and Enterprise development.Vol. 6.No. 3. pp: 240-252.
Quintane, E. Casselman, R.M. Reiche, B.S. and Nylund, P.A. (2011) "Innovation as a knowledge-based outcome." Journal of Knowledge Management.Vol.15 Iss.6 pp.928-947.
Rabianski, J.S. (2003) "Primary and Secondary Data: Concepts, Concerns, Errors, and Issues." Appraisal Journal.Vol.71 Iss.1 p. 43.

Ralston, D. Wright, A. and Kumar, J. (2001) "Process benchmarking as a market research tool for strategic planning." Marketing Intelligence & Planning.Vol.19 Iss.4 p.273–281.
Ramachandran, S. Rajeswari, S. Murty, S.A.V.S. Valsan, M. Dayal, R.K. Rao, R.V.S. and Raj, B. (2010) "Design of a dimensional database for materials data." Trendz in Information Sciences & Computing (TISC) p.10-15, available at: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5714598&isnumber=5714593 [last reviewed 20/4/2012].
Ranjan, A. And Bhatnagar, V. (2011) "Role of knowledge management and analytical CRM in business: data mining based framework", Learning Organization, The, Vol. 18 Iss: 2, pp.131 – 148.
Ranjan, J. & Bhatnagar, V. (2009).“A holistic framework for mCRM – data mining perspective”.Information Management & Computer Security.Vol. 17.No. 2. Page 151-165.
Rasmussen, L.B. (2007) “From human-centred to human-context centred approach: looking back over ‘the hills’, what has been gained and lost?” AI & Society.Vol.21 Iss.4 p.471-495.
Rezaee, Z. Sharbatoghlie, A. Elam, R, and McMickle, P. (2002) “Continuous Auditing: Building Automated Auditing Capability.” Auditing: a journal of practice and theory.Vol. 21 No. 1 p. 147.
Rhines, W. (1985) "ARTIFICIAL INTELLIGENCE: OUT OF THE LAB AND INTO BUSINESS", Journal of Business Strategy, Vol. 6 Iss: 1, pp.50 – 57.
Ries, S. (2011) “OCA Oracle Database 11g: SQL Fundamentals I: A Real-World Certification Guide” Bermingham: UK. Packt Publishing. avalabile at: http://proquestcombo.safaribooksonline.com/book/-/9781849683647/sql-and-relational-databases/7 [last reviewed 1/5/2012].
Ritchie, J. & Lewis, J. (2003). “Qualitative Research Practice: A Guide for Social Science Students and Researchers”. London: SAGE Publications Ltd.

Roach, C. (1989) "Segmentation of the Small Business Market on the Basis of Banking Requirements."International Journal of Bank Marketing.Vol.7 Iss.2 p.10-16.
Robert S. Huckman, Darren E. Zinner (2008) “Does focus improve operational performance? Lessons from the management of clinical trials.”Strategic Management Journal.Vol.29 Iss.2 p.173-193.

Rogers, S. (1990), Performance Management in Local Government, 1st edition.Longman, London, UK.

Rockart, J. F. (1982) "The Changing Role of the Information Systems Executive: A Critical Success Factors perspectives." Sloan Management Review. Vol. 24. Iss. 1. p. 3-13.

Rosenbloom, B. Warshaw, P.R. (1989) "Perceptions of Wholesaler Functional Role Prescriptions in Marketing Channels", European Journal of Marketing, Vol. 23 Iss: 2, pp.31 – 46.

RSA (1994), Tomorrow's Company: The Role of Business in a Changing World, Royal Society of Arts, Manufacturers and Commerce, London, interim report

Rupnik, R. Kukar, M. And Krisper, M. (2007) "INTEGRATING DATA MINING AND DECISION SUPPORT THROUGH DATA MINING BASED DECISION SUPPORT SYSTEM." Journal Of Computer Information Systems. Vol.47 iss.3 p.89-104.

Rupnik, R. Kukar, M. and Krisper, M. (2007) "INTEGRATING DATA MINING AND DECISION SUPPORT THROUGH DATA MINING BASED DECISION SUPPORT SYSTEM." Journal Of Computer Information Systems. Vol.47 Iss.3 p. 89-104.

Sambrook, S. (2003) "E-learning in small organisations."Education + Training.Vol.45 Iss.8/9 p.506-516.

Sanjit Sengupta, Jakki Mohr, Stanley Slater, (2006) "Strategic opportunities at the intersection of globalization, technology and lifestyles", Handbook of Business Strategy, Vol. 7 Iss: 1, pp.43 - 50)

Saunders, M. Lewis, P. and Thornhill, A. (2007) "Research Methods for business students." 4th ed. Essex, UK: Pearson Education Limited.

Saunders, M., Lewis, P. and Thornhill, A. (2003) "Research Methods for Business Students." 3rd ed. London: UK. Financial Times Prentice Hall.

Schiff, C. (2007), "Operational Analytics -- A Key Element of BPM 2.0." DM Review. Vol17, Issue 1, p. 34-34

Schiff, C. (2011) ,"BPM Finds Its Missing Pieces" Business Finance, Volume 17, Issue 1, p. 16.

Sharif, .J.K. Kalafatis, S.P. and Samouel, P. (2005) "Cognitive and behavioural determinants of trust in small and medium-sized enterprises."Journal of Small Business and Enterprise Development.Vol.12 Iss.3 p.409-421.

Sherman, R. (2005) "Hub-and-Spoke Redux." DM Review. Vol. 15 No. 5 p. 60-61.

Shi, Z. Huang, Y. He, Q. Xu, L. Liu, S. Qin, L Jia, Z. Li, J. Huang, H. Zhao, L. (2007) "MSMiner—a developing platform for OLAP." Decision Support Systems. Vol. 42 Iss.4 P. 2016-2028.

Shortland, R. and Scarfe, R. (2007) “Data mining applications in BT.” BT Technology Journal.Vol.25 No.3-4 p.272-277.
Simmie, J. (2002) “Knowledge Spillovers and Reasons for the Concentration of Innovative SMEs.”Urban Studies (Routledge).Vol.39 Iss.5/6 p.885-902.
Simon, K. (2002). “The boardroom agenda: developing the innovative organisation”. Corporate Governance.Vol. 2.No. 1. pp: 27-36.
Sims, M.A. and O’Regan, N. (2006) “In search of gazelles using a research DNA model.”Technovation.Vol.26. Iss.8 p.943-954.
SMITH, V. (1967) "Performance management, organization and practice for results", Management Decision, Vol. 1 Iss: 4, pp.42–45.
Sneyd, K. P. & Rowley, J. (2011).“Linking strategic objectives and operational performance: an action research-based exploration.”Measuring Business Excellence. Vol. 8 No. 3 Pp. 42-51.
Sohal, A.S. and Prajogo, D.I. (2006) “The integration of TQM and technology/R&D management in determining quality and innovation performance.”Omega.Vol.34 Iss.3 p.296-312.
Songini, M. L. (2002) “SAP Expands Worker Self-Service Software.” Computerworl. Vol. 36, No. 36, p. 12.
Srisa-ard, S. (2005) “Book Review : Understanding Information Systems: What They Do and Why We Need Them”. Online Information Review.Vol. 29.No. 3. pp. 333-334.
Storey, J. (1997). “Radical change or business as usual: flexibility in non-union SMEs”. International Journal of entrepreneurial behavior and research. Vol. 3.No. 3. pp: 157-167.
St-Pierre, O. And Delisle, S. (2006) "An expert diagnosis system for the benchmarking of SMEs' performance", Benchmarking: An International Journal, Vol. 13 Iss: 1/2, pp.106 – 119.
Stuhlman, D. D. (2010) “Knowledge management terms.” Stuhlman Managment Consutants. Available at: home.earthlink.net/~ddstuhlman/defin1.htm [last reviewed 30/4/2012].
Sunley, P. Pinch, S. Reimer, S. and Macmillen, J. (2008) “Innovation in a creative production system: the case of design.” Journal of Economic Geography.Vol.8 Iss.5 p. 675-698.
Sureephong, P. Chakpitak, N. Ouzrout, Y. and Bouras, A. (2008) “An Ontology-based Knowledge Management System for Industry Clusters.” International Conference on Advanced Design and Manufacture available at: http://arxiv.org/abs/0806.0526 [last reviewed, 17/7/2012].

Swoboda (2008) “International value chain processes by retailers and wholesalers — A general” Journal of retailing and consumer services Vol.15 Iss.2 P.63.

Talvinen, J. M. (1995). “Information systems in marketing Identifying opportunities for new applications”.European Journal of Marketing.Vol. 29.No. 1. pp: 8-26

Tan, X. Yen, D.C. and Fang, X. (2003) “Web warehousing: Web technology meets data warehousing.” Technology in Society.Vol.25 Iss.1 p.131-148.

Taplin, R. (2005) “The future looks bright with the right partners.” Managing Intellectual Property.ISS.155 p.50-52.

TAYLOR, R. (1999) “Knowledge is power.” Credit Union Management.Vol. 22 No. 1. pp. 39

Thassanabanjong, K, Miller, P. and Marchant, T. (2009) "Training in Thai SMEs."Journal of Small Business and Enterprise Development.Vol.16 Iss.4 p.678–693.

The European Commission (2005) “The new SME definition: User guide and model declaration.” ENTERPRISE AND INDUSTRY PUBLICATIONS. Available at: http://ec.europa.eu/enterprise/policies/sme/files/sme_definition/sme_user_guide_en.pdf [last reviewed 12/6/2012].

The Financial Times (2011) "" available at: http://www.ft.com/cms/s/0/07c387f2-1758-11e0-badd-00144feabdc0.html#axzz2GjlNtD1M [last reviewed 1/1/2013].

The guardian (2012) available at: http://www.guardian.co.uk/business/2012/mar/06/brazil-economy-worlds-sixth-largest [last reviewed 20/7/2012].

Theodore, B.R. and Gatchel, R.J. (2008) “Management and Interpretation of Data Obtained from Clinical Trials in Pain Management.” Pain Practice.Vol.8 Iss.6 p. 461–472.

Thierauf, R.J. “Effective Business Intelligence Systems.” Westport, CT, USA: Greenwood Press. Available at: http://site.ebrary.com/lib/uoh/Doc?id=10005668&ppg=13 [last reviewed: 21/5/2012].

Threat, H. (1993) "Measurement is free", Strategy & Leadership, Vol. 27 Iss: 3, pp.16 – 19.

Tietz, B. (1971) "The future development of retail and wholesale distribution in Western Europe: an analysis of trends up to 1980", European Journal of Marketing, Vol. 5 Iss: 1, pp.42 - 55

Tim Mazzarol, Stephen Choo, (2003) "A study of the factors influencing the operating location decisions of small firms", Property Management, Vol. 21 Iss: 2, pp.190 – 208.

Tourino, J. (2007) "Guest Editorial Grid Education and Grid-Based Technologies Applied to Education: Ongoing Activities." Education, IEEE Transactions on.vol.50 Iss.1 p.1-2.

Tuzzio, L. Schaefer, J. McCulloch, D. Greene, S.M. Bennett, S. Clark, A. and Austin, B. (2009) “PS1-38: Catalyzing Innovation at the Front Lines of Health Care.” Clinical Medicine & Research, Volume 8, Issue 1, p. 63.

ulia Gelfand, (1998) "Teaching and exposing grey literature: what the information profession needs to know - examples from the sciences", Collection Building, Vol. 17 Iss: 4, pp.159 – 166

Umit, S.B. UTrevor, T. and Carsten B. (2000) "Dynamics of performance measurement systems", International Journal of Operations & Production Management, Vol. 20 Iss: 6, pp.692 – 704

Vaidya, K, Sajeev, A, & Callender, G 2006, 'CRITICAL FACTORS THAT INFLUENCE E-PROCUREMENT IMPLEMENTATION SUCCESS IN THE PUBLIC SECTOR', Journal Of Public Procurement, Vol.6 Iss.1/2 p.70-99.

Van-Engers, T.M. and Glassee, E. (2001) "Facilitating the legislation process using a shared conceptual model."Intelligent Systems.Vol.16 no.1 p. 50- 58.

Vanpoucke, E. Boyer, K. K. and Vereecke, A. (2009) “Supply chain information flow strategies: an empirical taxonomy”. International Journal of Operations & Production Management.Vol. 29.No. 12. pp: 1213-1241.

Vasconcellos e Sá, J. A. Olão , F. Pereira, M. (2011) “From Levitt to the global age: one more time, how do we define our business?” Management Decision.Vol. 49.No. 1. pp 99-115.

Vaus, D. (2004) "Analyzing Social Science Data: 50 key problems in data analaysis." London: UK. SAGE publications Ltd.

Victoria J. Mabin, Steven J. Balderstone, (2003) "The performance of the theory of constraints methodology: Analysis and discussion of successful TOC applications." International Journal of Operations & Production Management.Vol.23 Iss.6 p.568 - 595.

Vos, E. Yeh, A.J. Carter, S. and Tagg, S. (2007) “The happy story of small business financing.”Journal of Banking and Finance.Vol.31 Iss.9 p.2648-2672.

Wallace, E.P. (2002) “THE INFLUENCE OF TECHNOLOGY ON AUDITING.”Pennsylvania CPA Journal.Vol. 72 Iss. 4, p. 36.

Walters, B.A. Priem, R.L. and Shook, C.L. (2005) "Small business manager scanning emphases and the dominant logic of the business level strategy."Journal of Small Business Strategy.Vol.15 No.2 p.19-32. Available at: http://www.highbeam.com/doc/1P3-940321461.html [last reviewed 12/6/2012].

Weaver, D.C. (2004) “Applying data mining techniques to library design, lead generation and lead optimization.” Current Opinion in Chemical Biology, Vol.8 Iss.3 p.264-270.

White, C. (2004) "Now is the Right Time for Real-Time BI." DM Review. Vol.14 Iss.9 p.47-54.
Wierzbicki, A.P. (2007) “Modelling as a way of organising knowledge."European Journal of Operational Research.Vol.176 Iss.1 p.610-635.
Wilkinson, D. (2000) "The researcher's toolkit: the complete guide to practitioner research." London: UK. RoutledgeFalmer.
Williamson, D. (2011), "Talent management in the new business world: How organizations can create the future and not be consumed by it", Human Resource Management International Digest, Vol. 19 Iss.6 p.33–36.
Wilson, A.M. Thabane, L. and Holbrook, A. (2004) “Application of data mining techniques in pharmacovigilance.” British Journal of Clinical Pharmacology.Vol.57 Iss.2 p.127–134.
Wilson, J. (2009) "Landscapes and watersheds?China and the current economic context."Journal of Technology Management in China, Vol.4 Iss.2 p.109–118.
Winch, G. and McDonald, J. (1999) "SMEs in an environment of change: computer-based tools to aid learning and change management." Industrial and Commercial Training.Vol.31 Iss.2 p.49-56.
Wintour, P. (1994) “Labour plans: learning revolution for workers.” The Guardian 16th Jun, 1994. (1959-2003) p. 9. Available at: http://search.proquest.com/docview/187565693?accountid=11526 [Last reviewed10/6/2012].
Wolff, T. L. and Pett, J. A. (2006). “Small firm performance: modeling the role of product and process improvements”. Journal of small business management (USA).Vol. 44.No. 2.page: 268.
Wong, H.Y. Merrilees, B. (2007) "Multiple roles for branding in international marketing."International Marketing Review.Vol.24 Iss.4 p.384 – 408.
Wu, R.S. Ou, C.S. Lin, H.Y. Chang, S.I. and Yen, D.C. (2012) “Using data mining technique to enhance tax evasion detection performance.”Expert systems with applications.Vol.39 Iss.10 p. 8769.
Xu, W.L. Kuhnert, L. Foster, K. Bronlund, J. Potgieter, J. and Diegel, O. (2007) “Object-oriented knowledge representation and discovery of human chewing behaviours.” Engineering Applications of Artificial Intelligence.Vol.20 Iss.7 p.1000-1012.
Yin, R. (2003) “Case study research: design and methods.” 3rd Ed London: UK. Sage.
Yip, G.S. and Rugman, A.M. (2006) “Alina Kudina, International Success of British Companies.”Long Range Planning.Vol.39 Iss.3 p.241-264.

Yun, U. Shin, H. Ryu, K.H. and Yoon, E. (2012) “An efficient mining algorithm for maximal weighted frequent patterns in transactional databases.”Knowledge-Based Systems.Vol.33 p.53-64.
Zaïane, O.R. (2002) “Guest Editor's Introduction—Special Issue on Multimedia Data Mining.”Journal of Intelligent Information Systems.Vol.19 No.1 p.5-6.
Zainol, F. and Daud, W. (2011) “Indigenous ("Bumiputera") Malay Entrepreneurs in Malaysia: Government Supports, Entrepreneurial Orientation and Firms Performances'.” International Business and Management.Vol.2 Iss.1 p.86-99.
Zelbst, P.J. Green Jr, K.W. and Sower, V.E. (2010) "Impact of RFID technology utilization on operational performance", Management Research Review, Vol. 33 Iss: 10, pp.994 – 1004.
Zhang, Y. (2004) “Constructing a conducive environment for the growth of knowledge-based SMEs in a science park context: a study on the demand-side perceptions in Malaysia.” International Journal of Entrepreneurship and Innovation Management.Vol.4 Iss.5 p.515-528.
Zheng, C. Hyland, P. and Soosay, C. (2007) "Training practices of multinational companies in Asia."Journal of European Industrial Training.Vol.31 Iss.6 p.472-494.
Zhiyong, P. Qing, L. Feng, L. Xuhui, L. and Junqiang, L. (2005) "Using object deputy model to prepare data for data warehousing," Knowledge and Data
Zink, K.J. Schmidt, A. And Voß, W. (1997), "Total quality “down under”: the Australian Quality Award - an innovative model for Business Excellence", The TQM Magazine, Vol. 9 Iss: 3, pp.217 – 220.

11.0 Appendixes

11.1 Appendix A: The questionnaire:

Objectives:

To develop a model that establishes a new policy that supports the adoption of BI tools within wholesale SMEs in the UK to enhance performance management within wholesale SMEs in the UK.

Instructions:

Please take a look at the following questionnaire and try to answer correctly and accurately. All the information gathered here will be kept strictly confidential and will be used only for research and analysis purposes without mentioning the person or company names.

Section A: Company's Characteristics

Q1. Which of the following is the speciality of your company:

□ Wholesale on a fee or contract basis.

□ Wholesale of agricultural raw materials and live animals

□ Wholesale of food, beverages and tobacco.

□ Wholesale of household goods.

□ Wholesale of information and communication equipment.

□ Wholesale of other machinery, equipment and supplies.

□ Other specialised wholesale.

□ Non-specialised wholesale trade

Q2. What is the number of employees in your company?

□ Less than 11. □ Between 11 and 51.

□ Between 51 and 251. □ More than 250.

Q3. What is your company's turnover in GBP?

□ Less than 2 million. □ Between 2 and 8 million.

□ Between 8 and 40 million. □ More than 40 million.

Q4. What is your job title?

□ Managing Director □ Department manager.

□ Team leader/supervisor □ Other…… (Please Specify)

Q5. Which of the following is your highest qualification:

□ High school □ College/University degree

□ Higher education (postgraduate) □ Professional training courses.

Q6. Does your company use any computer technology (software) to support decision making?

□ Yes □ No □ I don't know

Q7. Do you think that business development needs exist in your company?

□ Yes □ No □ Needs may exist but we are not aware of them.

Section B: Performance Management

Q8. To the best of your knowledge, does your company define a clear performance monitoring and measurement plan?

□ Yes, Such a plan is implemented.

□ No, but such a plan should be under consideration.

□ No, and we don't need such a plan.

Q9. Which of the following describe your company's performance management policy? *(Please select all the applicable choices)*

□ Employees' appraisals and bonuses scheme.

□ Periodic short-term meetings or motivational activities.

□ A continuous management process.

□ Other ……. (please specify)

Q10. Which of the following describes the perception of performance in your company?

Please rank the choices in order of importance (1,2,3,..) where "1" is the most important.

- Eliminating operational defects ……
- Increasing profits ……
- Gaining competitive advantage ……
- Others ……. (please specify) ……

Q11. Which of the following mostly influence the success of operations in your company?

Please rank the choices in order of importance (1,2,3,..) where "1" is the most important.

- Operations' efficiency (cost). ……
- Operations' effectiveness (Time). ……

- Operations' competitiveness. ……

- Others …… (Please specify) ……

Q12. How would you rank the relevance of the following data sources in measuring the operational performance of your company?

Please rank the choices in order of importance (1,2,3,...) where "1" is the most important

- Customers' feedback. ……

- Financial indicators (e.g. turnover or profit) ……

- Operational indicators (e.g. deliveries or throughput). ……

- Other measures …….. (*Please specify*) ……

**** In your opinion, how would you rate the importance of the following activities to ensure a superior performance?**

Q13. *Assessing performance to identify success and failure areas*

☐ Very important ☐Important☐Somewhat important ☐ Not important

Q14. ***Comparing performance with the performance of competitors***

☐ Very important ☐Important☐Somewhat important ☐ Not important

Q15. ***Comparing the current performance with previous performance***

☐ Very important ☐Important☐Somewhat important ☐ Not important

Q16. ***Identifying targets and goals for improvement***

☐ Very important ☐Important☐Somewhat important ☐ Not important

Section C: Business intelligence

Q17. Do you think that investing in new computer technologies may enhance your company's operational performance?

□ Yes, it may have significant effects.

□ No, and I don't think it will work in this company.

□ I don't really know until technologies come into place.

Q18. Please rank the influence of the following factors to encourage the adoption of advanced information systems in your company?

- Operational requirements. ……
- Reducing operational costs. ……
- Improving performance. ……
- Other ……(Please specify) ……

Q19. Which of the following may hinder the adoption of new information systems in your company?

Please rank the choices in order of importance (1,2,3,..) where "1" is the most important.

- Change resistance. ……
- Cost. ……
- Technical requirements. ……

- Training needs. ……

- Others …… (please specify) ……

In your opinion, how would you rate the importance of the following functions to ensure successful use of information in your company.

Q20. ***Systematic and regular collection of data***

☐ Very important ☐Important☐Somewhat important ☐ Not important

Q21. ***Reporting on data to gain usable knowledge***

☐ Very important ☐Important☐Somewhat important ☐ Not important

Q22. ***Analyse the data to identify areas for improvement.***

☐ Very important ☐Important☐Somewhat important ☐ Not important

Section E: Soft factors

****In your opinion, how would you rate the influence of the following factors on implementing a successful performance monitoring and measurement plan in your company?**

Q23. Research and development capabilities

□ Very important □ Important □ Somewhat important □ Not important

24. Top management commitment

□ Very important □ Important □ Somewhat important □ Not important

25. Human resource management skills

□ Very important □ Important □ Somewhat important □ Not important

26. Technological capabilities

□ Very important □ Important □ Somewhat important □ Not important

27. External environment

□ Very important □ Important □ Somewhat important □ Not important

28. Information and communication channels

□ Very important □ Important □ Somewhat important □ Not important

On a scale of 1 to 4 where 1 represents "Extremely agree" and 4 represents "Extremely disagree," please rate the correctness of the following statements.

Q29. *Flexibility of operations is an important feature of modern enterprises because predictability and stability are things of the past.*

□ 1 □ 2 □ 3 □ 4

Q30. It is important to make suitable investments in information technology to enable the achievement of successful performance management plans.

□ 1 □ 2 □ 3 □ 4

Q31. Making changes in the enterprise's operations is important to deal with the emerging opportunities and challenges for growth and improvement.

□ 1 □ 2 □ 3 □ 4

Q32. It is important to use information systems to monitor and measure the performance of operations in your company.

□ **1** □ **2** □ **3** □ **4**

Section F: Measurable "hard" factors

In your opinion, how would you rate the influence of the following aspects on the performance of your company?

Q33. ***Operations' efficiency***

□ Very important □ Important □ Somewhat important □ Not important

Q34.*Operations' effectiveness*

□ Very important □ Important □ Somewhat important □ Not important

Q35.*Competitiveness*

□ Very important □ Important □ Somewhat important □ Not important

Please rate the importance of the following measures to monitor and measure the operations' efficiency in your company.

Q36. Financial turnover

□ Very important □ Important □ Somewhat important □ Not important

Q37. Inventory turnover

□ Very important □ Important □ Somewhat important □ Not important

Q38. Volume discount

□ Very important □ Important □ Somewhat important □ Not important

Q39. Cost of operations

□ Very important □ Important □ Somewhat important □ Not important

Q40. Cost of a new customer

□ Very important □ Important □ Somewhat important □ Not important

Q41. Purchasing and warehousing costs

□ Very important □ Important □ Somewhat important □ Not important

Q42. Available Liquidity

□ Very important □ Important □ Somewhat important □ Not important

Q43. Return on investments

□ Very important □ Important □ Somewhat important □ Not important

Q44. Payback periods

□ Very important □ Important □ Somewhat important □ Not important

Q45. Throughput

□ Very important □ Important □ Somewhat important □ Not important

Please rate the importance of the following measures in measuring the operations' effectiveness.

Q46. Inventory turnover

□ Very important □ Important □ Somewhat important □ Not important

Q47. Deliveries lead times

□ Very important □ Important □ Somewhat important □ Not important

Q48. Speed of operations

□ Very important □ Important □ Somewhat important □ Not important

Q49. Trade-offs between transports

□ Very important □ Important □ Somewhat important □ Not important

Q50. Throughput

□ Very important □ Important □ Somewhat important □ Not important

Please rate the importance of the following measures in monitoring the competitiveness of your company.

Q51. Number of competitors

□ Very important □ Important □ Somewhat important □ Not important

Q52. Number of customers

□ Very important □ Important □ Somewhat important □ Not important

Q53. Customers' satisfaction.

□ Very important □ Important □ Somewhat useful □ Not important

Q54. Price performance against competitors.

□ Very important □ Important □ Somewhat useful □ Not important

Q55. Operational costs comparing to competitors.

□ Very important □ Important □ Somewhat useful □ Not important

Q56. Net sales.

□ Very important □ Important □ Somewhat useful □ Not important

Thank You

11.2 Appendix B: Analysis of the rank order questions.

Subsample 1			
Categories	**Variables**		
	Eliminating operational costs	Increasing profits	Gaining competitive advantage

Ranked 1st	.375	.500	.125
Ranked 2nd	.250	.125	.625
Ranked 3rd	.375	.375	.250
Total	1	1	1
Subsample 2			
Ranked 1st	.125	..875	.000
Ranked 2nd	.125	.125	.750
Ranked 3rd	.750	.000	.250
Total	1	1	1
Subsample 3			
Ranked 1st	.286	.714	.000
Ranked 2nd	.286	.000	.714
Ranked 3rd	.428	.286	.286
Total	1	1	1

Table: B.1: Subsamples of the perceptions of performance (Q10).

Categories	**Variables**		
	Eliminating operational costs	Increasing profits	Gaining competitive advantage
Subsample 2 and Subsample 3			
Ranked 1st	.206	.795	.000
Ranked 2nd	.206	.062	.732
Ranked 3rd	.588	.143	.268
Total	1	1	1
Subsample 1			
Ranked 1st	.375	.500	.125
Ranked 2nd	.250	.125	.625

Ranked 3rd	.375	.375	.250
Total	1	1	1
Subtraction			
Ranked 1st	.169	.295	.125
Ranked 2nd	.044	.063	.107
Ranked 3rd	.213	.232	.180
Average variability	.142	.197	.137

Table: B.2: Analysis of the Subsamples of the perceptions of performance (Q10).

Subsample 1			
Categories	**Variables**		
	Efficiency	Effectiveness	Competitiveness
Ranked 1st	.375	.625	.000
Ranked 2nd	.500	.375	.125
Ranked 3rd	.125	.000	.875
Total	1	1	1
Subsample 2			
Ranked 1st	.125	.875	.000
Ranked 2nd	.375	.125	.500
Ranked 3rd	.500	.000	.500
Total	1	1	1
Subsample 3			
Ranked 1st	.143	.714	.143
Ranked 2nd	.571	.143	.286
Ranked 3rd	.286	.143	.571
Total	1	1	1

Table B.3: The Subsamples of the success of operations (Q11).

Categories	Variables		
	Efficiency	Effectiveness	Competitiveness
Subsample 2 and Subsample 3			
Ranked 1st	.134	.795	.072
Ranked 2nd	.473	.134	.393
Ranked 3rd	.393	.071	.534
Total	1	1	1
Subsample 1			
Ranked 1st	.375	.625	.000
Ranked 2nd	.500	.375	.125
Ranked 3rd	.125	.000	.875
Total	1	1	1
Subtraction			
Ranked 1st	.241	.170	.072
Ranked 2nd	.027	.236	.268
Ranked 3rd	.268	.071	.341
Average variability	.179	.159	.227

Table B.4: Analysis of the Subsamples of the success of operations (Q11).

Subsample 1			
Categories	**Variables**		
	Customers' feedback	Financial indicators	Operational indicators

Ranked 1st	.625	.000	.375
Ranked 2nd	.125	.500	.375
Ranked 3rd	.250	.500	.250
Total	1	1	1
Subsample 2			
Ranked 1st	.250	.375	.375
Ranked 2nd	.250	.250	.500
Ranked 3rd	.500	.375	.125
Total	1	1	1
Subsample 3			
Ranked 1st	.143	.143	.714
Ranked 2nd	.429	.286	.286
Ranked 3rd	.428	.571	.000
Total	1	1	1

Table B.5: he Subsamples of the data sources (Q12).

Categories	**Variables**		
	Customers' feedback	Financial indicators	Operational indicators
Subsample 2 and Subsample 3			
Ranked 1st	.197	.259	.545
Ranked 2nd	.339	.268	.393
Ranked 3rd	.464	.473	.062
Total	1	1	1
Subsample 1			
Ranked 1st	.625	.000	.375
Ranked 2nd	.125	.500	.375
Ranked 3rd	.250	.500	.250
Total	1	1	1

Subtraction			
Ranked 1st	.428	.259	.460
Ranked 2nd	.214	.393	.384
Ranked 3rd	.214	.027	.156
Average variability	.285	.226	.333

Table B.6: Analysis of the Subsamples of the data sources (Q12).

Subsample 1			
Categories	**Variables**		
	Operational Requirements	Reducing operational costs	Improving performance
Ranked 1st	.625	.000	.375
Ranked 2nd	.250	.250	.125
Ranked 3rd	.125	.750	.500
Total	1	1	1
Subsample 2			
Ranked 1st	.625	0.00	.375
Ranked 2nd	.250	.500	.250
Ranked 3rd	.125	.500	.375
Total	1	1	1
Subsample 3			
Ranked 1st	.714	.000	.286
Ranked 2nd	.143	.286	.571
Ranked 3rd	.143	.714	.143

Total	1	1	1

Table B.7: The Subsamples of Priorities to adopt information technology (Q18).

Categories	**Variables**		
	Operational Requirements	Reducing operational costs	Improving performance
Subsample 2 and Subsample 3			
Ranked 1st	.670	.000	.331
Ranked 2nd	.196	.393	.410
Ranked 3rd	.134	.607	.259
Total	1	1	1
Subsample 1			
Ranked 1st	.625	.000	.375
Ranked 2nd	.250	.250	.125
Ranked 3rd	.125	.750	.500
Total	1	1	1
Subtraction			
Ranked 1st	.045	.000	.044
Ranked 2nd	.054	.143	.285
Ranked 3rd	.009	.143	.241
Average variability	.036	.286	.190

Table B.8: Analysis of the Subsamples of the priorities to adopt information technology (Q18).

Subsample 1				
Categories	**Variables**			
	Change resistance	Cost	Technical requirements	Training needs
Ranked 1st	.125	.875	0.00	.000
Ranked 2nd	.250	.000	.125	.625
Ranked 3rd	.000	.125	.500	.375
Ranked 4th	.625	.000	.375	.000
Total	1	1	1	1
Subsample 2				
Ranked 1st	.500	.250	.000	.250
Ranked 2nd	.000	.375	.250	.375
Ranked 3rd	.125	.250	.500	.125
Ranked 4th	.375	.125	.250	.250
Total	1	1	1	1
Subsample 3				
Ranked 1st	.428	.428	.000	.143
Ranked 2nd	.143	.286	.000	4
Ranked 3rd	.286	.286	.143	.286
Ranked 4th	.143	.000	.857	.000
Total	1	1	1	1

Table B.9: The Subsamples of the priorities hindering the adoption information technology (Q19).

Categories	Variables			
	Change resistance	Cost	Technical requirements	Training needs
Subsample 2 and Subsample 3				
Ranked 1st	.465	.339	.000	.198
Ranked 2nd	.071	.331	.125	.475
Ranked 3rd	.205	.268	.322	.202
Ranked 4th	.259	.062	.553	.125
Total	1	1	1	1
Subsample 1				
Ranked 1st	.125	.875	.000	.000
Ranked 2nd	.250	.000	.125	.625
Ranked 3rd	.000	.125	.500	.375
Ranked 4th	.625	.000	.375	.000
Total	1	1	1	1
Subtraction				
Ranked 1st	.340	.536	.000	.198
Ranked 2nd	.179	.331	.000	.150
Ranked 3rd	.205	.143	.178	.173
Ranked 4th	.366	.062	.178	.125
Average variability	.273	.268	.089	.162

Table B.10: Analysis of the Subsamples of the priorities hindering the adoption information technology (Q19).