A Decision Support System Framework for Assessing Small Business Website Features of the B2C E-commerce

By
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Abstract

Small business decision-makers require effective decision support solutions for their operational and strategic decision-making. Current decision support solutions provide various system provisions for managerial decisions. They remain limited in meeting the decision-makers' cognitive requirements, specifically for small businesses in the business-to-consumer (B2C) online environment. Small businesses continuously suffer from a range of issues associated with changing business environment, technology, and consumer preferences. In order to address these issues, a small business must have an interactive website that offers a competitive platform. Small business managers often lack knowledge of how to update their websites. More than half Australian small businesses in the retail sector use their websites for promotions. Although it is essential for managers to have a digital strategy using effective websites, social media, and mobile applications, most owners/managers have lack of confidence in making decisions strategically in this significant matter.

The objective of the study was to design an innovative decision support systems (DSS) solution to address the issues faced by owners/managers in making strategic decisions, particularly in their implementation of an effective website. The solution artefact was designed as an instantiation (a type of artefact) prototype. Practitioner groups evaluated it within the target small business retail industry. It was designed to provide support to small business owners/managers in making strategic decisions when selecting useful website features to achieve competitive advantage. As the DSS is a well-recognised research tradition within the information systems (IS) discipline, it was anticipated that the artefact would improve the current provisions of DSS and enable an innovative solution to support managerial decision-making in the context of online B2C business problems.

This study adopted the design science research (DSR) methodology to capture the decision problems and convert them into a set of problem specific requirements to develop the solution. The DSR methodology was appropriate because it contributes to addressing the real-world application design environment in which the research problem and solution are well-defined. Evolutionary prototyping approach was used for the DSS development under user-centred design (UCD) principles. The data were collected

through multiple focus group sessions involving owners/managers in evaluating the artefact. Qualitative and descriptive analysis approaches were adopted to analyse the data. These users evaluated the usability, efficacy, and performance of the DSS prototype instantiation. The evaluation was critical to producing a user-friendly DSS to meet end-user needs and for further improvements of the prototype.

Contributions made throughout this study are diverse, creating the bridge between theoretical and practical knowledge. The major theoretical contribution was the conceptual DSS framework that produced a KB practical solution known as the website features evaluation DSS (WFE-DSS). In practice, owners/managers require real-time knowledge to maintain their website features to improve their websites' performance. Information for knowledge must be derived from an analysis of the external business environment and related factors (competitors). The DSS can assist small businesses in selecting competitive website features by assessing them against potential competitors. The DSS was built on a Windows-based platform, familiar to many small businesses, and a cost-effective personal and KB-DSS type.

Declaration of Originality

The work contained in this thesis has not been previously submitted for a degree at any higher educational institutions. This PhD thesis is no more than 100,000 words in length excluding table of contents, appendices, and references. To the best of my knowledge and belief, the contents of this dissertation have not been published by any authors except where due references are made in the thesis itself.

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Date

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Dedication

To my daughter Fatima Jamal

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List of Publications from this PhD Thesis

Academic conference papers (peer reviewed):

1. Khatun, M., & Miah, S. J. (2015). A DSS framework for maintaining relevant features of the small business B2C websites. *In the Proceedings of the 26th Australasian Conference on Information System (ACIS' 2015),* November 30 - December 4th, Adelaide, Australia

2. Khatun, M., & Miah, S. J. (2016). Design of a decision support system framework for small business managers: A context of B2C e-commerce environment. *In the Proceedings of the Future Technologies Conference (FTC' 2016),* December 6-7, San Francisco, United States. IEEE, 1274-1281.

3. Khatun, M., & Miah, S. J. (2017). The design functions of a knowledge-based decision support system in the B2C e-commerce problem domain. *In the Proceeding of the 4th Asia-Pacific World Congress on Computer Science and Engineering 2017,* 11-13 December, Mana Island Resort and Spa, Fiji.

Journal publication:

4. Khatun, M., & Miah, S. J. (2017). Design methods for decision support systems: A perspective of small business B2C e-commerce environment. *International Journal of Business Intelligence Research, 8 (in press)*.

List of Abbreviations

ABS	-	Australian Bureau of Statistics
ABN	-	Australian Business Number
B2C	-	Business-to-Consumers
CA	-	Content Analysis
C#	-	C Sharp
DB	-	Database
DBMS	-	Database Management Systems
DSS	-	Decision Support System
DS	-	Design Science
DSR	-	Design Science Research
DIISRTE	-	Department of Industry, Innovation, Science, Research, and Tertiary Education
GST	-	Goods and Services Tax
HRE	-	Human Research Ethics
HTML	-	Hypertext Markup Language
ICDT	-	Information, Communication, Transaction and Distribution
IS	-	Information System
ICT	-	Information and Communication Technology
IT	-	Information Technology
JAD	-	Joint Application Development
KB	-	Knowledge Base
KBMS	-	Knowledge Base Management System
KM	-	Knowledge Management
KMDSS	-	Knowledge Management Decision Support System
KR	-	Knowledge Representations

NFRs	-	Non-functional Requirements
NTPs	-	New Theoretical Propositions (NTPs)
PDSS	-	Personal Decision Support Systems
RAD	-	Rapid Application Development
SBCB	-	Small Business Commissioner Bill
SDLC	-	System Development Life Cycle
SEO	-	Search Engine Optimisation
SQL	-	Structured Query Language
SWOT	-	Strengths, Weaknesses, Opportunities, and Threats
TSELC	-	The Senate Economic Legislation Committee
UCD	-	User-centred Design
UCDE	-	User-centred Design Environment
UI	-	User Interface
URL	-	Uniform Resource Locator
VUHREC	-	Victoria University Human Research Ethics Committee
WFE-DSS	-	Website Features Evaluation Decision Support Systems
WTO	-	World Trade Organisation

Glossary

Terms	Definition
B2C E-commerce	B2C e-commerce is one of the primary forms of commerce where any business transaction is executed electronically between companies and consumers (Stair & Reynolds, 2010).
Database (DB)	A DB is the best way to store and manage data (Coronel & Morris, 2016).
DB Management System (DBMS)	A DBMS is made up of software that operates DBs and provides storage, access, security, backup and other facilities to meet end-user requirements (Singh, 2015).
Design Science Research (DSR)	The DSR approach is involved in problem-solving activities, with an end goal to produce an artefact that must be built and then evaluated (Hevner, March, Park & Ram, 2004).
Decision Support System (DSS)	The DSS is an applied area within the IS discipline that focuses on solution design to support and improve managerial decision-making (Arnott & Pervan, 2012).
Joint Application Design (JAD)	The JAD is a team-based system development approach and seeks active user participation (Rosenblatt, 2014).
Knowledge Base (KB)	A KB is a collection of facts, rules, and procedures organised into representations. Traditionally, a KB refers to the data and set of rules used by an expert system (Power, 2014).
Knowledge Management (KM)	KM aims to capture, codify, and disseminate knowledge across organisations to enhance value, and the value is the performance-based knowledge system for strategic decision-making (Adler, 2008).
Non-functional Requirements (NFRs)	The NFRs describe how the system works, showing system performance, usability, and usefulness (Glinz, 2007).
Personal DSS (PDSS)	A PDSS is a small-scale system that develops for one manager, or a small number of independent managers, to support one decision task (Arnott & Pervan, 2008).
Prototype	A prototype is a smaller-scale system development method in the IS research domain, focused on user requirements (Haag & Cummings, 2009).
Rapid Application Development (RAD)	RAD is a system development approach for a business solution that delivers a series of stand-alone sub-systems to create a comprehensive and complex application (Kroenke, Bunker, & Wilson, 2014).
Small Business	Small business is any business with less than 20 employees (SBCB, 2013).
Structure Query Language (SQL)	The SQL is a widespread language for creating, updating and querying databases. The SQL is also DBMS software (Stair & Reynolds, 2016).
User-centred Design (UCD)	A UCD is a design philosophy and approach that places users at the centre of the design process from

	the stages of planning and designing the system requirements to implementing and testing the product (Baek, Cagiltay, Boling & Frick, 2008).
User-centred Design Environment (UCDE)	The UCDE is a system design method involved in secondary design activities by end-users that focuses on decision-support parameters, aids comparative analysis of current and desired states, obtains expert analysis and generate reports for business decision-making (Miah, Kerr, & von Hellens, 2014).
User Interface (UI)	The UI is one of the components of a DSS architecture accountable for creating communication and interactions between the user and a system (Rosenblatt, 2014).

Chapter 1: Introduction

Managers continuously analyse problems and explore opportunities for the growth of their businesses. Managerial roles require strategic decision-making to deal with the varying requirements of trading in the business environment (Baizyldayeva, Vlasov, Kuandykov & Akhmetov, 2013; Eisenhardt, 1989; Miah et al., 2014). However, decision-making can be difficult for managers working in a highly competitive business environment (Baizyldayeva et al., 2013). Decision-making can be particularly difficult for a manager in the business-to-consumer (B2C) electronic commerce (e-commerce) environment, through which millions of consumers interact directly with company websites searching for products. Consumers also evaluate goods and services at many e-commerce sites until they find a suitable site to make a purchase (Haag & Cummings, 2009). B2C e-commerce is one of the main forms of online business, with online transactions made directly between companies and individual consumers (Al-Qaed, 2008).

Therefore, creating an appropriate business strategy is fundamental for meeting the demands of any change in the external business environment. Many organisations address such needs internally to maintain their business performance (St-Jean, Julien & Audet, 2008). However, owners/managers of many small businesses are poor planners, and their goals are unclear, inadequately defined and have short-term based on personal intuition (Mazzarol, 2004). In addressing such issues, a small business needs technology-based support and solutions. Researchers have also found that small firm strategies with no alignment to information technology (IT) generate a lower level of business performance (Bergeron, Raymond & Rivard, 2004). Therefore, many organisations are motivated to adopt or build their own IT applications, such as a decision support system (DSS) that can assist them in gaining a competitive advantage (Power, 2016).

Only a few *small* businesses take advantage of using IT artefacts as strategic decision support tools for improving business decisions (Duan & Xu, 2005, 2009; Sexton & Van Auken, 1985). The lack of strategies is evident mainly in setting up their websites with appropriate features using advanced technology (Burgess, Sellitto & Karanasios, 2009). Small businesses typically have limited resources and a less skilled managerial workforce. This creates a higher possibility of business failure as small businesses do not always have access to the information they need (Duan & Xu, 2009), particularly

knowledge about the business environment (Hunter, 2011). As a result, IT artefact design research for managerial decision support solutions are acknowledged as necessary to improve business strategies (Hevner et al., 2004; Miah et al., 2014).

Previously research related to small businesses has focused on social and economic issues rather than technological developments. A few studies have addressed decision support requirements for online small businesses in the context of developing IT artefacts. Although various forms of DSSs are widely used in many organisations, there is a propensity among researchers to apply the same findings about experience and techniques in large organisations directly to small businesses, without recognising that there are different DSS needs within small businesses (Duan & Xu, 2009). Duan and Xu (2009) also argue that DSSs in small businesses are used for operational rather than strategic decision-making, which is of paramount task. This indicates that small businesses find strategic decision-making too challenging because of uncertain business environments. It is important to take this into account when looking to understand decision-makers' intuition and judgement in DSS design.

This study developed a new DSS artefact utilising the design science research (DSR) philosophy, which assists the researcher and "creates and evaluates IT artefacts intended to solve identified organisational problems" (Hevner et al., 2004, p. 77). It adopted the DSR seven guidelines developed by Hevner, March, Park and Ram (2004), known simply as HMPR guidelines, for overall research design. In DSR, the research background and problems must be introduced, followed by the research motivation and development of study objectives (Gregor & Hevner, 2013). The research questions developed to achieve research objectives are also outlined followed by a description of the thesis structure.

1.1 Research background and problem statements

The e-commerce platform promises countless opportunities for small businesses. Opportunities include the option of completing orders and payments online, reducing transaction costs, and maximising accessibility to new markets (Lacka, Chan & Yip, 2014). The most significant contribution of e-commerce is to provide an online environment for both buyers and sellers, including information and communication channels to complete the buying and selling process. In the B2C e-commerce environment, buyers have the benefit of gaining access to seller websites, and sellers have

the benefit of selling their products, anytime and anywhere (Al-Qaed, 2008). These advantages have influenced the rapid expansion of online markets, creating more new business opportunities for companies (Lacka et al., 2014).

Understandably, the demands on B2C e-commerce continue to rise, as more people prefer to shop online (Poon & Lau, 2006). Online shopping has grown significantly in recent years (Kwee-Fah, 2016). Its scope is continuously diversifying, with new options to buy products online (Abdul-Muhmin, 2011; Poon & Lau, 2006; Mohapatra, 2012). Consequently, B2C e-commerce has developed rapidly over recent years (Al-Maghrabi & Dennis, 2011). As a result, an e-commerce website, mainly a B2C e-commerce website for small businesses, can be popular with online shoppers. E-commerce provides many benefits to small enterprises as a relatively efficient and effective channel for delivering and exchanging information, advertising, marketing and completing transactions. In some cases, it facilitates the distribution of goods and services to trading partners and customers (Buxton & Walton, 2014; Marshall & McKay, 2002).

E-commerce also provides many benefits for both consumers and companies. One of the benefits is a convenient platform for buyers and sellers (AL-Qaed, 2008). This creates a sales and distribution channel between companies and consumers (Corbitt, Thanasankit & Yi, 2003; Turban, Lee, King, Liang & Turban, 2009). Ultimately, it helps to reduce the infrastructure costs for online retailers (WTO, 2013).

The e-commerce platform notably offers a well-designed web storefront with multimedia catalogue pages (Marakas & O'Brien, 2014: WTO, 2013) that assist companies to access global markets (Buxton & Walton, 2014; WTO, 2013). In the B2C e-commerce environment, the online catalogue is developed using innovative shopping cart software (WTO, 2013). This software generates web pages or online catalogues with all the information about the selling processes, including information on products, price, billing, shipping, and payment methods (Stair & Reynolds, 2010). E-commerce also provides opportunities for small businesses with the ability to accept credit and debit card payments via mobile devices (e.g., smartphone and tablet) (Buxton & Walton, 2014). These benefits create close relationships between companies and their customers (Dubelaar, Sohal & Savic, 2005). However, while e-commerce provides substantial benefits to businesses, including small businesses, many companies in the B2C e-commerce sector have failed to attract the local online consumer market (Irvine, Richardson, Fear & Denniss, 2011),

as many Australian consumers buy products from overseas websites instead of local websites (Deloitte, 2013; Frost & Sullivan, 2012; Irvine et al., 2011; Khatun, 2011; PwC, 2012; Sensis, 2013; Sivasailam, 2012; Todd, 2012). This creates loss of potential online domestic sales in Australia (Ewing, 2011; Todd, 2012; Wright, 2012). According to the Department of Industry, Innovation, Science, Research, and Tertiary Education (DIISRTE, 2012), small businesses in Australia represent 95.6 percent of all businesses, so the potential loss of online sales is significant.

Many studies have identified some factors associated with purchasing products from overseas websites. These factors include affordable prices, better products with a greater range, and high-quality services (Forrest & Sullivan, 2012). Also, overseas websites provide a free or lower delivery cost (Forrest & Sullivan, 2012; PwC, 2012). Moreover, a strong Australian dollar (Moodie, 2012) and GST exemption for goods under AU$1,000 on overseas purchases (Irvine et al., 2011), have made international online purchases very attractive. Recently, the Australian Government announced changes to this GST exemption. As of 1 July 2017, overseas online retailers who sell into Australia are required to register for GST, the costs of which are passed on to the Australian consumer (Bullot & Hornbrook, 2015).

This study differs from previous studies that have focused on the various factors associated with consumers' buying decisions. Instead, it focuses on the improvement of managerial strategic decisions, particularly the selection of competitive features on B2C websites. Small businesses need IT support for their strategic decision-making in the B2C e-commerce environment, particularly for improving their website features and attracting potential online customers. Many researchers in the small business domain have recognised that the owner/manager is the most important resource in this type of organisation and their decisions are the most significant factor in improving organisational performance (Hansen & Hamilton, 2011; Mazzarol, Sophie & Geoffrey, 2009).

Therefore, small business owners/managers need appropriate support when selecting relevant website features. This is vital for addressing the issue of products being purchased from overseas websites instead of local small business B2C websites. This suggests a clear need for DSS-based solutions to address the decision-making issues for the online retailers in Australia.

1.2 Motivation and research objectives

To address the problems discussed above, one needs to establish the relationship between the factors that impact consumers' purchases from overseas websites and owners/managers strategic decisions concerning the selection of relevant features that need to be available on small business websites. In addition to understanding this relationship, the main motivation of this study was to develop a new DSS-based solution to assist owners/managers of small businesses in making strategic decisions in the B2C e-commerce environment. DSS solutions fall within the information system (IS) discipline focused on improving managerial decision-making (Arnott & Pervan, 2012). The new DSS will specifically help owners/managers in making strategic decisions about the best features to include in their websites to attract consumers. This will allow a small business to achieve competitive advantage in the dynamic B2C e-commerce environment. Hence, this study has the following specific objectives:

1. To identify the factors influencing products being purchased from overseas competitor websites rather than small business B2C websites.
2. To investigate the relationship between factors (theoretically and empirically) that influence consumer online purchasing and owner/manager strategic decisions concerning the selection of relevant features on their B2C websites.
3. To develop a new DSS-based solution to help owners/managers of small businesses make strategic decisions when implementing relevant features on their websites.

In the online business environment, a website is the first dealing place between companies and their customers (Ashraf, Thongpapanl, & Spyropoulou, 2016; Wang, Minor, & Wei, 2011). A website is also a global marketplace where visitors search for products and services. An accessible website interface enables users to access, find, see and use the information from the website (Miah, 2004). An accessible website is easy to use. Ultimately, it creates an attractive and interactive online presence for an organisation, and it meets the needs of its visitors and helps a company in achieving its goals (Stair & Reynolds, 2010). From a B2C e-commerce perspective, the website is the essential channel of communication with potential online customers.

E-commerce website features help to determine site quality include accessibility, speed, navigability, and content. Companies need to make full use of the current technology and manage the information on their websites in order to enhance their online performance (HernaNdez, JimeNez, & MartíN, 2009). Significant time, resources, and attention have been given in the past to explore how businesses can attract more customers to their online stores (Ashraf, Thongpapanl, & Spyropoulou, 2016). However, no one has focused on a DSS-based solution in such an environment. It was for this reason that owners/managers' strategies to select competitive features for their retail websites were considered for this study.

A DSS is significant for the current study related to addressing small business issues and needs because it can provide potential solutions to organisational problems (Arnott & Pervan, 2012). The DSS also can assist in improving managerial, strategic decision-making competencies (Arnott & Pervan, 2012; Power, 2016), and can help decision-makers understand underlying issues in a system (Wienclaw, 2008). Therefore, a DSS can help managers make better decisions (Pick, 2008; Wienclaw, 2008).

When managers make decisions in an electronic trading environment, in which markets change rapidly and consumer demands are ever increasingly, it is difficult to forecast the online environment and attract customers (Power, Sharda & Kulkarni, 2007). Appropriate decisions and actions must be taken in such situations, as interactions change in response to different business environmental factors, such as competition (Hall, 2008). Therefore, the employment of a DSS becomes not only desirable but essential for business decision-makers (Alalwan, 2013).

1.3 Research questions and contributions

In seeking to address the objectives as stated above, this study developed the following research questions (RQs):

1. **RQ 1:** What significant factors influence consumers to purchase products from overseas websites rather than local small business B2C websites?
2. **RQ 2:** What might be a solution that helps owners/managers in making strategic decisions about selecting competitive features on their websites to attract consumers?

3. **RQ 3:** How could a new DSS solution artefact be designed and evaluated through well-executed methods?

These RQs are addressed in different chapters of the thesis. In order to answer the RQ 1, the study was built strategies through reviewing the relevant literature. Particular focus studies were selected from the Australian context as discussed in Chapter 2. A series of theoretical or justificatory knowledge scenarios have been formulated that suggest further investigations and a solution. Accordingly, web content analysis has been carried out, which is documented in Chapter 5. Case studies have also been carried out; the results are documented in Chapter 6. These investigations were significant in identifying the small business problems and needs that formed the DSS-based solution design requirements. In responding to the RQ 2, the study further created strategies on how to build the solution. Therefore, literature reviewing in the DSS domain has been carried out to create justificatory knowledge or theory that established a DSS-based solution. In addressing the RQ 3, such as how to develop a DSS-based solution for small businesses in the B2C e-commerce environment, this study reviewed relevant literature to develop the conceptual DSS framework in the theoretical basis, which is documented in Chapter 3. The practical DSS design and development using rigorous methods are discussed and documented in Chapter 7, Chapter 8 and Chapter 9. However, the DSR was adopted as the overall research methodology, as discussed in Chapter 4, to achieve the research objectives related to the three research questions.

1.3.1 Main research contributions and major outcomes

Contributions to knowledge throughout this study were diverse, creating the bridge between theoretical and practical knowledge. As this study adopted DSR to identify small business problems, needs and a DSS-based solution, one of the significant academic contributions of the study was to build theoretical knowledge to address the research problems and study objectives for a solution. DSR is a research philosophy in which a designer answers questions relevant to human problems via the creation of innovative artefacts and by contributing new knowledge to the body of scientific evidence (Hevner & Chatterjee, 2010). Theoretical contributions of knowledge to this study were the development of theories or justificatory knowledge. This type of knowledge is known as kernel theories that inform the construction of new artefacts (Gregor & Hevner, 2013). Artefacts include construct, method, model, and instantiation (March & Smith, 1995).

Theoretical knowledge has been crafted first by reviewing the relevant and available literature on the small business problem domain in the B2C e-commerce environment and DSS field. A conceptual DSS solution framework has also been designed in the theoretical basis that builds the bridge between theoretical and practical knowledge. This DSS ultimately assists to take steps to produce a knowledge-based (KB) practical solution, known as the website features evaluation DSS (WFE-DSS).

New theories or justificatory knowledge have also been created from the empirical studies through web content analysis, and case studies. The new series of justificatory knowledge are described as the small business problems, needs, and DSS-based solution design requirements. One of the significant contributions of this study was to produce knowledge through case studies. The results inform the lack of knowledge of the majority of small business owners/managers of the business environment. The lack is mainly in respect of the external business environments and associated factors. These factors are significant in the context of their inability to make strategic decisions in the B2C e-commerce environment. Previous studies also found that many small business owners have limited knowledge about the external business environment (Bridge & O'Neill, 2009; DeLone, 1981; Fassehi, 2014). An organisation's external environment involves customers, suppliers, competitors, governments, and other social and economic forces, including technological (Fernie et al., 2015). These factors or forces impact on the organisational decision-making processes (Fernie et al., 2015; Xue, Liang, & Boulton, 2008). Ultimately, factors related to the external environment change the structure of an organisation over time. Only those which adopt changes can survive (Fernie et al., 2015).

Environmental knowledge and analysis are essential components of the strategic planning process. This type of knowledge helps decision-makers to explore new opportunities and identify risks before making a significant decision (Khan & Khalique, 2014). In his book, Toffler (1981) described the creation of wealth related to three broad waves. The third wave is the information era, in which profits are strongly connected to information and knowledge management (KM) practice. In KM practice, knowledge is defined as a justified belief that increases an entity's capacity for taking effective action (Moreno & Cavazotte, 2015). From the strategic business perspective, KM assists people to know before others do, and make profits through challenging the environment and creating more opportunities. In the broader aspect, the focus of KM is on the changing

environment in which societies, organisations, an individual live, work, learn, and adapt for surviving (Botha, Kourie, & Snyman, 2008; Malhotra, 2003). Ultimately, knowledge is a capability that includes the potential to influence action and improve decision-making (Moreno & Cavazotte, 2015). Therefore, in the online retail environment, small businesses need to analyse the environment to enhance their knowledge and adopt changes. It is these aspects upon which the current study focused.

Further, theories or justificatory knowledge have been elaborated upon through evaluating the DSS prototype by focus group studies to confirm that the prototype meets the small business needs and further improvement of the prototype. Finally, the main practical contribution of this study was the DSS-based solution (WFE-DSS) that can assist small business to identify its website problems and get recommendations for solutions in the B2C e-commerce environment. Conclusively, an owner/manager can assess or analyse its current website features against its successful competitors (data from the external business environment) using the innovative DSS. This artefact is a KB-DSS type that can convert data (website features) into information, then to knowledge, in the selection of competitive features to enable a small business website to remain competitive.

1.4 The structure of the thesis

This thesis comprises ten chapters including this introductory chapter. **Figure 1.1** provides a snapshot of the thesis structure. This section briefly introduces each chapter in terms of its focus.

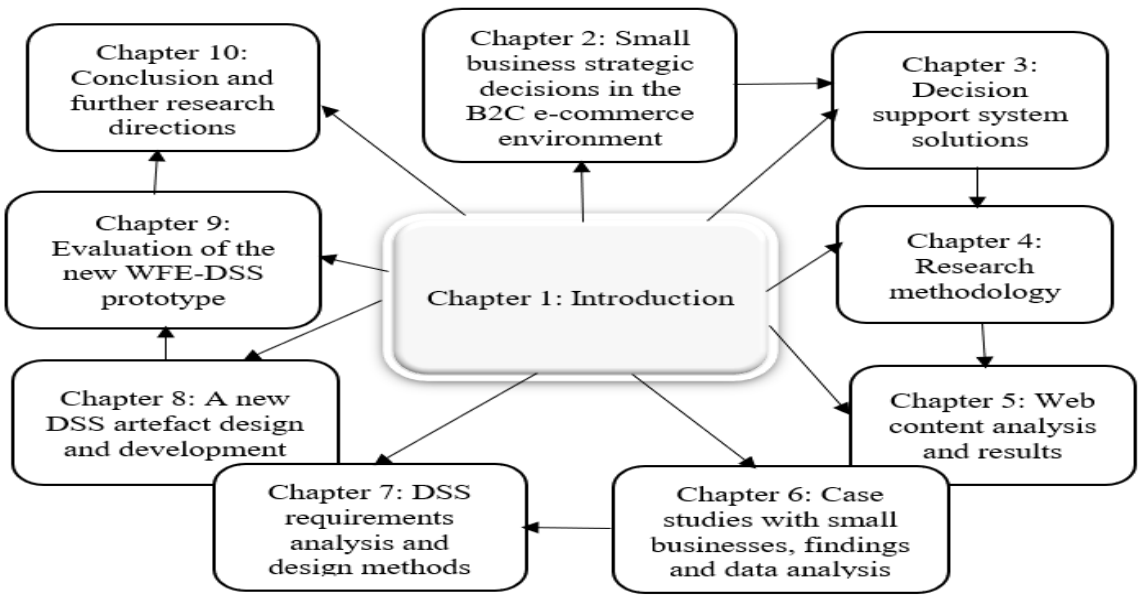


Figure 1.1: Thesis chapters

Chapter 2: Small business strategic decisions in the B2C e-commerce environment

Through an extensive review of the literature within the small business B2C e-commerce, strategic decision, and DSS domains, small business problems are identified in this chapter. The theoretical concepts are defined and concepts constructed using descriptive and justificatory knowledge for further investigations of small business issues and DSS-based solution within this type environment.

Chapter 3: Decision support system solutions

This chapter introduces the conceptual or theoretical DSS solution framework used in this study to identify small business issues, needs, and practical DSS requirements. The conceptual DSS was designed using the Mintzberg, Raisinghani and Theoret (1976) or MRT model, a strategic decision-making theoretical model developing for managers. Various definitions and benefits of DSS are discussed in this chapter to meet the specifics of small business DSS development requirements.

Chapter 4: Research methodology

This chapter first describes the research philosophy, a broad concept related to the development of knowledge for the period of the research. The research methodology is then introduced, with an overview of the overall strategy for conducting the research and the different stages of the research design. This chapter also describes the particular research approach, including the use of the DSR methodology for small business DSS design, development and evaluation perspectives. In addition, this chapter describes the data collection and analysis methods, as well as the ethical considerations of conducting the research.

Chapter 5: Web content analysis and results

This chapter describes the significant issues that exist on small business websites in the B2C e-commerce environment. This concerns the number and extent of important features on their websites, identified through web content analysis. This investigation process is one of the assessment methods for analysing the business environmental factors, which is necessary in DSS design and development. In this study, the external factor is small firms' overseas competition in the B2C e-commerce environment.

Chapter 6: Case studies with small businesses, findings and data analysis

This chapter discusses empirical results from multiple case studies with small businesses in the Australian online retail sector. The aim of the case studies was to identify small business internal issues, their strategic needs, and requirements for a new DSS development. From this data, new theoretical propositions (NTPs) or concluding concepts that are series of justificatory knowledge are constructed in relation to small business internal issues. DSS requirements could then be addressed.

Chapter 7: DSS requirements analysis and design methods

Using the MRT model in the conceptual DSS framework, this chapter provides an analysis to rationalise small business internal issues related to their strategic decision-making competencies within the B2C e-commerce environment. This analysis helped to identify the small business problems, needs and DSS requirements. The chapter also discusses issues that exist on small business websites through the analysis of website features. Various system development approaches are reviewed in this chapter for the purpose of selecting rigorous methods for both the construction and evaluation of the DSS artefact prototype. Methods for DSS design, development and evaluation include user-centred design (UCD) as user-focused and involvements, evolutionary and prototyping.

Chapter 8: A new DSS artefact design and development

This chapter describes the small business DSS design and development procedures, including the initial DSS prototype (instantiation) development. A small-scale knowledge-based DSS prototype was designed for owners/managers of small businesses following the UCDE (user-centred design environment) method. Chapter 8 also describes the small business DSS solution design and development principles and various DSS components that are vital for the small business DSS architecture. The chapter then describes the functional model of the DSS artefact with various user interfaces (UIs) for interaction between users and the system.

Chapter 9: Evaluation of the new WFE-DSS prototype

This chapter describes the DSS prototype evaluation, using rigorous methods. The system evaluation goals were to satisfy user requirements and the user experience using the system, and to identify any particular problem persists with the system. This study carried out multiple focus group sessions with end-users, such as with the involvements of owners/managers of small businesses for evaluation. Assessments of the artefact were

completed, identifying usability, efficacy, performance and overall user experience of using the artefact prototype. The results of the assessment validate to produce a user-friendly solution artefact for an owner/manager of a small business.

Chapter 10: Conclusion and further research directions

This chapter reiterates the goals of the study and key findings of the research project, while summarising the entire research. It also describes the research contributions from theoretical, methodological and practical perspectives. In addition, research strengths and limitations are described. Further research directions are discussed at the end of this chapter. The next chapter describes the small business strategic decision-making in the B2C e-commerce environment and reviews the related literature.

1.5 Chapter summary

This chapter has outlined the summary of the overall thesis and research directions. It includes a brief introduction that describes managerial roles within the changing B2C e-commerce environment in which they analyse problems, and create opportunities for their businesses. In these contexts, managers need to formulate strategies and make decisions to meet their needs in the ever-changing external business environment. However, many small business owners/managers are poor in formulating strategies and making effective decisions related to their problems and needs. This chapter also described the research background and the main research problem that have led to the creating of the research objectives. The objectives have been formulated to identify the real problems of small businesses. One significant problem experienced by small business communities in the retail sector in Australia is that many Australian consumers purchase from overseas websites instead of from their local sites. The result is the actual loss of online sales for small businesses. The objectives were also formulated to identify their needs and a DSS-based solution in the B2C e-commerce environment. In seeking to address the objectives, this study developed three research questions. This chapter also introduces the DSR methodology, and its importance for the study, that is recommended to design a technology-based solution to address the small business issues and needs. Finally, this chapter outlined the contributions of the research and concisely introduced each chapter regarding its focus and research directions. The next chapter critically reviews the relevant literature through which this study can identify the small business problems within the B2C e-commerce environment in Australia.

Chapter 2: Small Business Strategic Decisions in the B2C Ecommerce Environment

This chapter reviews the literature related to strategic decision-making for small business owners/managers in the online retail environment. Definitions of small business are discussed in this chapter, including the one selected as appropriate for the purpose of this study. Other areas discussed in this chapter are e-commerce, B2C e-commerce and its benefits for businesses, including small business. The website features commonly used in the B2C E-commerce environment, and their benefits are reviewed. DSS practices for small businesses in the B2C e-commerce environment are also discussed. Relevant theoretical concepts or justificatory knowledge are presented with the intention of identifying small business problems and how to resolve them. Factors related to research problems identified through analysis of the early studies in the literature enabled an examination of the problems faced by small businesses in the Australian B2C e-commerce context. The chapter concludes with a summary that represents a clear problem definition and their importance for target stakeholders through the relevant literature review.

2.1 Small business definition

Although the concept of "small business is quite intuitive, there is no consistently used small business definition" (Connolly, Norman & West, 2012, p.1). According to the DIISRTE (2012, p. vii) report, "no single definition of a small business will suit all the needs of government or the private sector. This is reflected in the many different ways a small business can be defined." The *Small Business Commissioner Bill* 2013 (SBCB, 2013) indicates that financial institutions in Australia use a wider range of benchmarks to define a small business, including loan size, number of employees, revenue, and balance-sheet indicators.

Table 2.1 shows some examples of the various definitions used at the Commonwealth level as developed by the Productivity Commission in Australia and cited by SBCB (2013). The Reserve Bank of Australia (RBA) defines a small business based on the loan principal, which should be under $2 million (Connolly et al., 2012). For statistical purposes, the Australian Bureau of Statistics (ABS) defines a small business as an active trading company, with an Australian Business Number (ABN) and registered for goods

and services tax (GST). In addition, a small business must have 0–19 employees. This includes micro firms, which are small businesses with 0–4 employees (DIISRTE, 2012). By contrast, the ABS defines a medium business as an active trading company with 20–199 employees, and a large business with 200 or more employees.

Table 2.1: Small business definitions used by Commonwealth agencies

Metrics	Threshold	Institution/Legislation	Purpose
Employees	< 15	Fair Work Australia (FWA)	Unfair dismissal laws
	< 20	Australian Bureau of Statistics (ABS)	Business surveys
	< 20	Reserve Bank of Australia (RBA)	Business liaison
	< 50*	Australian Securities and Investments Commission (ASIC)	Annual financial reports
	< 100	Workplace Gender Equality Act 2012	Equal opportunity laws
Legal structure	Unincorporated	Reserve Bank of Australia (RBA)	Analysis of financing conditions
Revenue	< $2 million	Australian Taxation Office (ATO)	Taxation laws
	< $3 million	Privacy Act 1988	Privacy laws
Assets	< $50 million	Australian Prudential Regulation Authority (APRA)	Prudential supervision
Individual loan size	< $1 million	Australian Prudential Regulation Authority (APRA)	Prudential supervision
	< $2 million	Reserve Bank of Australia (RBA)	Analysis of financing conditions

Source: SBCB 2013, p. 22

According to the DIISRTE (2012), there were over two million active trading small businesses in Australia as at June 2011. Non-employing businesses numbered the most. These were owner-operated and accounted for 61.2 percent of all small businesses; micro businesses accounted for 23.9 percent. The remaining small businesses were accounted for 10.8 percent.

The most common ways of defining an Australian small business are either by annual turnover or the number of employees, or a combination of the two (Burgess et al., 2009; DIISRTE, 2012; Connolly et al., 2012). Some researchers have adopted a number of employees' definition for their study based on 0-19 employees in the Australian small business research domain (e.g., Parker & Castleman, 2009). Although, Burgess et al. (2009) adopted the small business definition based on the number of employees, such as 1-20 employees and the employee should be "regular." According to these researchers, a regular employee being someone who works more than 15 hours' weekly basis with the business. However, this definition is not appropriate for this current study as the majority

of small businesses are owner-operated (SBCB, 2013; DIISRTE, 2012). Based on the discussions above, for this study, the researcher adopted the definition of small business based on companies with 0-19 employees (DIISRTE, 2012).

2.2 Managerial characteristics and shortcomings of small businesses

Managers are responsible for addressing changing demands within the business environment and making strategic decisions for efficient business operations (Baizyldayeva et al., 2013; Eisenhardt, 1989; Miah et al., 2014). As a rule, decision-makers work in challenging and dynamic environments and are overloaded with information (Baizyldayeva et al., 2013). They also investigate problems and create opportunities in these environments to suit their business requirements (Hall, 2008) and support business goals and actions (D'Amboise & Muldowney, 1988).

Although owners/managers of small businesses are key decision-makers (Burgess et al., 2009; Parker & Castleman, 2009), their goals are often unclear, inadequately defined, and short-term (Sexton & Van Auken, 1985). Also, mistakes are made repeatedly by small firms (Sharda, Delen & Efraim, 2015) with no forward planning. They make strategic decisions based more on own thinking and lack decision-making competence when looking to adopt advanced technology (Mazzarol, 2004). Only a few small businesses apply strategic planning in their operational development (Sexton & Van Auken, 1985).

While many small business owners/managers do have business strategies, they are not usually related to an effective web presence (Fisher, Craig & Bentley, 2007), particularly in terms of what website features they require to meet those strategies. For a provisional web presence, such features might include product and service information that promotes their business, a catalogue with price lists, frequently asked questions (FAQs), internal site links that add value for a visitor to the site, and industry-specific information. For a transactional web presence, features might include online ordering, processing and payment activities to sell products or services. However, small businesses are typically traditional in the use of IT, using it for various purposes but not related to effective web presence (Burgess et al., 2009).

Others have indicated the following small business shortcomings:

- Lack of resources and expertise (Burgess & Schauder, 2003; SBCB, 2013; Tatnall, Burgess & Singh, 2004).
- Inadequate skills for using Information and Communication Technology (ICT) (Burgess et al., 2009).
- A tendency to only sell their products locally (SBCB, 2013; SELC, 2013; Sensis, 2005).

Each of these areas are discussed as follows.

2.2.1 Lack of resources and expertise

Many large businesses have extensive resources with specialised management teams and employees who can complete specific tasks. However, small businesses run by an individual or with a small group of people, may not have the same level of competence. Owners/managers need to deal directly with multiple issues, including the immediate pressures associated with daily business operations, cash flow management and compliance with various Australian Commonwealth, state or territory laws. But many owners/managers lack the expertise necessary to deal with all the issues that may arise (SBCB, 2013). Unlike large businesses, small businesses are operated by fewer individuals and an owner of the firm. Generally, they have a less sophisticated management structure (SBCB, 2013).

Small businesses are also constrained by a lack of resources, both financial and human, and no strategic, long-term focus (Tatnall et al., 2004). Moreover, many small businesses do not have the time or resources to address potential changes in their existing systems or business environment. Many of them lack the technical expertise and proper planning practices to help them take advantage of opportunities (Burgess & Schauder, 2003).

2.2.2 ICT skills and use

ICT includes any hardware, software, or communications technology that is implemented by an organisation to support the business process, and enable management decisions (Beynon-Davies, 2013). ICT can help an organisation speed up the dissemination of information, integrate networking between firms, enable closer links between businesses and customers, reduce geographic boundaries, and increase efficiency in communication (Spiezia, 2011). ICT can also be used to support data gathering and processing for making business decisions (Beynon-Davies, 2013).

Although ICT provides significant benefits, Australian small businesses have been slow to adopt ICT compared with large companies, particularly in the use of technology to an effective web presence (Burgess et al., 2009). Also, many owners/managers of small businesses are poor planners, particularly in using DSSs that are much more user-friendly. DSS use remains an issue for small business operations (Magee, 2007). Small businesses have limited resources for IT development, as well as using commercially developed DSS software (Duan & Xu, 2005; Khosrow-Pour, 2008).

2.2.3 Small business tendencies to only sell products locally

Many small businesses prefer to sell their products to local customers and therefore do not need an online presence. For example, an early study found that 61 percent of small businesses in Australia mainly sell to local customers (Sensis, 2005). Also, a survey carried out by the Senate Economic Legislation Committee (SELC, 2013) in Australia indicated that the majority of small businesses operate in one location, sell goods or services to nearby customers, and have poor market control. Similarly, the SBCB (2013) identified that small businesses prefer to sell their products only to local customers and set up their businesses in one location.

Despite the small business shortcomings discussed above however, their contributions to the national economy are significant.

2.3 Small businesses in Australia and their contributions

Most people know the importance of small businesses, which represent the majority (approximately 90 percent) of all businesses. More importantly, small businesses support around half of the private workforce globally (Burgess et al., 2009). Small businesses also play significant roles in the Australian national economy, accounting for almost half of the employment in the private non-financial sector (Connolly et al., 2012). According to the Office of the Australian Small Business Commissioner (ASBC, 2013), in 2013 there were over two million small businesses in Australia, comprising 95.9 percent of all businesses. These small businesses employed approximately 4.8 million people, representing 45.7 percent of the private sector workforce. The small business contribution represents 34 percent of the Australian national economy, compared with a 23 percent contribution by medium businesses and 43 percent by large companies (DIISRTE, 2012).

Given this significant small business contribution, it is vital to develop an innovative technological solution to sustain small business communities in Australia in the B2C e-commerce competitive environment.

2.4 E-commerce

E-commerce is the commonly used term for electronic commerce (Mohapatra, 2012), which involves trade-related activities accelerating by ICT, mostly using the Internet (Haag & Cummings, 2009). E-commerce is also a subset of e-business (electronic business) (Khosla, Damiani & Grosky, 2003; Laudon & Laudon, 2007). E-business involves not only buying and selling of goods and services over the Internet but also servicing customers, collaborating with business partners and conducting electronic transactions (Baltzan & Phillips, 2009; Turban & Volonino, 2010). Sometimes these terms are used interchangeably (Castleman 2004; Chugh & Gupta, 2010).

Researchers have used many definitions of e-commerce based on different perspectives. Some of these are presented in **Table 2.2.**

Table 2.2: Various definitions of e-commerce

Sources	Definition of e-commerce
Baltzan & Phillips, 2009; Mohapatra, 2012	E-commerce involves in a wide range of online business activities associated with buying and selling goods and services over the Internet.
Australian Communication and Media Authority (ACMA), 2010	The ACMA used the Organisation for Economic Co-operation and Development (OECD) definition: "an internet transaction is the sale or purchase of goods or services, whether between businesses, households, individuals, governments, and other public or private organizations, conducted over the internet, but the payment and ultimate delivery of the good or service may be conducted on or off-line, that is, the commitment to purchase is made over the internet" ACMA, 2010, p. 2).
Kalakota & Whinston, 1997	These researchers defined e-commerce from a range of perspectives, including: • A communication perspective: E-commerce involves delivery of information, products or services, and electronic payment. • A business process perspective: E-commerce enables the automation of business transactions and workflows with the application of technology. • A service view perspective: E-commerce enables cost cutting while simultaneously increasing the speed of delivering quality services. • An online perspective: E-commerce involves the buying and selling of products and the creation of information online.
Chaffey & Wood, 2005	E-commerce is not only limited to the buying and selling of products but also applies to pre-sale and post-sale activities across the supply chain.

Sellitto, Wenn & Burgess, 2003	E-commerce is a growing part of modern consumer and business interactions, and Australian businesses are being encouraged, by both state and Federal governments to embrace this new model of doing business.
Stair & Reynolds, 2010	E-commerce involves any business transaction executed electronically between companies (business-to-business, or B2B), companies and consumers (business-to-consumers, or B2C), consumers and other consumers (consumer-to-consumer, or C2C), business and the public sector, and consumers and the public sector.

2.4.1 Types of e-commerce

According to the World Trade Organisation (WTO, 2013), in 2013, various types of business transactions were carried out in the online environment for buying and selling goods and services, and distinct classes of e-commerce had grown based on business transactions. In business-to-business (B2B) e-commerce, companies sell their products and services to customers in the electronic marketplace, primarily to other businesses. For example, when the Gates Rubber Company sells belts, hoses, and other rubber and synthetic products to General Motors or other manufacturers that need those parts, this is a B2B e-commerce transaction. When e-commerce involves any deal online between businesses and consumers, this is known as B2C e-commerce (Haag & Cummings, 2009). The significant differences between B2B and B2C e-commerce are shown in **Table 2.3.**

Table 2.3: Major differences between B2B and B2C e-commerce

Activities	**B2C**	**B2B**
Value chain	Customer chain	Supply chain
Interactions	Business and consumers	Business and business
Direction of transactions	Both: Consumers - businesses	Companies - suppliers
Nature of goods/services and prices	Low volume and standard prices	Customised/high prices
Form of payment	Cash/credit card	Credit/repeat

Source: Beynon-Davies 2013, p. 239

The next section provides a detailed description of B2C e-commerce because this study focuses on small businesses in the online retail sector or the B2C e-commerce environment in Australia.

2.4.2 B2C e-commerce

B2C e-commerce is distinct from B2B e-commerce. It is more visible as it involves direct interaction with millions of consumers on the Web. Many consumers search and evaluate products and services through B2C e-commerce websites until they find a suitable one to

make a purchase. The B2C e-commerce model stimulated the early growth of e-commerce (Haag & Cummings, 2009). Moreover, B2C e-commerce is one of the primary forms of e-commerce, with online transactions made between businesses and individual consumers (Mitchell, 2000; Turban, Leidner, McLean & Wetherbe, 2008).

The demand for B2C e-commerce continues to grow as many people prefer to shop online (Poon & Lau, 2006). In the online trading environment, companies typically sell their products or services to consumers through online catalogues utilising shopping cart software (WTO, 2013) due to the innovation of the B2C e-commerce and its recent development (Kwee-Fah, 2016). The role of the shopping cart software is to generate web pages or online catalogues to present to shoppers. The online catalogue shows lists of items that customers can select for purchasing (Himmel, Rodriguez, Smith & Spinac, 2002; Saarinen, Bartake, Armstrong, Millington & Roubal, 2012). A shopping cart also assists customers in tracking selected items, with options to add or remove items from the cart. The shopping cart provides all information about the products, including price, product number, billing, shipping, and payment method to confirm the order (Stair & Reynolds, 2010). In recent years, many businesses have begun to use electronic shopping carts to sell their products on B2C websites (Saarinen et al., 2012; Stair & Reynolds, 2010).

2.4.3 The benefits of B2C e-commerce

This section discusses the various benefits of B2C e-commerce, including benefits to small businesses.

2.4.3.1 Early e-commerce benefits

From the outset of the e-commerce revolution, researchers recognised this IT enabled medium as a new way of doing business (Mitchell, 2000). Therefore, in the early 2000s, many companies began to receive benefits from e-commerce through trade-related activities such as sales and distribution between businesses and consumers (Corbitt, Thanasankit & Yi, 2003; Mitchell, 2000). E-commerce also began to make use of computer networks in new and more efficient ways, involving all electronic communication used within a company (Mitchell, 2000).

2.4.3.2 An online meeting place for buyers and sellers

One of the significant benefits offered by B2C e-commerce is the provision of online meeting places or environments for buyers and sellers, with information and communication channels created to complete the buying and selling processes on the Internet (Turban, Lee, King, Liang & Turban, 2009).

2.4.3.3 A convenient platform for buyers and sellers

E-commerce is one of the most convenient platforms for both buyers and sellers, particularly B2C e-commerce, which offers tremendous assistance for businesses to sell their products, services, and information on the Web. Buyers benefit from convenient access to seller websites, and sellers can sell their products at anytime and anywhere around the world (AL-Qaed, 2008).

2.4.3.4 Other potential benefits of B2C e-commerce

According to the WTO (2013), B2C e-commerce offers potential benefits to companies, including:

- Assists companies to access global markets and facilitate global trading. Helps to reduce costs for exchanging information and conducting transactions.
- Supports reduced infrastructure costs for retailers, such as the cost of vast storage spaces for tangible products that are required for running a retail business.
- Provides well-designed web storefronts to reach customers.

Consequently, e-commerce allows companies to achieve higher profit margins as the cost of running a business is reduced. Other success factors and benefits of e-commerce are outlined in **Table 2.4.**

Table 2.4: Other success factors and benefits of e-commerce

E-commerce success factors	**E-commerce benefits**
Selection and value	Attractive product selection, competitive prices, satisfaction guarantees and customer support after the sale.
Performance and service	Fast and easy navigation, shopping, purchasing and prompt shipping and delivery.
Look and feel	Attractive web storefront, website shopping areas, multimedia product catalogue pages, and shopping features.
Advertising and incentives	Targeted web page advertising and email promotions, discounts, and special offers, including advertising at affiliate sites.

Personal attention	Personal web pages, personalised product recommendations, web advertising and email notices, and interactive support (online chat, Skype and so forth) for all customers.
Community relationships	Virtual communities of customers, suppliers, company representatives, and others via news groups and chat rooms and linked to other related sites.
Security and reliability	Security of customer information and website transactions, trustworthy product information, and reliable order fulfillment.
Great customer communication	Easy to find contact information, online order status, and product support specialists.

Source: Marakas & O'Brien, 2014, p. 383

2.4.3.5 E-commerce benefits for small businesses

E-commerce offers countless benefits to many businesses, allowing companies of any size, situated anywhere, to conduct business with anyone (O'Brien & Marakas, 2009). Hence, e-commerce can provide many benefits to small and medium-sized enterprises (SMEs), creating relatively efficient and effective channels for exchanging information, advertising, marketing, completing transactions, and, in some cases, facilitating or supporting the distribution of goods and services directly to trading partners and customers (Marshall & McKay, 2007). In the long run, these benefits create close relationships between companies and their customers (Dubelaar et al., 2005). Moreover, B2C e-commerce attracts not only local consumers, but also draws the attention of diversified customer groups (Gibbs, Kraemer & Dedrick, 2003; Kraemer, Gibbs & Dedrick, 2005). E-commerce also allows small businesses to compete against big companies (Burgess & Schauder, 2003).

2.5 Small business problems in the B2C e-commerce environment

Although e-commerce provides wide-ranging benefits to companies, including small businesses, when interacting with consumers in the B2C e-commerce environment (Campbell, Wells & Valacich, 2009), many companies in the B2C e-commerce sector have failed to attract the local online consumer market (Irvine et al., 2011). As a result, many Australian consumers purchase products from overseas websites (Deloitte, 2013; Frost & Sullivan, 2012; Irvine et al. 2011; Khatun, 2011; Oster & Thorn, 2012; PwC, 2012; Sensis, 2013; Sivasailam, 2012; Todd, 2012). This has resulted in the huge loss of potential online domestic sales for many Australian businesses in the retail sector (Ewing, 2011; Todd, 2012). Given there are over two million small businesses in Australia, comprising 95.9 percent of all businesses (DIISRTE, 2012), this equates to substantial losses.

Moreover, Irvine et al. (2011) detected that the retail sector in Australia is a slower adopter of e-commerce than other sectors. Pease and Rowe (2003) also identified that many SMEs in regional areas of Australia fall behind metropolitan areas in the adoption of e-commerce. Moreover, the failure rate is higher in the small business B2C sector than the other types of small businesses (DIISRTE, 2012). The present study is concerned with small business problems in the Australian B2C online sector and potential technology-based solutions.

As mentioned previously, an earlier study identified some of the factors associated with the attractions of purchasing products from overseas websites (e.g., affordable prices, better products with a more extensive range, and quality services). However, these factors are not prevalent in the Australian B2C e-commerce environment according to the ACMA (2011) and IBIS World (2012). Also, overseas websites provide free or lower delivery costs (Forrest & Sullivan, 2012; PwC, 2012). Moreover, a high Australian dollar value (Moodie, 2012), and GST exemption for goods under AU$1,000 on overseas purchases (Irvine et al., 2011), have made international online purchases very attractive.

The intention of this research was to examine these identified problems and any other problems that impact on small businesses in the B2C environment in order to develop potential solutions.

Other factors that attract consumer online purchases are discussed in the next section.

2.5.1 Factors that influence consumer online purchasing

Table 2.5 presents a summary of the factors that influence consumer shopping online. Few of the influencing factors relate specifically to website features, others do not. For the purposes of this present study, buying factors have been categorised this way because website features increase the visibility of company products and services (Miah, 2004).

Table 2.5: Some factors that influence consumers in shopping online

Online buying factors		**Sources**
Website features	*Non-website features*	
	Convenience	Abdul-Muhmin, 2010; Ewing 2011; Irvine et al., 2011
	Affordable and lower prices	Abdul-Muhmin, 2010; ACMA, 2011; Ewing, 2011; IBIS World, 2012b; Irvine et al., 2011

	Wide range of products	Abdul-Muhmin, 2010; ACMA, 2011; Ewing, 2011; IBIS World, 2012b; Irvine et al., 2011; Long, 2016
	Better products and quality services	Abdul-Muhmin ,2010; ACMA, 2011; IBIS World, 2012b; Liu, Xiao, Lim, & Tan, 2017; Long, 2016
	Free or lower delivery cost	Forrest & Sullivan, 2012; PwC, 2012
	Timely delivery of products	Abdul-Muhmin, 2010; Liu et al., 2017
	Security and privacy	Abdul-Muhmin, 2010; Hartono, Holsapple, Kim, Na & Simpson, 2014; Jaejoo, Grover & Purvis, 2012; Kim, Ferrin & Rao, 2008; Liu et al, 2017; Long, 2016; Ranganathan & Ganapathy, 2002
Information quality on the websites		Jaejoo et al., 2012; Kim et al., 2008; Long, 2016; Ranganathan & Ganapathy, 2002
Visual design and textual presentations of products on websites		Kim & Lennon, 2008; Long, 2016
	Business reputation	Kim et al., 2008; Long, 2016

As shown in this table, the majority of previous studies focused on identifying different factors related to consumer buying behaviour. For instance, Abdul-Muhmin (2010) carried out a survey of 460 consumers across Saudi Arabia, finding that convenience, better prices, range of products, quality products and services, secure payment methods, and timely delivery of products were the main factors attracting consumers in shopping online. Also, a survey carried out by Jaejoo et al. (2012) with 309 customers in the south-eastern region of the United States of America (USA) found that information quality and trustworthiness motivated purchasing online. Similarly, Kim and Lennon (2008) found that visual and textual presentations of products on websites influenced consumers in buying online. Recent studies also found that wide ranges of products, business and brand reputation (Long, 2016), security and trust, and quality services (Liu et al., 2017; Long, 2016) motivate consumers' online purchase, where Long's (2016) study was carried out in Australia.

However, the majority of identified factors were not related to website features. Only a few studies identified information quality on a website as a factor attracting consumers to shop online (for example, Jaejoo et al., 2012; Kim et al., 2008; Long 2016; Ranganathan & Ganapathy, 2002). While information quality on a website can be considered a website feature, previous studies were related to consumer buying behaviour

concept and in the area of marketing discipline. However, the present study is concerned with improving managerial, strategic decisions and IT support requirements within the small business B2C e-commerce environment. Therefore, owners/managers would be provided with better options for improving their decision-making competencies related to select website features to assist them in attracting consumers.

Some studies have recognised that the small business owner/manager is the most valuable company asset and their decisions are the most influential in shaping the performance of an organisation (Hansen & Hamilton, 2011; Mazzarol et al., 2009).

Through an extensive review of the related literature on small business in the B2C e-commerce field, this current study identified the research problems and generated associated research questions. The next stage of the research design is to develop theories (Myers, 2013).

2.6 Theoretical justificatory knowledge

When a study is primarily aimed at DSR in information systems fields, the development of theory or knowledge is the contribution of DSR (Gregor & Hevner, 2013). As this study adopted DSR to identify small business problems, needs and DSS-based solution, one of the significant academic contributions of this study is to build theoretical knowledge to address the research issues and objectives. In DSR, this type of knowledge is called justificatory knowledge or kernel theory, which informs the construction of a new artefact. The exact setting of the justificatory theory or knowledge requires some judgement to define the exact situation to construct such knowledge (Gregor & Hevner, 2013). Justificatory knowledge is "the underlying knowledge or theory from the natural or social or design sciences that gives a basis and explanation for the design (kernel theories)" (Gregor & Jones, 2007, p. 322).

This section provides a critical review of the relevant literature in the context of small business website features in the B2C e-commerce environment in Australia and creates the justificatory knowledge that informed the research directions.

2.6.1 Benefits of websites and their features

The website is the world marketplace where visitors search for products and services. Accessible websites create many benefits for businesses. Accordingly, a website interface

provides accessibility features for users to access, find, see and use the information from websites (Miah, 2004). An effective website that is easy to use can help a company achieve its goals. A website also creates an attractive and interactive online presence of an organisation to meet the needs of its visitors (Stair & Reynolds, 2010).

In B2C e-commerce, the website is the essential channel of communication with potential customers. Consequently, e-commerce website features determine the site quality, including accessibility, speed, navigability, and contents. Companies need to manage the technology and information on their websites systematically in order to achieve online sales success (HernaNdez, JimeNez & MartíN, 2009). Therefore, different categories of website features may assist small businesses in a variety of ways, by improving business efficiencies, adding value to products and services and helping with the promotion of the firm. Website features can thus be directly related to business benefits and matched to the overall business strategy and aims (Burgess et al., 2009). The next section describes categories of features for a B2C e-commerce website and their requirements, as suggested by researchers.

2.6.2 Website feature categories and requirements in the B2C e-commerce environment

Some authors have recommended various categories of features that need to be available on a business website when interacting with customers in the e-commerce environment. For example, Gary (2017) recommended fifteen features and some of them are:

- **Ease of use:** Help customers to provide necessary information to make a sell. Therefore, suggested to consider customer reviews and frequently asked questions (FAQ) information to help them purchase quickly.
- **Photos and videos:** Provide products introductions in different angles and environments that people are used.
- **Mobile-friendly:** A website is required to have a mobile-friendly because one in three online purchases is completed on a smartphone.
- **User-generated reviews:** E-commerce sites can use the review platforms (e.g., Yelp, Foursquare, and Facebook) for reviewing their products and services. This is an option for registering any complaints or negative and positive reviews about the products. Therefore, the company could improve their products and services.

- **Special offer:** E-commerce sites need to use special offers in their normal marketing practices via email, social websites, text, etc. Therefore, shoppers perceive, they are offered a special deal from companies and motivate to buy more and spend time for more searching.
- **Find-in-store**: Some e-commerce sites have physical stores. Thus, they need to have this feature (e.g., general and contact information about the business) because some customers do not wait for an item to ship.

Burgess et al. (2009) recommended small business website features within the following five categories:

- Features that tell a customer about contacting the business. These features include the business address, telephone number, and email address. These are classified as information and communication website features.
- Features that tell a customer about the products and services of a business (for instance, online catalogues). These are classified as information-based web features.
- Features that help to provide added value for goods and services, such as instructions on how to use products effectively.
- Features that assist in building an online community of customers (for instance, bulletin boards, blogs or wikis). These are classified as communication-based web features.
- Features that allow customers to pay for the order and sometimes even receive goods online (for instance, music downloads). These are classified as transaction and distribution related web features.

In the B2C e-commerce environment, a business obligation is to develop an attractive website to sell products and services to potential customers. Thus, many companies offer e-commerce sites, providing virtual web fronts (or virtual shop fronts) and multimedia catalogues, order processing, secure payment systems, and online customer support for making their websites interactive (Marakas & O'Brien, 2014).

In the virtual environment, a business can use four virtual spaces when engaging with customers online. These are classified as information, communication, distribution, and transaction (ICDT) based spaces (Angehrn, 1997). The ICDT model is also known as the

web-based platform for B2B or B2C e-commerce strategy development (Raisinghani, Meade & Schkade, 2007). Accordingly, in the B2C e-commerce domain, a small business should include the following ICDT types of features on its website:

- **Features for business information:** Features should ensure visibility and access to product and service information, such as marketing, advertising and pricing, as well as company name, maps, telephone number and email address.
- **Features for business communication:** Features should enable the development, monitoring and influencing of business-related communication. Therefore, features should include relationship building, lobbying, email, call centre information, feedback, and log-in, through the creation of virtual communities with potential and existing customers.
- **Features for products' distribution:** Features should include functional requirements regarding the web-based delivery of goods and services, comprising digital goods and content, software and online physical product tracking information.
- **Features for business transaction:** Features should include serviceable contents about the initiation and execution of transactions, including order and payment methods (Angehrn, 1997).

2.6.3 Small business website features within the B2C e-commerce environment

Traditionally, e-commerce systems have selected website features including interactive marketing, ordering, payment and customer support processing options, with a real-time catalogue (Baltzan & Phillips, 2009). The right types of website features are essential for making a small business website interactive and engaging for potential consumers within the B2C e-commerce dynamic world. However, many small business B2C website features are very different from those used on the websites of medium and large firms. For example, more than half of Australian small businesses have used their websites only for promoting their business (Fisher et al., 2007; Sensis, 2014). Also, many small business owners view their websites only as an advertising medium (Fisher et al., 2007; Deloitte, 2013). Domestic online shopping options have been limited, due to slow investment in the Australian B2C e-commerce sector (Irvine et al., 2011). From the B2C e-commerce perspective, a website must be attractive, with adequate features so consumers can

choose, perform, and enjoy their shopping experience (Abdallah & Jaleel, 2015; Bilgihan & Bujisic, 2015).

A study carried out by Sensis (2014) indicated that although 95 percent of SMEs in Australia had an online presence, only 19 percent had a digital strategy, including using the Internet, their company websites, social media and mobile components. Similarly, a study was carried out by Deloitte Access Economics (Deloitte, 2013), which identified that:

- Only 16 percent of small businesses make use of all available digital technologies, including search engine optimisation and search engine e-marketing.
- Twenty-five percent of small businesses use their websites for advertising.
- Twenty-four percent of small businesses use social media for marketing.

Moreover, in a report provided by the ABS (2015), only seven percent of small businesses had automated links between systems used to receive orders and other business processes.

Based on a review of previous studies, the following justificatory knowledge is constructed for achieving the research objectives:

First justificatory knowledge: *There is a link between the relevant features that should be available on small business B2C websites and the factors that influence consumer online purchasing from overseas competitor websites.*

Although a few studies have been carried out in the Australian B2C e-commerce sector (Chang & Samuel, 2004; Irvine et al., 2011; Islam & Miah, 2012; Michael, 2006), these studies did not focus on factors related to website features. For example, Chang and Samuel's (2004) study considered demographic factors (e.g., gender, age, income, and location), which were associated with different patterns of online purchasing frequency and spending. Similarly, Michael (2006) identified a series of factors, including convenience and time-savings. Other factors that encouraged Australian consumers to shop online included affordable prices, and ease of product and price comparisons. None of these buying factors were related to website features.

Moreover, Islam and Miah's (2012) study was centred on emotional, engaging and motivational factors that influenced consumers in purchasing online. Their study found

that enjoyment was by far the dominant predictor of attitude towards online shopping. Enjoyment is also a non-website feature. The goal of Islam and Miah's study was to determine the relationship between online consumers' shopping motivation and attitude towards shopping. A recent study also carried out in Australia by Long (2016) found that visual website design, e-service quality, brand image, product variety range, and country-of-origin motivate Australian consumers' online shopping. However, higher levels of perceived risk produce negative attitudes towards online shopping. Conclusively, none of these buying factors were related to website features and their significance.

However, unlike the previous studies, this current study aimed to establish the relationships between the factors that influence consumer purchasing from overseas websites and small business owner/manager strategic decisions. Such decisions relate to the strategic selection of competitive features on their websites in the B2C e-commerce environment.

Some studies in the Australian small business domain have highlighted that only a few small firms apply strategic planning (Blackburn, Hart & Wainwright, 2013; Mazzarol et al., 2009). When small businesses do have business strategies, they are often unrelated to their web presence (Fisher et al., 2007), particularly when it comes to setting up appropriate website features (Burgess et al., 2009). Based on a review of previous studies, the following justificatory knowledge is constructed:

Second justificatory knowledge: *There is a link between the level of relevant features available on small business B2C websites that influence consumer purchasing from overseas websites, and owners/managers' strategic decision-making in the selection of related features that should be on their websites.*

While decision-making can be challenging for all managers, it is particularly difficult for small firms in the contemporary business environment, with its many risks and opportunities (Power, 2010). Managers must analyse problems and create opportunities within this context and make decisions accordingly (Hall, 2008). Moreover, the business environment is getting more competitive as global products and services are produced and delivered to customers in a technologically sophisticated electronic trading environment. Markets change rapidly, and consumer demands are ever increasing (Power, Sharda & Kulkarni, 2007). As discussed earlier, Australian small business

communities in the retail sector have been encountering challenges in this environment, with many global products and services delivered to Australian consumers via overseas websites.

Decision-makers need to make appropriate decisions and take strategic action in such a fluctuating environment (Hall, 2008). The employment of a DSS is essential for business managers (Alalwan, 2013). The next section describes the DSS in the small business B2C e-commerce environment.

2.6.4 DSS for a small business in the B2C e-commerce environment

Typically, a DSS is viewed as a primary decision-making tool for a large business (Magee, 2007). However, some researchers have recognised that the DSS is also a potentially useful tool for small firms (Burgess & Schauder, 2003; Duan & Xu, 2005; Kerr, 2004; Power, 2010; Raymond & Bergeron, 1992).

Over the years, many DSS-based solutions have been introduced to support managers in their business decision-making (Arnott & Pervan, 2008; Clark, Jones & Armstrong, 2007; Miah et al., 2014). At the enterprise level, common applications of a DSS include cash flow analysis, the improvement of product performance, and analysis of the allocation of resources for making business decisions (Magee, 2007). Decision support in small business has also focused on building applications in Microsoft (MS) Access and Excel for tracking sales, forecasting, budgeting and analysing cash flow (Power, 2010).

It has been difficult to find any studies that have examined the use of DSS-based solutions to assist small business decision-makers in the strategic selection of competitive features on their B2C websites. A few studies in the DSS research domain have focused on technological improvements, particularly for supporting the online business process in the B2C e-commerce environment (Al-Qaed, 2008; Jiyong & Pu, 2006). However, these analysed DSSs supported consumers in making purchase decisions. For instance, Jiyong and Pu's (2006) study focused on how to improve existing consumer decision support systems (CDSSs) to help online consumers make purchase decisions. In his study, Al-Qaed (2008) built a DSS-based solution in the B2C e-commerce environment. This study is designed to help web designers to support consumers in making decisions about information displays, searching strategies and appropriate advice. It is not focused on managerial decision-making requirements, like this study.

While Oduoza and Xiongn (2009) built a DSS for SMEs, their study was aimed at the manufacturing sector in a make-to-order environment, focused on quality and the speed of product delivery. In addition, although Burgess and Schauder (2003) produced a DSS tool for small business in the B2C sector in Australia, the DSS proposed was focused on identifying the cost of designing a website for a small business.

Based on the review above and the recognition that no research has yet been carried out to build a DSS-based solution for the selection of competitive features on small business B2C websites, the following justificatory knowledge is constructed:

Third justificatory knowledge: *There is a great need to develop a DSS-based solution that can support owners/managers of small businesses in making strategic decisions to select relevant features on their websites in the B2C e-commerce environment.*

A series of justificatory knowledge were crafted based on an extensive review of the relevant literature and available research in the B2C e-commerce field, DSS in the small business domain, and issues related to small business website features within the B2C e-commerce environment. These theories have addressed the research questions for further investigations related to the context of the research problem and DSS-based solution. It can be concluded that discussions and rationalisations have been made adequately in this chapter of the study to construct three justificatory knowledge or kernel theories, which define the theoretical basis of the small business problems and a solution.

2.7 Chapter summary

This chapter has described the research problem that emerged from an extensive review of the relevant literature within the B2C e-commerce, small business and DSS domains. This chapter also outlined the theoretical basis of the solution. The relationship between owners/managers in making strategic decisions about the selection of competitive features on their websites and relevant features that influence consumer purchases from overseas websites, has been outlined by constructing theoretical concepts. Most importantly, issues that may exist on Australian small business websites in the B2C e-commerce environment have been described and constructed as theoretical concepts or justificatory knowledge following kernel theory. Therefore, issues may be connected to the research problem raised. Concepts of justificatory knowledge will assist in identifying real-life problems and provided support for a viable IS design-based solution. The next chapter discusses the conceptual DSS solution framework.

Chapter 3: Decision Support System Solutions

This chapter introduces theoretical discussions related to DSS solutions which is a central topic area of the study. This study aims to produce a viable solution to address the small business decision support problem. Various DSS definitions have been proposed for improving strategic decision-making practices for small businesses. DSSs have a proven track record of benefiting organisations and users. The discussion in this chapter helps establish a new conceptual grounding for designing a DSS solution framework. The chapter is organised into five sections. Section 3.1 presents DSS definitions, and Section 3.2 outlines the DSS benefits for business. Section 3.3 discusses the DSS scope in IS research and practice, and Section 3.4 describes the theories of managerial problem-solving and decision-making processes, building the conceptual DSS framework from a theoretical perspective. Finally, Section 3.5 summarises the chapter.

3.1 DSS definitions

A management support system (MSS) is a broad class of system with the fundamental purpose of supporting managerial action and decision-making (Clark et al., 2007). Different forms of MSS have been designed and developed in the IS research field to support the managerial decision, and one of the support systems is known as the DSS (Clark et al., 2007; Eom, 2007). Many researchers in the IS domain have defined the DSS. These are outlined in **Table 3.1** for the purpose of improving decision-making practices for small business strategic decision support needs.

Table 3.1: DSS definitions

Sources	DSS definitions and functions
Gorry & Morton, 1971	A DSS is an interactive computer-based system that helps decision-makers used data and decision models to solve unstructured problems.
Turban, 1995	A DSS is an interactive, flexible, and adaptable computer-based information system specially developed for supporting the solution to unstructured management problems. It utilises data, provides an easy-to-use interface, and allows decision-makers to use their insights.
Power & Kaparthi, 2002	A DSS is a specific class of computerised IS that supports decision-making activities.
Bandopadhyay & Kumar, 2007	DSSs have been considered and analysed from the viewpoints of: • Computer-based applications. • As a support mechanism for implementing decision models. • Input handling and processing mechanisms applicable primarily in the context of structured and semi-structured inputs.

	• Human-computer interaction for ease-of-use.
Stair & Reynolds, 2010	A DSS is an organised collection of people, procedures, software, databases, and devices used to support problem-specific decision-making.
Arnott & Pervan, 2008; Stair & Reynolds 2012	A DSS is a system that develops interactive IT-based IS to assist decision-makers by using data, models, software tools, visualisation, and the user interface to resolve structured, semi-structured or unstructured business problems, and to support managers in business decision-making.
Arnott & Pervan, 2012	A DSS is the area of the IS discipline focused on systems that support and improve managerial decision-making.
Power, 2014	A DSS is an interactive computer-based system intended to help decision-makers using communication technologies, data, documents, knowledge, and models to identify and resolve problems, complete decision process tasks, and make decisions.
Marakas & O'Brien, 2014	"DSSs are computer-based information systems that provide interactive information support to managers and business professionals during the decision-making process" (Marakas & O'Brien, 2014, p. 420).
Holsapple, 2008	A DSS is a computer-based system that represents and processes knowledge in ways that allow decision-making to be more productive, agile, innovative, and reputable.

3.2 DSS benefits to business

The most tangible benefit of a DSS is its ability to assist users in making better decisions. The outcomes will be reduced costs, more efficient use of resources, increased revenue, reduced risks, improved customer service, and many other benefits. Sometimes, a DSS does not provide better decisions, but the decision-making process can be enhanced (Pick, 2008). For instance, decision-makers might achieve their goals and improve productivity with less effort (Holsapple, 2008; Pick, 2008) within a time frame and, in some cases, with better documentation. As a result, decision process improvements may support improved decisions (Pick, 2008). Klein and Methlie (1995) confirmed that "improving the effectiveness of decision-making" is the most significant claim in DSS literature.

Also, by using a DSS, a decision-maker might find unanticipated results and issues, which they can then address innovatively (Holsapple, 2008). The purpose of most DSSs is to assist decision-makers in problem-solving across different phases and the business environment, including intelligence, design, choice, implementation, and monitoring (Moisiadis, Genrich, Stair & Reynolds, 2008). A DSS can assist decision-makers to

improve the decision process in any or all of these phases (Moisiadis et al., 2008; Pick, 2008). However, particular DSSs might support only one or a few of these phases (Moisiadis et al., 2008). Many knowledge management (KM) systems fall into this category (Pick, 2008). The purpose of a DSS is also to support humans in the performance of primarily cognitive tasks that involve human information processing, judgements, and choice (Sage, 1995).

The role of a DSS is to build a support system in the decision process (Holsapple, 2008; Pick, 2008). Decisions can be made in different phases and iteratively from operational to strategic levels within the organisation. For strategic decision-making, a DSS can help managers by providing analysis for long-term decisions based on internal and external business environmental information (Moisiadis et al., 2008). A strategy is a plan of action to help an organisation in achieving its business goals. A good business strategy is based on the rigorous analysis of empirical data from market trends, competitors and the organisation's resources and competencies (Wienclaw, 2008). Furthermore, a DSS interactively supports the decision-maker in solving unprogrammed, and unstructured or semi-structured problems (Bose & Sugumaran, 2007; Eom, 2007).

Although owners/managers are main decision-makers in the small business environment, unstructured and semi-structured decisions can challenge them due to limited technology and skilled human resources. Many decision-makers may not understand customer views and competitor importance. To manage these difficulties, an owner/manager of a small business needs assistance from tools and techniques that do not demand much of their time and resources. Therefore, a DSS can provide them with support in running and managing their business (Magee, 2007).

3.3 The scope of DSS

A DSS covers the core subject areas of IS research and practice (Angehrn & Jelassi, 1994; Burstein & Holsapple, 2008) and creates scope and benefits for the organisational, e-commerce and e-business domains. Many DSS theories and applications have been developed specifically for the expansion of e-commerce (Burstein & Holsapple, 2008).

Angehrn and Jelassi (1994) identified three key areas of focus for DSS research and practice, as follows:

1. A DSS can have a conceptual focus when it supports the human decision-making process to address the individual and organisational decision-making processes.
2. A DSS can have a methodological focus when it is integrated into the human decision-making context by using the existing and evolving computer-based tools, technique and systems.
3. A DSS can have an application-oriented focus when it supports the real organisational needs by extending decision support to business teams.

The origin of DSS research activities came from two main research directions (cited by Beneki & Papastathopoulos, 2009; Liu, Duffy, Whitfield & Boyle, 2010; Shim et al., 2002):

- The theoretical study of organisational decision-making undertaken by Simon, Cyert, March, and others at the Carnegie Institute of Technology during the late 1950s and early 1960s.
- The technical work of the organisational decision context by using interactive computer systems carried out by Gerrity, Ness, and others in 1960 at the MIT and Keen and Morton in 1978.

Decision-making has always been a primary issue in the DSS research field (Angehrn & Jelassi, 1994). Therefore, DSS theories are useful for managerial practices in leading the integrated process of designing, developing, implementing, and evaluating the DSS (Eom, 2007). In this context, Eom (2007) defined the DSS as an applied discipline aimed at improving the practice of managers' effectiveness (decisions) as well as the efficiency of decision-making activities through the development and deployment of a DSS. Hence, Eom (2007) categorised DSS research broadly into three concepts, as follows:

- DSS theory building, and the study of reference disciplines.
- DSS theory must be useful in constructing the specific DSS.
- Application development.

This chapter later discusses the conceptual DSS solution framework designed for this study, aligned to the conceptual focus suggested by Angehrn and Jelassi (1994), and similar to the theoretical concept proposed by Eom (2007). The conceptual DSS

framework also fits into the theoretical study of individual and organisational decision-making, as recommended by Liu et al. (2010), Beneki and Papastathopoulos (2009), and Shim et al. (2002), whose works also align with that of Eom (2007). Most significantly, DSS can be differentiated from other computer-based systems in two fundamental ways. First, it focuses on decision-making and second, it is an interactive practice-based method requiring both the system and the decision-maker to contribute to the decision-making process (Pick & Weatherholt, 2013).

3.4 Theories and decision models of DSS

This section comprises two parts. The first part describes the theories of organisational and managerial problem-solving and decision-making processes within the business environment. Many researchers have developed theories and models for human decision-making processes in different phases that apply to the organisational decision-making context. The second part of this section constructs a conceptual DSS solution framework. This comprises one of the decision models and related theories through which the study investigated how owners/managers of small businesses could make their strategic decisions within the B2C e-commerce environment related to their specific business needs.

3.4.1 Theories and models of managerial decision-making processes

Decision-making is a process of choosing among alternative courses of action to attain an organisational goal (Tariq & Rafi, 2012). Typically, managerial decision-making processes consider various steps and methods within the organisational environment. Initially, managerial responsibility is to analyse the business environment for potential problems and opportunities. The next concern is to design a model that describes real-world problems and to identify possible solutions to address the issues and evaluate solutions (Sharda et al., 2015). A successful manager needs to be knowledgeable enough to make appropriate decisions and actions (Klein & Methlie, 1995). However, the decision-making process has gone through vast changes in the rapidly evolving and dynamic technological environment. Decision-making is also a dynamic process within this type of environment (Tariq & Rafi, 2012). Therefore, continuous observations are necessary for making effective decisions and actions (Hall, 2008; Zarate, 2013).

When a situation is new, normal actions can no longer be guaranteed to work, a decision-making process is applied to the identification of the problem. Problem identification goes through different phases, eventually ending with the performance of one or more actions grounded on the existing information. As a result, decision theories and models have been used many different ways to formulate decisions based on research settings (Adwok, 2014). Many researchers have divided the decision-making process into various phases and the critical role of the DSS is to support all aspects of the decision processes (cited by Pick, 2008; Sprague & Carlson, 1982). Various decision theories and models have been developed for managerial problem-solving and decision-making processes. Three of the most used models and related theories are:

- Simon's (1960) decision-making model and theory.
- Brim, Glass, Lavin & Goodman's (1962) decision-making model and theory.
- Mintzberg, Raisinghani & Theoret's (1976) strategic decision-making model and theory.

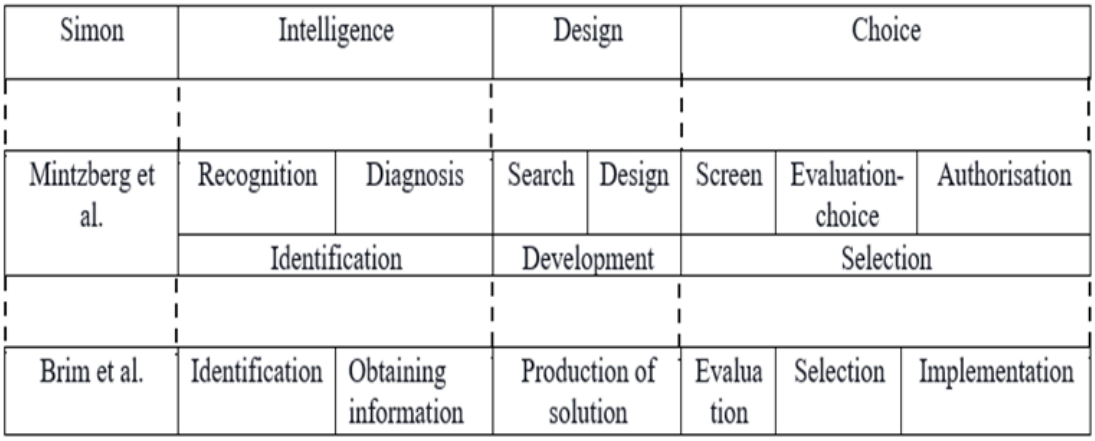
The decision model is an intellectual template for perceiving and managing the business logic behind a business decision (Von Halle & Goldberg, 2010). In the managerial decision-making concept, Simon's (1960) decision model is the most influential, describing the theories of decision-making processes in three main phases including intelligence, design, and choice (cited by Pick, 2008; Sprague & Carlson, 1982). Later Simon (1977) added the implementation and review phases.

Brim et al. (1962) divided the decision-making process into six phases: the identification of the problem; obtaining necessary information; production of possible solutions; evaluation of such solutions; selection of a strategy for performance; and the implementation of the decision. One of the most influential decision-making models was proposed by Mintzberg et al. (1976), also known as the MRT model (cited by Power, 2009). This model comprises three distinct phases of identification, development and selection for the strategic level of management problem-solving and decision-making within the business environment. The next section compares the three decision models.

3.4.1.1 Comparison of three decision models

Comparisons of the various phases of the three decision models are shown in **Figure 3.1.** The left-hand part of this figure shows the names of three models and the right-hand part

outlines the comparative analysis of decision phases of three models. In the managerial decision-making concept, Simon (1960) first proposed a decision model that described decision-making processes in three main phases. These phases are compared with the phases of the MRT model and Brim et al.'s (1962) model. The comparative analysis is described in the following sections.



Source: Hansson, 2005, p.44

Figure 3.1: Comparison three models with phases of the decision-making process

3.4.1.1.1 Intelligence phase

In the intelligence phase of the Simon model, decision-makers search the environment for opportunities and potential problems (cited by Klein & Methlie, 1995). Therefore, a human decision-maker plays a significant role in defining problems to be solved (Zarate, 2013). This phase is also known as the diagnostic phase of decision-making, during which managers recognise problems, needs and opportunities (Haag & Cummings, 2009). Decision-makers search the environment, collecting data and exploring information in order to make effective decisions (Zarate, 2013). For example, a decision-maker might identify customer requirements regarding product features, the threat of new competitions, and/or the cause of declining sales (Haag & Cummings, 2009).

As cited in Klein and Methlie (1995) and Hansson (2005), the identification phase of the MRT model could be comparable to Simon's intelligence phase, although the identification phase of the MRT model involves in two activities. The first is the recognition routine in which problems and opportunities are identified from the business environment. The second is the diagnosis activity, used to clarify and define the problem. These two routines in the MRT model can be considered equivalent to Brim et al.'s (1962)

two phases of identification of the problem and obtaining the information. Similarly, these two of Brim et al.'s steps are similar to Simon's intelligence phase.

3.4.1.1.2 Design phase

In the design phase of the Simon's model, decision-makers find possible ways to solve problems, identifying needs and taking advantage of opportunities (Haag & Cummings, 2009). They also take possible courses of action to formulate a model, set the criterion for choice, and search for alternatives (Zarate, 2013). Therefore, the majority of the DSSs in use are developed to generate alternative decisions via "what-if" analyses in the design phase (Eom, 2007). The development phase of the MRT model is similar to Simon's design phase, although it comprises two sets of activities that lead to producing one or more solutions (Hansson, 2005; Klein & Methlie, 1995). The first relates to search activities aimed at finding ready-made solutions. The second relates to the design method aimed at developing new solutions or modifications of ready-made ones (Hansson, 2005; Klein & Methlie, 1995; Mintzberg et al., 1976). Hence, the development phase of the MRT model and Simon's design phase can be considered similar to the production of possible solutions phase of Brim et al.'s model.

3.4.1.1.3 Choice phase

In the choice phase of Simon's model, decision-makers choose between courses of action, such as evaluation of alternatives, sensitivity analysis, selection of best choice(s) and plan for implementation. However, the best option sometimes depends on the cost, the ease of implementation, employment requirements, and timing (Zarate, 2013).

The last phase of the MRT model is the selection phase. This can be considered similar to Simon's choice phase, although the selection phase involves three activities (Hansson, 2005). The selection is the determination of criteria for choice, the evaluation of the consequences of alternatives, and the choice itself. The MRT model suggested that the selection phase is typically a multi-stage iterative process. The first involves screening activities, which are only suggested when a search is expected to generate more ready-made alternatives that can be intensively evaluated. In the screening activity, suboptimal options are eliminated. The second is the evaluation-choice activity that involves the actual choice between the alternatives. It may include the use of one or three modes, specifically intuitive (judgement), analysis and making a decision (Klein & Methlie, 1995). The third is the authorisation activity, in which approval for the solution selected

is required from a higher authority (Hansson, 2005; Klein & Methlie, 1995). This is a typical binary process (i.e., accept or reject) (Klein & Methlie, 1995). Hence, the Simon's choice phase and the selection phase of the MRT model are also comparable to the selection of a strategy for performance phase of Brim et al.'s model.

In the small business problem identification and solution context, from a theoretical perspective, this study adopted the MRT model for designing the conceptual DSS solution framework.

3.4.1.2 Reasons for the adoption of the MRT model and its theories

As cited by Power (2009), the most crucial part of the MRT model is the decision-making process involving a set of activities. Therefore, the decision-making process leads to the development of one or more solutions to a problem that builds on an opportunity. Most importantly, the development phase involves two activities: search (often supported by IT) and design. The search phase is often used to find a ready-made solution. Therefore, the design is used to develop a specific solution.

Notably, the MRT model deals with strategic decisions, which is one of the significant aspects of development in this study. Central to the MRT model is management strategic decision-making at various phases (Klein & Methlie, 1995; Mintzberg et al., 1976), which is not incorporated into the other two models. The MRT model is also descriptive (Power, 2009). The strategic decision in the MRT model focuses on the external and internal business environmental factors of the organisation (Mintzberg et al., 1976) that this present study is directed.

Three retail theories have been developed by researchers in the retail trading environment. One of them is the theory of retail change, which incorporates environmental analysis (cited by Fernie, Fernie & Moore, 2015). According to Fernie et al. (2015), environmental theories or theories of retail change are concerned with the external and internal environment of an organisation and associated factors. Factors related to the external environment include political, legal, socio-cultural, demographic, economic, technological and competition, which can change organisational structure over time. Only those organisations that adopt change and take advantage of the external opportunities offered will succeed.

Two dominant environmental theories have been changing the retail industry structure. One of them is evolution theory. The theory of retail evolution is linked to the theory of evolution developed by Charles Darwin, with the survival of organisms based on their ability to adapt to changing conditions (Fernie et al., 2015). In the retail environment, organisations need to analyse the environment and adapt to changes. Applying the evolution theory to the B2C e-commerce environment, small businesses need to embrace change in this dynamic and expanding environment.

Davies (1998) discussed the evolution theory in the context of environmental 'design-spaces' (as cited by Fernie et al., 2015), which offer opportunities and threats for retail organisations operating within them. The viability of the design space relates to many factors and one of them is the use of technology. Weill and Woerner (2015, p. 27) asked 'How should companies prepare for digital disruption of their businesses?' These researchers suggested companies evaluated threats and opportunities to start creating new business options in digital environments.

Business strategy is an essential area of a business organisation, needed to continuously meet the demands of change in the external environment. Many organisations deal with such needs internally to support their business practice (St-Jean et al., 2008). Researchers from various disciplines have studied and analysed the management decision-making process in the business environment. The dominant focus has been on models of decision-making, including investigating the various factors that affect decision-making within organisations (Vaidya & Seetharaman, 2007).

A range of factors have been identified as important for effective strategic planning. One of the essential factors is knowledge. Thus, it is critical for an organisation to assimilate new knowledge from external sources through an analysis of the business environment. An organisation can then utilise this knowledge to meet operational requirements that can contribute to business opportunities. Environmental review is one of the essential components of the strategic planning process, to explore new possibilities and to identify threats before making critical decisions (Khan & Khalique, 2014). Therefore, many research and development activities in the area of entrepreneurship and small business incorporate the continuous study of the environment and integrate environmental information into their strategic planning (Balasundaram, 2008).

For managerial decision-making, DSS researchers have developed the knowledge management DSS (KMDSS). The KMDSS is a computer-based system that stores, represents and processes the knowledge in ways that allow for more productive, agile and innovative decision-making. This system supports the decision through acquiring additional knowledge from external sources and focusing on the selection of knowledge from internal sources. The purpose is to generate new knowledge that may assist decision-makers with solving a problem. Thus, the organisation can store this knowledge for the future improvement of decision-making (Holsapple, 2008).

The discussion above highlights why the MRT model is more useful and influential than the other two models in supporting managers in their strategic decision-making at various phases in the online retail business environment. MRT model is important as later, Simon (1996) focused on the internal and external environment of an organisation in framing the design science (DS), which is the "science of the artificial" for designing an IT artefact.

The MRT model is also the most suitable for both research and practice. Therefore, the present study can use this model to determine how owners/managers of small businesses could make their strategic decisions at different phases in order to identify problems and opportunities in the B2C e-commerce environment. This process represents the theoretical study of organisational decision-making in DSS research (Beneki & Papastathopoulos, 2009; Eom, 2007; Liu et al., 2010; Shim et al., 2002), which has a conceptual DSS focus (Angehrn & Jelassi, 1994).

In addition, many researchers have argued that the MRT model is more useful for making strategic decisions. The model has been widely accepted and empirically supported in the dealing of problems and opportunities (Alalwan & Weistroffer, 2011; Klein & Methlie, 1995; Mintzberg et al., 1976). A number of researchers have used this model for management decision-making processes (Alalwan & Weistroffer, 2011; Alalwan, Thomas & Weistroffer, 2014; Kowalczyk & Buxmann, 2014; Xueli & Wang, 2012). For example, Alalwan and Weistroffer (2011) employed the MRT model for enterprise content management (ECM), including web content, electronic records, workflow and document management. Activities were related to the capturing of knowledge from internal and external sources for management's strategic decision processes. Similarly, Alalwan et al. (2014) investigated the potential of ECM technology for decision support by employing the MRT model. Their results showed that ECM positively influences

problem identification and definition, decision-making speed and analysis, decision quality, and decision-maker satisfaction. ECM supports the management of information across an enterprise. ECM tools and strategies enable the capture, management, storage, and delivery of an organisation's information (Cameron, 2011). Kowalczyk and Buxmann (2014) applied the MRT model to the decision process with a data-centric approach. Also, Hang and Wang (2012) carried out a study in Australia employing the MRT model to identify how owners/managers of SMEs in the manufacturing sector made their strategic decisions. Their study found that many owners/managers were making strategic decisions in two stages (problem-solution) rather than through problem-analysis-solution. The other shortcoming among SME owners/managers related to the strategic decisions being made with a limited focus on developing potential decision alternatives. Researchers also found that most of the decision-making models discussed in the literature focused on large firms.

Consequently, the MRT model had a significant role to play in developing the conceptual DSS solution framework for this study. This would help identify how owners/managers of small businesses make their business decisions strategically in the B2C e-commerce environment, and specifically, how they select features on their B2C websites. This assessment would help in identifying small business internal issues, needs and requirements for designing a new DSS solution artefact. In turn, this new DSS solution artefact could assist owners/managers in making strategic decisions driven by knowledge from the analysis of the B2C e-commerce environment and related factors. The next section describes the building of the conceptual DSS solution framework from a theoretical perspective.

3.4.2 A conceptual DSS solution framework

As indicated above, the conceptual DSS solution framework was developed by adopting the MRT model for strategic decision-making processes. Ultimately, this theoretical view of DSS research followed the conceptual focus suggested by Angehrn and Jelassi (1994), which supports human decision-making to address individual and organisational decision-making processes.

The MRT model in the conceptual DSS solution framework is shown in **Figure 3.2**. Through the phases of the decision-making process (i.e., identification, development, and

selection), this study would be able to identify small business problems, needs, and DSS requirements.

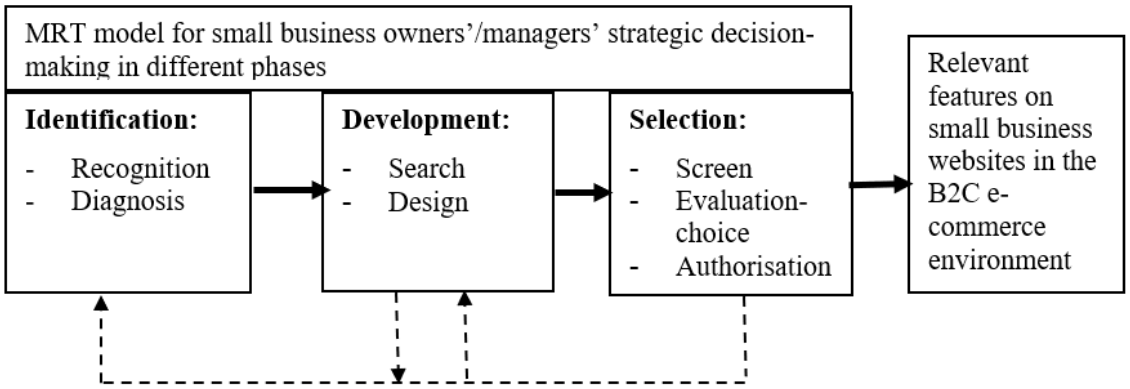


Figure 3.2: A conceptual DSS solution framework in the theoretical view (based on MRT model)

The phases of the MRT model in the conceptual DSS framework are described in the following sections.

3.4.2.1 The identification phase of MRT model

In this phase, typically a decision-maker can be alerted to specific issues in the surrounding business environment. Accordingly, many managers or decision-makers focus on accumulating knowledge from internal and external sources through the processing of data. They turn data into information and information into knowledge, evaluating that knowledge in the context of organisational needs before making an effective decision (Holsapple, 2008). This phase of the MRT model incorporates two routines or activities: recognition and diagnosis.

Recognition activities initiate the decision process by identifying problems and opportunities. Hence, this current study could identify the real problems of many small businesses, with the involvement of owners/managers, through these activities. As a result, the study could determine the owners/managers awareness and knowledge of specific organisational problems (e.g., the threat of competition from overseas websites) through case studies. The study could then determine how owners/managers address issues.

In the diagnosis routine, further information or data are required to define and clarify the previously recognised problem or opportunity. Therefore, the human decision-makers

play a significant role in defining problems to be solved (Zarate, 2013). Given that, information is required for an owner/manager in making the strategic decision to this routine. Decision-makers need to search information both from the internal and external business environment and identify related influential factors (Mintzberg et al., 1976).

Making strategic decisions involves an investigative and analytical approach to resolving organisational problems (Beynon-Davies, 2013; Mintzberg et al., 1976). As already indicated, the analysis of the business environment is vital for achieving organisation goals (Beynon-Davies, 2013; Thierauf, 1988). This phase is also used in this current study to investigate small business issues or factors within the B2C e-commerce environment.

3.4.2.1.1 Analysis of the external environment and related factors

Strategic decision-making is vital for achieving business goals (Hang & Wang, 2012) and to create a competitive advantage (Renee, Olivier & Truong, 2009) to ensure a firm is more profitable than its competitors (Huff, Floyd, Sherman, & Terjesen, 2009). Competitive advantage is sometimes difficult to achieve in a fast-changing external business environment (Renee et al., 2009).

A strategic decision occurs infrequently, goals are often ambiguous, and every situation seems different (Power, 2009). Although strategic management activities and decisions are involved in long-range planning, in the digital business environment, managers are now required to make decisions in much shorter timeframes (Turban et al., 2008). In this environment, small business managers are required to make decisions in much shorter time. Therefore, analysing the business environment is critical if a company is to remain competitive.

This study analyses the external business environment and related factors that may impact on small business performance within the online retail sector. Researchers in the domain of small business recommend that "the external factors analysis involves an examination of how competitors are using their websites, customer expectations of business web presence and consideration of possible alliances" (Burgess et al. 2009, p. 108).

Other researchers have targeted specific factors in the external business environment, including customer demands, general economic condition, regulations, new technology and competition (Pedersen & Sudzina, 2012; Thierauf, 1988). The current study considered the significant external environmental factors of competitors and their

interactive websites with competitive features in the online retail trading environment. A study carried out by Weill and Woerner (2015) indicated that two-thirds of organisations faced a high level of risk due to competition. One-third of the respondents in Weill and Woerner's (2015) study said that competitors offered their products and services through alternative digital channels (e.g. online payment systems), which represented a high degree of threat to their core business.

Therefore, the diagnosis activities of this phase need to involve an examination of competitor websites compared to small business websites. In this context, the overseas competitors are considered an external environmental factor or threat to small businesses. This supports the construction of the first justificatory knowledge, as presented in Chapter 2.

3.4.2.1.2 Analysis of the internal environment and related factors

Typically, internal environmental analysis involves identifying strategic factors crucial to the success of an organisation, determining the importance of each of these factors, and mapping the strengths and weaknesses of the organisation against them. Ultimately, this type of analysis creates a strategic advantage profile for the organisation, allowing them to compare themselves against the profiles of successful competitors in the same industry (Srivastava & Verma, 2012).

According to Burgess et al. (2009, p. 108) "the internal factor analysis involves documenting the overall business strategy, investigating available resources (capital and capacity) and consideration of the types of products and/or services offered by the small business." Other researchers have included management skills and knowledge, technology use, and strategies among internal business environmental factors (Pedersen & Sudzina, 2012). Strategies can be an "organisation's objectives, strengths, and problems" (Thierauf, 1988, p. 236).

Decision-making is also a knowledge-intensive and learning activity, which can alter the state of knowledge of an organisation. Thus, the production of new knowledge is not only represented by a decision but the building process itself may have resulted in additional new insights (Holsapple, 2008). However, many small businesses have limited knowledge about the external business environment (Bridge & O'Neill, 2009; DeLone, 1981; Fassehi, 2014).

In the present study the focus is on managerial decision-making relating to internal factors, such as their analytical knowledge about the business environment with associated factors (e.g., competitors and their website features and their strategies in the selection of relevant features on their websites in the B2C e-commerce environment). In addition, this study has considered how owners/managers identified their problems and opportunities and addressed them innovatively in such a dynamic online retail environment. This supports the second justificatory knowledge, as presented in Chapter 2, for investigating and analysing the internal business environment with associated factors or issues. Multiple case studies will be conducted to identify small business problems, needs and the requirements of the new DSS solution artefact design and development.

3.4.2.2 The development phase of MRT model

This phase of the MRT model comprised two activities: search and design. Therefore, it involved a set of activities that produced one or more solutions.

In the search activity, a decision-maker could apply different search actions. For example, a decision-maker might analyse the business environment and its associated factors, as well as explore alternative solutions to a known problem. Consequently, it is essential to complete the intelligence or identification phase of the environmental analysis before continuing with the design and development activities of the DSS (Holsapple, 2008). The environmental reviews or analysis, in which the owner/manager could investigate the internal and external environment, were discussed early in the identification phase of the MRT model.

In the development or design phase, the decision-maker seeks additional knowledge if it is required. This prompts the decision-maker to return to the intelligence or identification phase until they have all the information they need to continue with the design activity (Holsapple, 2008).

These activities are shown in **Figure 3.2,** with the dotted lines creating continuous links between the identification and development phases (an iterative process). Accordingly, a small business decision-maker can gain decision support based on the results of the analysis of the internal and external business environment and associated factors. Ultimately, these activities assisted in initiating the design a new DSS solution artefact.

After completing the search activities, in the design part of the development phase, a new solution can be recommended, or solutions modified to match the particular situation. In the design activities, therefore, a new DSS solution artefact would be developed using the UCDE method developed by Miah et al. (2014), which is discussed further in Chapter 8. Finally, in this phase owners/managers of small businesses would contribute to the design of the new DSS solution artefact through a requirement analysis and evaluation phase.

Activities in the development phase of the MRT model in the conceptual DSS framework have an application-oriented focus (Angehrn & Jelassi, 1994), creating a bridge between theory and practice. These activities are also associated with the technical work of organisational decision-making using interactive computer systems (cited by Beneki & Papastathopoulos, 2009; Liu et al., 2010; Shim et al., 2002). During the decision-making phases, a DSS is a computer-based system designed to aid decision-makers in their activities, helping them to identify numbers of alternative courses of action options and comparing between those options before and choosing one (Holspale, 2008).

The current study adopted the MRT model because Mintzberg et al. (1976) concluded that decision processes are programmable even they are not in fact programmed (cited by Klein & Methlie, 1995). Therefore, a new DSS solution represents a practice-based solution for small business decision-makers in this phase of the MRT model.

3.4.2.3 The selection phase of MRT model

Since Simon (1960), many researchers have different understandings and explanations regading a decision. Hanson (2005) and, Tariq and Rafi (2012) asserted that a decision is a goal-directed behaviour in the presence of options to attain an organisational objective. Morden (2017) signifies a decision refers to making choices among alternative courses of action, which may also include inaction. Ultimately, a decision-maker can choose among the options that have been created (Rhee & Rao, 2008). Morden (2017) also explainded that a decision that is inimitable or unique and important requires analytical thinking, information gathering, and careful consideration of alternatives.

Traditionally, a decision is regarded as being a choice where a choice is about a course of action (Holsapple, 2008; Simon, 1960). As a result, a decision leads to the desired objective and is a non-random activity concluding in the selection of one from among multiple alternative courses of action (Holspale, 2008). However, Mintzberg et al. (1976)

recommended that the selection phase should be a multi-stage iterative process of decision-making with three activities involved in this phase: screen, evaluation-choice, and authorisation. An iterative process is based on the repetition of steps and procedures (Rob & Coronel, 2009).

Decision-making has always been a primary issue in the DSS research field (Angehrn & Jelassi, 1994). Decision-making is arguably at the core of managerial tasks. However, managers often make decisions under pressure and with inadequate information. Therefore, iteration is essential to complete the task by gathering more information. The iteration is mainly required for systems design to support managerial decision making, and ultimately the actions managers take based on these decisions (Baba & HakemZadeh, 2012). Screening activities, which eliminate any impractical options. Next, the best option is selected through a process of analysis in the evaluation-choice activities. Finally, the decision goes through the authorisation activities, involving an authorised decision-maker taking a particular course of action. If an individual is controlling the decision process, then no authorisation is required (Huff et al., 2009). In the small business sector, the authorised decision-maker is usually an individual and decisions are made by the owner/manager (Burgess et al., 2009; Parker & Castleman, 2009).

In the small business context, therefore, a problem can be identified based on the difference between "what it is" and "what it ought to be," or between the actual situation and the desired situation as recommended by the MRT model, as well as aligned with the UCDE method (Miah et al., 2014). Accordingly, there may be a requirement of collecting further information until the real cause is determined (Hansson, 2005; Klein & Methlie, 1995) which is an iterative process.

In this phase, a decision-maker has the exercising authority to select an alternative solution based on the knowledge acquired and generated. This process can be done in the context of internal and external environmental factors and problems related to the nature of the decision context and the decision-maker's self-rules (Holspale, 2008).

Theoretically, the present study followed these three routines to develop the final DSS solution artefact using a prototype approach under the UCDE method. This supports the third justificatory knowledge as presented in Chapter 2, which informed to build the DSS based solution through this activities. Ultimately, these activities are aligned with the

evaluation phase of the initial DSS prototype involving the owners/managers of small businesses in the retail sector.

3.5 Chapter summary

The goal of this chapter was to build a conceptual DSS solution framework from a theoretical perspective. Three main scopes of DSS research and practice were identified in the literature: a conceptual or theoretical focus; a methodological focus; and an application-oriented focus. When a DSS supports organisational or individual decision-making processes, which represents the conceptual or theoretical DSS focus, as discussed in this chapter.

Thus, the conceptual DSS can help identify small business problems, needs, and requirements to inform the design, development, and evaluation of a new DSS solution artefact (practice-based solution). Therefore, the MRT model and UCDE method have been adopted to construct the conceptual DSS solution. The MRT model and UCDE method are suitable for the problem, needs and requirement analysis of small business and solution finding because the current study is concerned with identifying actual and desired situations from a theoretical or conceptual basis, which can then be integrated into a new practice-based DSS.

Many DSS definitions have been reviewed in this chapter, as well as the benefits of DSS. The main purpose of a DSS is to provide a support system for managers to assist the process of them in making better decisions at various phases within the business environment.

The next chapter presents the research design and methodology used in the various stages of data collection processes and their techniques.

Chapter 4: Research Methodology

This chapter first describes the research philosophy that provided the overall strategy for conducting the research, followed by a discussion of the specific research methodology used. This is the DSR methodology used for the IS artefact design, development and evaluation perspectives for small business problem and solution finding. This chapter also presents the research design details at different stages, including data collection and analysis methods followed by a chapter summary

4.1 Research philosophy

A philosophical concept is important for influencing research practice and to shape how the research is operationalised (Creswell, 2014; Wahyuni, 2012). A research philosophy is defined as a broad concept related to the development of knowledge for the period of conducting the research. Thus, when researchers initiate a research project with assumptions about how they aim to gather data and what they will learn during their investigations, this is their knowledge claim. Researchers term these claims as philosophical assumptions, paradigms, epistemologies, and ontologies, or more broadly, research methodologies (Creswell, 2003). The research philosophy adopted can influence practical considerations (Saunders, Lewis & Thornhill, 2009).

There are significant differences between the concepts of paradigms, epistemologies, ontologies and research methodologies. Philosophically, researchers make claims about what is knowledge (ontology), how they know it (epistemology), and what the study process is called (methodology) (Creswell, 2003). According to Babbie (2016), the research methodology is also the subfield of epistemology (the science of knowledge) and is the process of scientific investigation. Hallebone and Priest (2009, p. 3) defined a paradigm as "the philosophy of science and the logic of research inquiry."

The two most important philosophical aspects to differentiate existing research paradigms or concepts are ontology and epistemology (Hallebone & Priest, 2009; Saunders et al., 2009). The term "ontology is derived from the Greek words 'onto' (for being) and 'logos' (theory of knowledge) through which reality is viewed" (Hallebone & Priest, 2009, p. 189). However, "epistemology signifies how knowledge is generated" (Hallebone & Priest, 2009, p.76), such as how a theory of knowledge is introduced from a theoretical

perspective. From a theoretical viewpoint, epistemology is also concerned with providing a philosophical grounding for deciding what types of knowledge are potential and how researchers can confirm that they are both adequate and appropriate for their research (Crotty, 1998).

Besides this, philosophical assumptions assist academic researchers in explaining why they select qualitative, quantitative, or mixed method research design for their studies (Creswell, 2014; Myers, 2015). Moreover, assumptions also assist a researcher which research methods are appropriate for conducting the study (Myers, 2015).

4.1.1 Fundamental differences between quantitative and qualitative research strategies

There are fundamental differences between qualitative and quantitative research strategies in terms of their epistemological foundations, the role of research theory and ontological considerations (Bryman, 2015). These differences are summarised in **Table 4.1.**

Table 4.1: Fundamental differences between quantitative and qualitative research strategies

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

Source: Bryman, 2015, p. 32

Bryman (2015) suggested that quantitative research emphasises quantification in the collection and analysis of data that:

- Demands a deductive approach to the relationship between theory and research, in which the focus is placed on the testing of theories;
- Has combined the practices and norms of the natural science model and is particularly associated with positivism; and
- Represents a view of social reality as an external objective reality.

By contrast, qualitative research usually emphasises words rather than quantification in the collection and analysis of data (Bryman, 2015) that:

- Demands an inductive approach to the relationship between theory and research, in which an emphasis is placed on the generation of theories;
- Has rejected the practices and norms of the natural scientific model, and of positivism in particular, in preference for an emphasis on how an individual interprets their social world; and
- Embodies a view of social reality as a constantly shifting emergent property of individuals' creation.

Four philosophical assumptions were proposed by Creswell (2014) as paradigms: post-positivism, constructivism, advocacy or participatory, and pragmatism. The connections between these research paradigms and ontology, epistemology and research methodology are outlined in **Table 4.2.** This table also shows views that are addressed in the present study.

Table 4.2: A synopses of four research paradigms relevant to this study

Research paradigms/philosophy					
	Positivism	Post-positivism	Pragmatism	Interpretivism (Constructivism)	Views addressed in the present study
Ontology: The position on the nature of reality	External, one single reality, objective and independent of social actors and testing theory	Objective, exists independently of human thoughts and beliefs of their existence but is interpreted through social conditioning	External, multiple, problem-centered (view was chosen to achieve the best answer to the research question)	Socially constructed, subjective, multiple participant meaning, may change, theory generation.	Fall into the constructivist paradigm, encouraged subjective and multiple participant meaning, such as carried out in multiple case studies and the system would be constructed by using the new generated theories or justificatory knowledge.
Epistemology: The view on what constitutes acceptable knowledge	The only observable phenomenon can provide credible data and facts; focus on causation and fixed the overview; reducing the phenomenon to simplest elements.	Only observable phenomena can provide credible data, facts. Focus on explaining within a context	Both observable phenomena and subjective meanings can provide acceptable knowledge dependent upon the research question. Focus on practical applied research, integrating different perspectives to help interpret the data.	Subjective meanings and social phenomena. Focus on the details of situation, the reality behind these details, subjective meanings, and motivating actions	This study focuses on details of the situation through case studies and web content analysis. These methods help to construct knowledge and finally use the knowledge that motivates for system development and evaluation.
Methodology: A model behind the research process	Quantitative: Deductive and testing theory	Quantitative or qualitative	Quantitative and qualitative (mixed or multiple methods designs)	Qualitative: Inductive and generate theories	Focused on innovation concerning users' (owners/managers) strategic decision issues in the B2C e-commerce environment, particularly to select competitive features on their websites. Thus, adopted qualitative research methodology and constructed theories.

Sources: Bryman, 2015; Hallebone & Priest, 2009; Lincoln, Lynham & Guba, 2011; Saunders et al., 2009; Wahyuni, 2012

This study used a constructivist philosophy to accommodate the qualitative research strategies. The constructivist philosophy is built on the view of ontological relativity, which holds that all rational statements about existence depend on a worldview, and are uniquely determined by empirical or rational data about the world (Patton, 2015). Moreover, constructivist research provides practical guidelines for understanding a context with multiple perspectives and diversities and generates theories (Creswell, 2013). The constructivist research approach often combines with interpretivism and is typically seen as an approach to qualitative research (Bryman, 2015; Creswell, 2013).

In qualitative research enquiry, Lincoln and Guba (2013) defined constructivist ontology as a set of foundational principals in the form of propositional statements. They proposed 150 propositional statements based on their works. These pioneers articulated the constructivist ontology for qualitative enquiries. Myers (2013) suggested that interpretative case study research relies on an underlying interpretative epistemology.

In the context of small business problem definition, needs, and the DSS-based solution design, three theoretical concepts or knowledge were constructed following a review and analysis of related literature using a constructivist ontology, an interpretive epistemology, and a qualitative research strategy. The study further developed theoretical concepts or justificatory knowledge based on qualitative interpretations of empirical data from case studies and web content analysis. Again, theories or justificatory knowledge were constructed after the evaluation of the initial DSS artefact prototype through focus group sessions with owners/managers of small businesses, using qualitative and descriptive analysis method. As already discussed, the justificatory knowledge is known as the kernel theory, which informs the construction of the new artefact. Moreover, the exact setting of the justificatory theory or knowledge may require some judgement (Gregor & Hevner, 2013). The next section describes the overall research methodology.

4.2 Research methodology

The overall methodology for developing this study was the DSR. The DSR was considered appropriate because this method assists in addressing the real-world application environment in which the research problem or opportunity is illustrated (Hevner et al., 2004). Design science (DS) has also become an important and widely used approach within the IS research communities (Leukel, Mueller & Sugumaran, 2014). The primary purpose of the DSR is to design a system for the solution of a problem (Dresch, Lacerda & Antunes, 2015) where design is fundamental to the IS discipline (March & Storey, 2008).

Ultimately, the DSR is a research philosophy in which a designer answers questions relevant to human problems via the creation of innovative artefacts and contributing new knowledge to the body of scientific evidence. The designed artefacts are both useful and fundamental in understanding that problem (Hevner & Chatterjee, 2010). Accordingly, a website features evaluation DSS (WFE-DSS) artefact was designed and evaluated for the identification of small business website issues and to help generate recommendations for solutions through the analysis of the external business environment. The next section describes the philosophical rationale for adopting DSR rather than other approaches.

4.2.1 Philosophical grounds of using DSR as a research methodology

Simon (1996) highlighted the fundamental differences between natural science and DSR (known as the "science of the artificial") (as cited by Kuechler & Vaishnavi, 2004; Van Aken, 2005). The core goal of natural science is to develop rational knowledge to understand the natural or social world and, more specifically, to describe, explain and possibly predict a situation (Dresch et al., 2015; Van Aken, 2005). On the other hand, the central aim of DSR is to develop knowledge that can be used by experts to design solutions to problems in their field. Most importantly, understanding the nature and cause of problems can help significantly in designing solutions using a DSR approach. In addition, DSR does not limit itself to understanding the problem, it also enables the development of knowledge on the advantages and disadvantages of alternative solutions (Simon, 1996; Van Aken, 2005). Moreover, in DSR, researchers design, produce and evaluate systems that do not yet exist and focus on solving problems (Dresch et al., 2015).

As specified by Kuechler and Vaishnavi (2012), the most important key elements distinguishing the DSR from the behavioural science in IS research are:

- DSR can explore new, as yet un-theorised areas;
- DSR uses constructivism rather than statistical methods; and
- DSR can build and test the theory.

Moreover, evaluation is crucial to DSR, unlike other research paradigms (e.g., positivism, interpretivism, and critical) because they do not design and develop new artefacts (Venable, Pries-Heje, & Baskerville, 2016). In DSR, a researcher creates IT artefacts to solve identified business problems (Hevner et al. 2004). Evaluation is the major concern with the assessment of DSR outputs. Outputs can be IS design theories (Gregor & Jones, 2007) and design artefacts (March & Smith, 1995). Fundamentally, the DSR is a research methodology in the IS discipline in which new knowledge is produced by the construction and evaluation of artefacts (Kuechler & Vaishnavi, 2012).

In this study, knowledge was produced by constructing a WFE-DSS artefact using design theories. A rule in pseudocode for the algorithm involved in the method was provided (e.g., design principles) for the designing of the WFE-DSS artefact (instantiated artefact). This process is discussed further in Chapter 8. The new knowledge (justificatory knowledge or concepts) was produced after evaluation of the WFE-DSS artefact prototype by using end-users' generated data to identify the usability, efficacy, and performance of the artefact. The new knowledge was essential for further improvement of the artefact prototype.

The DSR methodology was appropriate for this study because this approach is fundamentally involved in problem-solving activities, which is vital for resolving small business problems through the creation of a new IS artefact. Also, the end goal of DSR activities is to produce an artefact, which must be built and then evaluated (Hevner & Chatterjee, 2010; Hevner et al., 2004; March & Smith, 1995). March and Smith (1995) categorised artefacts into four groups, as follows:

1. **Construct:** This type of artefact constitutes a conceptualisation used to describe problems within the domain and to specify their solutions.
2. **Model:** This type of artefact constitutes a set of propositions or statements expressing relationships among constructs.

3. **Method:** This type of artefact constitutes a set of steps used to perform a task.
4. **Instantiation:** The realisation of an artefact in its environment which operationalises constructs, models, and methods.

As cited by Kuechler and Vaishnavi (2004), Simon (1996) discussed the design of such artefacts in relation to the internal and external environment of an organisation, and the interface between the two to meet specific desired goals. The external environment comprises the entire set of external forces that affect the actions of the artefact. The internal environment includes the set of components that make up the artefact and the relationship between the organisation and the artefact. Therefore, the behaviour of the artefact is affected by both the internal and external environment of an organisation. In this study, small business internal components were their problems and needs, and the external forces were competitors with interactive website features. These controlled the behaviour of the designed artefact and formed the interface between two environments, which was necessary to reach desired goals.

Gregor and Jones (2007) claimed that conceptual artefacts are constructs, models, and methods which are theories or components of theories. Arnott and Pervan (2010) recommended constructing theories for the improvement of DSR. Later, Peffers, Rothenberger, and Kuechler (2012) classified artefacts into two groups, including conceptual and formal logical instructions:

1. **Conceptual artefacts:** These artefacts include constructs, models, frameworks (a meta-model) and methods, which are actionable conceptual or theoretical instructions.
2. **Formal logical instructions:** These artefacts are classified as algorithms. An algorithm is an approach, method, or process described mostly by a set of formal logical instructions and actual hardware or software implementations are classified as instantiations.

In conceptual artefacts, theorising is a significant outcome in DSR. Gregor and Jones (2007) recommended kernel theory should be used as the descriptive theory that informs the artefact construction. Later, Gregor and Hevner (2013) suggested that the design knowledge should include kernel theory because this theory explains why the design works. They called the kernel theory as justificatory knowledge. However, justificatory

knowledge could also be seen more broadly as any knowledge that informs design research, including informal knowledge from the field and the experience of practitioners (Gregor & Jones, 2007). Ultimately, in this study descriptive theories are kernel theories that were built in parallel with the DSR, which informed the artefact construction using the constructivist research philosophy in DSR.

Kuechler and Vaishnavi (2012) also articulated that the DSR involved three general activities:

1. The construction of an artefact where construction is informed either by practice-based insight or theory;
2. The gathering of data on the functional performance of the artefact, which is evaluation; and
3. Reflection on the construction process and the evaluation of the artefact to inform insight(s) or theory.

DSR is becoming an accepted and valid design methodology for many specialised IS artefact designs, as it contributes to knowledge and design theories beyond practical problem-solving (Arnott & Pervan, 2014; Gregor & Hevner, 2013; Hevner & Chatterjee, 2010). It implies that applying DSR, in general, is significant, since DSS is a subset of IS domain (Miah et al., 2014). Accordingly, DSR is demarcated within the IS discipline because of the construction of a wide range of artefacts, some of which include DSS and methods of IS evaluations (Gregor & Hevner, 2013).

Based on the discussion above, in the small business DSS solution designing environment, artefacts include constructs and different methods that support the design, development, and evaluation of the artefact prototype. Constructs, such as concluding concepts or kernel theories, were adopted throughout the research. This informed the building of the IS artefact and its improvement to produce the final artefact as instantiation. Therefore, this study used the DSR methodology for overall research activities related to the designing of the WFE-DSS artefact for small business problem-solving.

4.2.2 The specific DSR method

As evident in the literature, researchers have developed different methods for conducting DSR in the IS discipline to produce viable artefacts (Hevner et al. 2004; Peffers, Tuunanen, Rothenberger, & Chatterjee, 2007). Peffers et al.'s (2007) method has six steps: problem identification and motivation, the definition of the objectives for a solution, design and development, demonstration, evaluation, and communication. However, their DSR approach originated from Hevner et al.'s (2004) DSR guidelines, known as the HMPR guidelines (named after the authors). These consist of seven activities: design as an artefact, problem relevance, design evaluation, research contributions, research rigour, design as a search process, and communication of the research.

Hevner et al. (2004) recommended that design research must produce a viable artefact in the form of a construct, model, method, or instantiation. They also indicated that DS could give further opportunities to evaluate new artefacts in a given organisational context to apply empirical and qualitative methods. Therefore, the interaction of people and technology is needed to meet organisational needs. In this study context, the artefact was evaluated by focus group sessions using the artefact prototype. Theories were developed for further improvement of the artefact according to user needs.

Similarly, this study designed the WFE-DSS, which was initially a prototype instantiation, then evaluated the prototype with the direct input of owners/managers through focus group sessions to improve the prototype. This evaluation process is documented in Chapter 9. Therefore, new theoretical concepts or justificatory knowledge have been constructed following the constructivist research philosophy, with a qualitative and descriptive focus rather than using statistical methods in DSR (Kuechler & Vaishnavi, 2012). User-generated data from the evaluation of the usability, efficacy, and performance of the WFE-DSS artefact prototype informed to production of the final artefact instantiation version.

Importantly, Hevner et al. (2004) argued that DSR is particularly relevant for modern-day IS research, because this approach helps researchers confront two significant long-term issues within IS design. The first is the absence of rigour in creating innovative artefacts and the second is the nature of IS research outputs. Many IS research outputs produce irrelevant knowledge that are not practical or applicable to the solution of the

real-world problems (Benbasat & Zmud, 1999; Orlikowski & Iacono, 2001). Practical issues are considered just a starting point in some DSR approaches, particularly in Hevner et al.'s (2004) DSR activities, which parallel the work of this study. The next section describes the HMPR seven guidelines for DSR, used in this study.

4.2.3 HMPR guidelines in DSR

As indicated earlier, the HMPR guidelines consist of seven phases of activities. These are listed in **Table 4.3.** The left-hand side of this table describes the guidelines. The right-hand side describes the activities of this study that were consistent with the guidelines. Specifically, the WFE-DSS was designed, developed, and evaluated using the HMPR guidelines. Detailed descriptions of the HMPR guidelines and related activities in this study are presented in the sections following the table.

Table 4.3: HMPR seven guidelines for DSR

HMPR guidelines	Relevance to the artefact design research
Guideline 1 - Design as an artefact: DSR must produce a viable artefact in the form of a construct, a model, a method, or an instantiation.	A new WFE-DSS solution artefact was developed and evaluated with the involvement of owners/managers of small businesses. This is an innovative artefact with a software solution prototype (instantiation).
Guideline 2 - Problem relevance: The objective of DSR is to develop technology-based solutions to important and relevant business problems.	The WFE-DSS solution artefact can address the differences between the current state of small business website features and the desired state as recommended by the artefact.
Guideline 3 - Design evaluation: The utility, quality, and efficacy of a design artefact must be rigorously demonstrated via well-executed evaluation methods.	A descriptive evaluation method was used for showing the utility, usefulness, and efficacy of the initial WFE-DSS prototype with the direct input of small business decision-makers as end-users through focus group sessions. The functionality of the artefact was also tested by the researcher and the project supervisor.
Guideline 4 - Research contributions: Effective DSR must provide clear and verifiable contributions in the areas of design artefact, design foundations, and/or design methodologies.	The practical contribution is the new WFE-DSS artefact, which is a practice-based DSR outcome. The theoretical contributions include developed theoretical concepts or justificatory knowledge (kernel theories) that informed the artefact construction through a literature review in the problem domain and empirical studies (case studies, web content analysis, and focus groups). These are the conceptual DSR outcomes. Also, design theories were developed to construct the new artefact with a rule provided in pseudocode for the algorithm involved in the method (design principles). The innovative evaluation methods were used with end-user involvement to assess the usability, efficacy, and performance of the artefact prototype instantiation.
Guideline 5 - Research rigour: DSR relies upon the application of rigorous methods in both the construction and evaluation of the design artefact.	This study adopted DSR methodology. It also used appropriate data collection through case studies, web content analysis, and focus groups sessions. Research rigour was derived from the knowledge-based theoretical foundation and methodologies for the user-centred DSS design, development and evaluation principles.

Guideline 6 - Design as a search process: The search for an effective artefact requires utilising available means to reach desired ends while satisfying laws in the problem environment.	In following this guideline, the artefact was closely aligned with owner/manager input through the requirement analysis and the evaluation phases of the artefact. Therefore, a user-centred DSS solution artefact was designed based on findings from case studies, along with scanning relevant external and internal business environments and associated factors.
Guideline 7 - Communication of research: DSR must be presented effectively both to technology-oriented as well as management-oriented audiences.	This goal was achieved through the system demonstration with end-users. The DSS prototype was presented in a focus group workshop. End-users were small business owners/managers. Also, three research-in-progress papers were presented to technology-oriented audiences at international conferences.

Source: Hevner et al., 2004, p. 83

4.2.3.1 HMPR guideline 1: Design as an artefact

In line with this guideline, the WFE-DSS artefact was designed with functional features. The various user-friendly user interfaces (UIs) were designed for communications between an end-user and the system. These activities are documented in Chapter 8 and outlined in the **Appendix H:** End-user manual. More precisely, the artefact applied the knowledge base concepts for presenting its parameters and involved knowledge representations (KR) ('if-then' rules). As a result, the instantiation artefact automates a set of rules and constraints related to the decision process and supports the elaboration of different 'if-then' scenarios. Therefore, a small business decision-maker within the B2C e-commerce environment can obtain assistance through expert recommendations together with a strategic analysis of selecting website features.

4.2.3.2 HMPR guideline 2: Problem relevance

This guideline supports the identification of real problems through multiple case studies and web content analysis prior to the prototype design. Therefore, to address the problem and create a potential solution, the initial WFE-DSS prototype was developed as a small-scale, knowledge-based DSS. The DSS is easy to use and has the capacity to identify gaps between current and desired states, in this case the current and desired features on small business websites in the B2C e-commerce environment.

4.2.3.3 HMPR guideline 3: Design evaluation

In line with this guideline, the study carried out focus group sessions for evaluating the WFE-DSS prototype. It also collected feedback data through the completion of questionnaires and interviews based on user experiences of using the prototype. In addition, initially the prototype was tested by the researcher and the project supervisor to run the data and fixed any errors. These evaluation processes are documented in Chapter 9.

4.2.3.4 HMPR guideline 4: Research contributions

Contributions of this study include theoretical, methodological and practical, as detailed in the sections below.

4.2.3.4.1 Theoretical contributions

Theoretical concepts or descriptive justificatory knowledge have been constructed through reviewing the relevant literature to define the research problem, aimed at identifying real business issues and needs. Accordingly, a DSS framework was built with

a conceptual focus to allow for the theoretical study of managerial decision-making processes. The conceptual DSS enabled the design of a new DSS-based solution. Again, theories or justificatory knowledge were constructed through multiple case studies and web content analysis to identify the small business problems and needs that informed the design of the prototype instantiation. Further, justificatory knowledge or theoretical concepts were constructed based on prototype evaluation results. This informed improvement in the initial prototype to produce the final version.

4.2.3.4.2 Methodological contributions

The small business issues, needs, and DSS requirement analysis methods made significant methodological contributions, using case studies and web content analysis. An MRT model in the conceptual DSS framework was employed for the DSS requirement analysis. The prototype instantiation evaluation method represents a significant contribution of this study focus group sessions were carried out using user-centred designed (UCD) principles. End-users were invited to evaluate the porotype instantiation to test the usefulness, efficacy, and performance of the artefact with rigorous assessment and data collection techniques. Most importantly, the DSR methodology itself represents a significant approach for problem identification and technology-based solutions with the analysis of the internal and external environments of an organisation.

4.2.3.4.3 Practical contributions

The artefact instantiation, represented as the WFE-DSS, is the practical contribution developed using the UCDE method to create a bridge between theoretical and practice-based DSS. The artefact was designed with various user-friendly UIs to meet the small business needs. The functional model of the WFE-DSS is presented in Chapter 8. This model shows how an owner/manager can obtain knowledge from the external business environment through the comparative analysis of competitor website features. This knowledge can enhance strategic decisions when selecting appropriate website features to improve competitiveness.

4.2.3.5 HMPR guideline 5: Research rigour

Research rigour was achieved using a DSR methodology, which allowed the researcher to define small business problems and needs, and design the artefact as an instantiation. Therefore, research rigour was derived from the user-centred artefact design and evaluation methods using an evolutionary and prototype approach. As already indicated,

small business problems and needs were identified through multiple case studies and web content analysis methods. Design principles or theories were constructed to inform the development of the prototype instantiation. A prototype design method, which is a well-accepted approach, was used for evaluating the initial WFE-DSS prototype instantiation, with the direct input of small business decision-makers.

4.2.3.6 HMPR guideline 6: Design as a search process

This study adopted the UCDE method, with users involved in the DSS design environment. Owners/managers were invited to create knowledge in relation to the current state of features on their websites and the desired state after using the WFE-DSS prototype. Ultimately, an artefact instantiation was developed with owner/manager contributions through the requirement analysis and evaluation phases of the artefact.

4.2.3.7 HMPR guideline 7: Communication of research

Communication was maintained through system demonstrations and evaluation by owners/managers through focus group sessions. Also, three research-in-progress papers were presented to technology-oriented audiences at the 2015 Australasian Conference on Information System in Adelaide, Australia, the 2016 Institute of Electrical and Electronics Engineers Future Technology Conference in San Francisco in the US, and the 4th Asia Pacific World Congress on Computer Science and Engineering 2017 in Mana Island Resort and Spa, Fiji.

The next section describes the different stages of the research design.

4.3 Research design stages

This section describes the research design stages and explains how the study was carried out, applying various methods to support the rigorous research process.

To answer the research questions explicitly, and to evaluate the three theoretical concepts or justificatory knowledge, the overall research was designed in three stages. These stages are shown in **Figure 4.1.** The individual stages of research design are described in the sections following this figure.

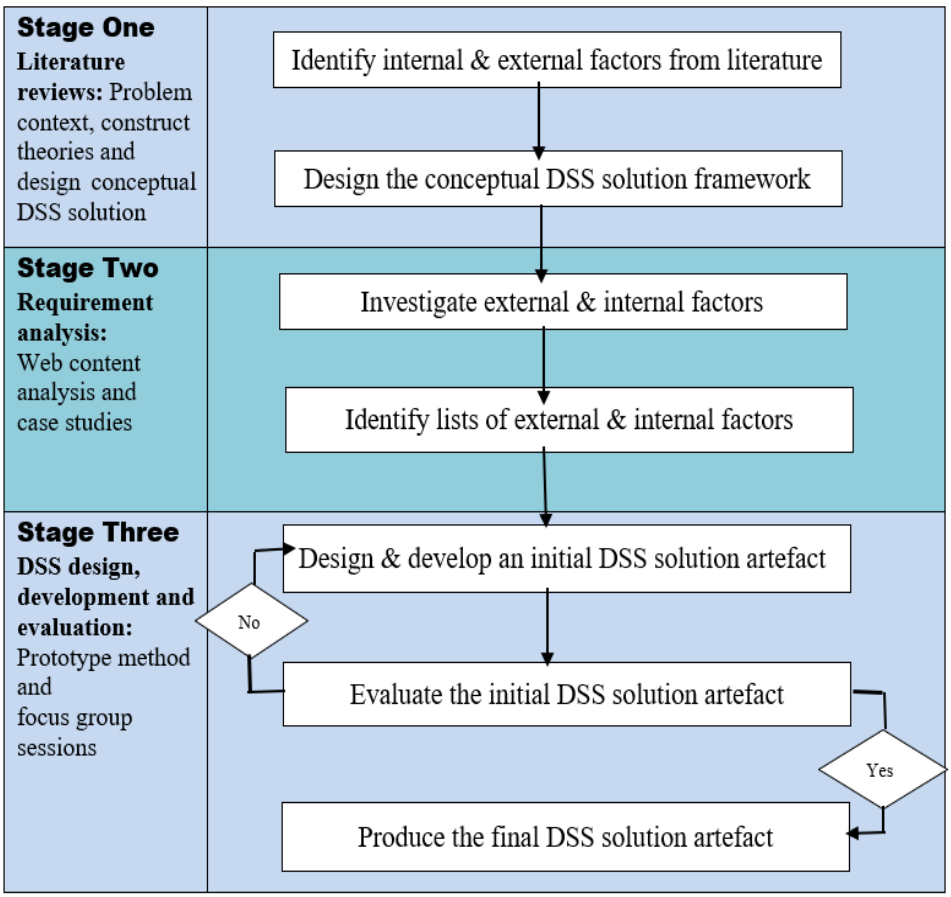


Figure 4.1: Research design stages

4.3.1 Stage one of the research design

This stage of the research design consisted of three key steps, as shown in **Figure 4.2**. The first step involved reviewing the relevant literature in the field of e-commerce, largely in the small business B2C e-commerce domain, strategic decision-making, and DSSs in the IS discipline.

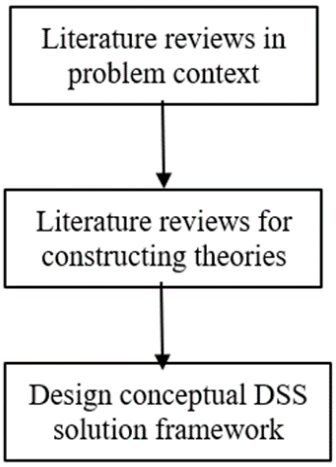


Figure 4.2: Steps for stage one of the research design

Theories from the relevant literature are often formulated in the initial phase of research and the theoretical framework can be developed based on the analysis of that literature (Boeije, 2010). This study analysed external and internal factors within the existing literature and constructed theoretical concepts. Three central research questions and three descriptive theoretical concepts or justificatory knowledge emerged from this stage, aimed at investigating the research problem and providing a possible technology-based solution to the issues raised. In the third step of this stage, a conceptual DSS solution framework was designed, as documented in Chapter 3. **Table 4.4** presents the three theoretical concepts or justificatory knowledge linked with three research questions.

Table 4.4: Justificatory knowledge links to the research questions

Research questions	**Justificatory knowledge**
1. What significant factors influence consumers to purchase products from overseas websites rather than local small business B2C websites?	There is a link between the relevant features that should be available on small business B2C websites and the factors that influence consumer online purchasing from overseas competitor websites (External factors).
	There is a link between the level of relevant features available on B2C websites that influence consumer purchasing from overseas websites, and small business owners/managers' strategic decision-making in the selection of related features that should be on their websites (Internal factors).
2. What might be a solution that helps owners/managers in making strategic decisions about selecting competitive features on their websites to attract consumers? 3. How could a new DSS solution artefact be designed and evaluated through well-executed methods?	There is a great need to develop a DSS-based solution that can support owners/managers of small businesses in making strategic decisions to select relevant features on their websites in the B2C e-commerce environment.

4.3.2 Stage two of the research design

Stage two of the research design comprised three steps: case studies, web content analysis, and a DSS requirement analysis. These steps are shown in **Figure 4.3.** This stage of the research was designed to address RQ1, which linked with two justificatory knowledge statements constructed to identify small business problems and needs. This stage also linked with the identification phase of the MRT model in the conceptual DSS solution framework. Accordingly, web content analysis and multiple case studies have been carried out to identify the small business issues, needs, and DSS requirements.

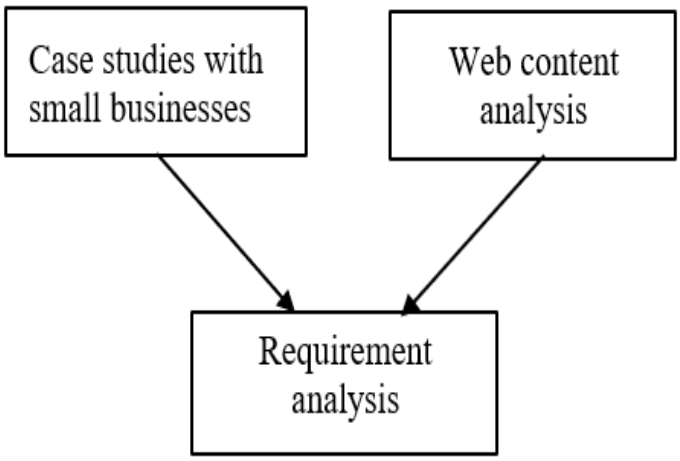


Figure 4.3: Steps for stage two of the research design

Therefore, this stage involved knowledge acquisition through investigating the external and internal factors of small business organisations in the B2C e-commerce environment. **Table 4.5** presents a list of internal and external factors as identified in the literature, as well as those factors considered relevant to this study.

Table 4.5: Internal and external business environmental factors

Internal factors from the literature	**External factors from the literature**	**Factors considered in this study**
Skills and knowledge, technology use, and management strategies (Beynon-Davies, 2013; Pedersen & Sudzina, 2012).	Customer demands, general economic conditions, regulations, new technology and competition (Pedersen & Sudzina, 2012; Thierauf, 1988).	***Internal factors for case studies***
Organisation objectives, strengths, and problems (Thierauf, 1988).		Skills and knowledge, technology use, management strategies, objectives, strengths and problems, system users and existing systems.
		External factors for web content analysis
Strategic plans, top managers, system users, and existing systems (Rosenblatt, 2014).	Technology, suppliers, customers, competitors, the economy and government policies (Rosenblatt, 2014).	E-commerce technology and competitors.

For the investigation and analysis of the internal business environment and related issues or factors, multiple case studies were conducted. For external environmental investigation and analysis, this study assessed the small business website features against their overseas competitors by using a content analysis method to identify the issue of the existing websites. The web content analysis techniques, results, and new theories or justificatory knowledge are documented in Chapter 5. Case study results, analysis and new theories or justificatory knowledge are documented in Chapter 6.

4.3.2.1 Sample source for case studies

The online Yellow Pages of Australia was a suitable source of samples because many Australian small businesses advertise their details on this site, for a range of reasons. The site provides companies with free listings, with features including business name, address, phone number, email and website (Sensis, 2016). The site provides basic local advertising, particularly for small businesses (Rice & Martin, 2014). This source was also appropriate as it provides company size based on the number of employees. A pilot study was carried out before conducting multiple case studies, as described in the next section.

4.3.2.2 A pilot study

A pilot study assists the researcher in generating data to meet their research purposes (Bazeley, 2013). It also helps the researcher become familiar with the empirical study (Boeije, 2010). Moreover, before distributing questionnaires to potential respondents, it is necessary to check the method works well and respondents have no problems in responding to research questions (Bazeley, 2013).

Consequently, a pilot study was used in this study before circulating questionnaires to potential participants in the small business B2C sector in Australia. The data generated from the pilot study was confirmed as relevant to achieving the research goals. It also helped the researcher become familiar with online case study research with small businesses.

Participants were selected for this study based on purposive sampling. The study selected a sample of five owners/managers in the online retail sector in New Zealand and Australia. However, only two responses were received for the pilot. Such a low response rate created one of the key challenges of this research.

4.3.2.3 Case study method with multiple cases

In stage two of the research, before the development of the WFE-DSS prototype artefact (instantiation), multiple case studies were carried out to identify small business internal issues, needs, and DSS requirements following the HMPR DSR guideline 2. The case study was useful as it is an empirical inquiry that investigates the phenomenon within its real-life context (Myers, 2013; Yin, 2009). As mentioned previously, a case study is also a qualitative research method adopted by this study, which aims to explore and explain contemporary real-life situations (Myers, 2013). In addition, in IS research, the use of

qualitative research methods like case studies can determine the managerial and organisational issues associated with the innovation of technology (Myers, 2015). Moreover, DSR has two essential processes of design and evaluation, supported by various approaches. One of these activities is problem identification and requires qualitative data to be gathered through interviews (Botes, Goede & Smit, 2014).

This study was centred on the IS and management disciplines and applied the qualitative research method following DSR to ascertain small business decision-making issues within the B2C e-commerce environment. A case study design should be considered when the focus of the study is to answer "what," "why," "how" and "when" questions (Baxter & Jack 2008; Myers 2013). Case studies also support multiple approaches in data collection and analysis processes (Selvanathan, 2011; Myers, 2013).

Therefore, the case study method was a suitable approach to identify small business problems, needs, and DSS requirements.

4.3.2.4 Sample size for case studies

In the field of business and management research, the focus is usually on a single organisation as a sample (Myers, 2013). In addition, samples are often small in qualitative case study research (Myers, 2013; Saunders et al., 2009). However, this study targeted 20 small firms in the Australian retail sector because a small sample is not a fixed rule in qualitative research (Boeije, 2010). Accordingly, a case study method with multiple cases was considered appropriate for this research project. In the same fashion, some researchers also used multiple-case-study design to understand the contemporary phenomenon in their qualitative research (e.g., Houghton, Casey, Shaw, & Murphy, 2013; Ritvala & Salmi, 2011). Although the targeted sample size was 20, responses were received from only 11 small businesses.

4.3.2.5 Sampling techniques for case studies

Two types of sampling techniques are recommended by some researchers (Saunders et al., 2009):

1. Probability or representative sampling.
2. Non-probability or judgement sampling.

4.3.2.5.1 Probability or representative sampling

With probability sampling, each case can be selected from the known population and the population is usually equal for all cases. This idea aims to answer research questions and to achieve objectives and requires researchers to estimate the characteristics of the population statistically from the sample. Rationally, probability sampling is often associated with survey and experimental research strategies (Saunders et al., 2009). However, probability sampling was not suitable for the current study despite the selected population being known. This study was centred on management decision-making strategies using case study method in qualitative research.

4.3.2.5.2 Non-probability or judgement sampling

With the non-probability or judgement sampling, each case is selected from a total population that is not known. The judgement sampling enables researchers to use their judgement to select cases that will be reliable and allow them to get answers to their research question(s) and meet research objectives (Saunders et al., 2009). Judgement or non-probability sampling is also known as purposive sampling. This is often used when working with small samples using case study research, and specifically when a researcher wishes to select cases that are particularly informative (Saunders et al., 2009). In addition, purposive sampling enables the selection of particular individuals who are in most need of improvements. Judgement sampling is a popular method in qualitative research because the researcher is concerned with selecting information-rich subjects and often has a predetermined target population in mind (Tomal, 2010).

The purposive sampling technique was suitable for this study because the targeted population was owners/managers of small businesses in the online retail sector in Australia. Furthermore, the study has a particular focus on their strategic decision-making and improvements through the development a DSS artefact.

4.3.2.6 Data collection technique through multiple case studies

This study adopted the qualitative data collection approach because case studies are the most common qualitative method used in IS research (Myers, 2013). The rationalisation for the qualitative approach was the relevance for collecting descriptive data from participants in statements rather than numbers (Barrat, Choi, & Li, 2011). Questionnaire was designed to collect information about owner/manager perceptions of their experiences and strategic decisions in the dynamic B2C e-commerce environment to

select competitive features on their websites. Thus, this study can develop strategies to improve decision-making through designing a practice-based DSS solution artefact.

Many data collection techniques can be applied in strategic decision research, including observation, the study of organisational records, interviewing and questionnaires (Mintzberg et al., 1976). The interview is the most common, and one of the most recommended data gathering tools in qualitative research (Myers & Newman, 2007). The interview technique is applied for a variety of purposes including assessment of needs, improvement of performance, and identification of issues related to strategic planning (Guion, Diehl & McDonald, 2011). Although the qualitative interview is an excellent way to gather data, it does create some difficulties. The researcher asks respondents questions often under time pressure during the conduct of time-limited interviews (Myers & Newman, 2007). Such difficulties were experienced by the researcher in this study when conducting case studies with small businesses.

Therefore, this study developed online questionnaire for collecting descriptive data from participants. Interview questionnaire was circulated via an email that provided a URL and data was gathered through the use of a Google form. This form provides a number of options for creating online questionnaire for qualitative data collection purposes. Online research methods provide considerable methodological potential and flexibility for studies in all fields of social science research (O'Connor, Madge, Shaw & Wellens, 2008).

Contact was first established with respondents via phone and then by email. An introductory invitation letter was sent to respondents briefly explaining the purposes of the study and including an information sheet about the research and a link to the web-based interview questionnaire.

This study mainly adopted the asynchronous online interview method, which has many advantages. A comparison of various approaches is presented in **Table 4.6.** However, the significant disadvantage of using this approach is that respondents can easily ignore and/or delete the email (O'Connor et al., 2008). Thus, the researcher followed-up communication with respondents by phone and email, giving them a friendly reminder to complete the form, or to enquire if they needed any help. The researcher also met a few small business respondents in person in Melbourne, request them to fill out the online form. In the end, 11 responses were received from the 20 samples selected.

Table 4.6: A comparison attributes of online and in person interviews

Attributes	Asynchronous online interviews	Synchronous online interviews	Onsite face-to-face interviews	Telephone interviews	VOIP interviews
Venue	Email and discussion board	Chat room or conferencing site	Onsite venue	Telephone provider	VOIP provider
Temporal restrictions	Non-real time	Real time	Real time	Real time	Real time
Limitations	No time constraints	Constrained by time	Constrained by time	Constrained by time	Constrained by time
Software requirements	Simple, familiar	More complex	N/A	N/A	More complex
Technical ability	Low	Medium	N/A	N/A	Medium
Speed of response	Time to reflect included	Spontaneous	Spontaneous	Spontaneous	Spontaneous
Format of response	Written	Written	Oral and non-visual clues	oral	Oral and potential for visual clues
Disadvantages	Easy to ignore or delete	Technical issues	Cost	Technical issues	Technical issues
Transcription	Generated automatically	Generated automatically	Not generated	Not generated	Not generated
Cost	Low cost	Low cost	High cost	High cost	Low cost

Source: O'Connor et al., 2008, p. 273

Many researchers have employed email interviews for the data collection (Khatun, 2011; O'Connor et al., 2008; Sellitto et al. 2003). Sellitto et al. (2003) used email interviews with small business owners in wineries in Australia. Similarly, O'Connor et al. (2008) employed online interviews and suggested that these can be conduct in non-real time and are increasingly being used as a data collection method by social scientists. Likewise, Khatun (2011) administered email interviews by using web-based structured and unstructured questionnaires with B2C organisations in New Zealand, Australia, and Bangladesh.

4.3.2.7 Designing interview questionnaire for multiple case studies

Semi-structured and unstructured questions were used in this study. SWOT (strengths, weaknesses, opportunities, and threats) guidelines were also used to investigate small business internal issues and needs in the online retail environment. The interview questionnaire is provided in **Appendix A.**

A SWOT framework was developed by Ken Andrews of the Harvard Business School in the mid-1960s and was applied to the field of strategic management research (Zack, 2009). Traditionally, SWOT analysis involves describing and analysing firms' internal competencies, such as their strengths and weaknesses relate to external opportunities and threats in the competitive marketplace (Andrews, 1997; Zack, 2009).

The internal factor analysis involves documenting the overall business strategy, including organisation objectives, strengths, and problems, investigating available resources (capital and competency) and considering the types of products or services offered by the small business (Burgess et al., 2009). As discussed earlier and shown in **Table 4.5**, in this study, internal environmental factors include skills and knowledge, technology use, and management strategies, objectives, strengths and problems, system users and existing systems.

4.3.2.8 Data analysis methods

Data analysis is typically based on the philosophical, methodological and theoretical perspectives that researchers adopt. These foundations are gradually articulated as researchers continue to reflect on their research experiences while conducting research (Bazeley, 2013). As discussed early in this chapter, the present study adopted the constructivist research philosophy with a qualitative research strategy and a DSR methodology for finding problems and addressing the technology-based solution. Qualitative data can be analysed and interpreted in many different ways (Myers, 2013). Therefore, no formula exists for the transformation of data into knowledge (Patton, 2015). The basic techniques of qualitative data analysis are the top-down and bottom-up methods (Myers, 2013).

4.3.2.8.1 Top-down and bottom-up methods

In the top-down method, researchers analyse data generated from the research literature and construct theories for the evaluation through empirical studies. In the bottom-up approach, the qualitative project is designed to be exploratory, and the outcome relates to building theories (Myers, 2013). Given that, the present study adopted both the top-down and bottom-up qualitative research approaches. The study developed theoretical knowledge through the literature review in the problem and solution contexts, and conducted case studies and web content analysis for evaluating theories to identify business issues and needs. This process was a top-down analysis method. Again, new

theories or justificatory knowledge were constructed from the case studies and web content analysis to inform the development of an IS-based solution artefact that was exploratory in nature. This represented a bottom-up data analysis approach.

4.3.2.8.2 Data analysis using a content analysis method

The content analysis (CA) method was utilised to analyse small business responses through case studies using questionnaire and an analysis of website features. The CA method is broadly applied to a range of strategies for text analysis and typically uses a computer to analyse a large sample of texts (Bazeley, 2013). Some of the benefits of CA are outlined in **Table 4.7.**

Table 4.7: Benefits of the content analysis method

Sources	Advantages of content analysis
Myers (2013)	• CA provides a researcher with a structured method for quantifying the contents of qualitative or interpretative texts in a simple, clear and easily repeatable format.
Patton (2015)	• CA searches text for counting recurring words or themes. • It analyses texts including interview transcripts, diaries or documents, rather than observation-based field notes. • Notably, CA assists researchers with qualitative data reduction and sense-making. • It assists in condensing the volume of qualitative data and attempts to identify core consistencies and meanings.
Elo and Kyngäs (2008)	• CA is a method that may be used with either qualitative or quantitative data and in an inductive or deductive way.

Although, CA can be used with either qualitative or quantitative data and in inductive or deductive ways (Elo & Kyngäs, 2008), this study implemented an inductive CA method as the case study responses and web feature assessments were in text format.

4.3.2.8.3 Inductive content analysis method

The inductive CA method can be used in cases in which no previous studies have dealt with the phenomenon. The inductive CA can also be applied when content is fragmented by using qualitative data (Elo & Kyngäs, 2008). This is discussed later.

The benefits of using an inductive CA method for analysing qualitative data are outlined in **Table 4.8.** Qualitative inductive analysis "generates new concepts, explanations, results, and theories from the specific data of a qualitative study" (Patton 2015, p. 541).

Table 4.8: Benefits of the inductive content analysis method

Sources	Benefits of inductive content analysis
Patton (2015)	• It begins with immersion in the details and specifics of the inquiry to discover meaningful patterns, themes, and interrelationships among texts. • Data analysis is looking for themes and patterns across case studies. • The inductive analysis is guided by the analytical principle rather than by rules and ends with a creative synthesis. • Theory emerges from cases (grounded theory).
Eriksson and Kovalainen (2015)	• Inductive analysis often relates to qualitative analysis and discovery-based research.
Cho and Lee (2014)	• Inductive content analysis is typically used for qualitative data analysis. • Codes, categories, or themes are directly drawn from the data.

The data analysis assists in segmenting the data and then in reassembling that data with the aim of transforming the data into results. Results could be descriptions that are more or less theoretical and interpretative explanations of the research topic (Boeije, 2010). Thus, this study adopted a qualitative inductive CA method through multiple case studies and web features analysis to generate explanations of findings and produce justificatory knowledge or theories.

4.3.2.9 The data source for content analysis

Qualitative data can be split into two main forms: text and non-text formats (Saunders & Lewis, 2012). One of the sources of text data can be interview transcripts (Saunders & Lewis, 2012; Mayring, 2014). The qualitative data sources in this study were case studies responses and small business and overseas competitor website features. The data were in the form of texts.

4.3.2.10 Qualitative data reduction methods

The first step in qualitative data analysis is data reduction, which is the process of selecting, coding and categorising the data (Uma & Roger, 2010). Researchers use a number of data reduction methods (Boeije, 2010; Myers, 2013; Saldaña, 2015; Uma & Roger, 2010). A summary of these methods is presented in **Table 4.9.**

Table 4.9: Data reduction procedures

Sources	Data reduction procedures
Uma and Roger (2010)	• Selecting, coding and categorising data.
Boeije (2010)	• Breaking up and separating research data into pieces, parts, elements or units.
Myers (2013)	• Coding that can be a word and used to describe or summarise a sentence, a paragraph, or even a whole piece of text, such as an interview script.
Saldaña (2015)	• Coding, categorising and building concepts and theories or assertions.

One of the modest ways of analysing qualitative data is the coding of data (Myers, 2013). The codes in data reduction are researcher-generated constructs that interpret individual data for the purpose of detecting data patterns, categorisation, development of propositions, building of theories and other analytical processes (Saldaña, 2015). The core of theory building is called data analysis (Barratt et al., 2011).

Saldaña (2015) developed a model of data reduction and qualitative data analysis known as the streamlined codes-to-theory model, shown in **Figure 4.4.** This model was appropriate for this study because the model suggests not only qualitative data reduction practices through data coding and categorising, but also recommends qualitative analysis through developing concepts and theories that the current study adopted in DSR. Other researchers only focus on data reduction techniques, but they do not emphasise concept or theory building (Boeije, 2010; Myers, 2013; Um & Roger, 2010). Given that, as discussed early, this study adopted the qualitative inductive analysis method to provide explanations of findings and generate theories or justificatory knowledge.

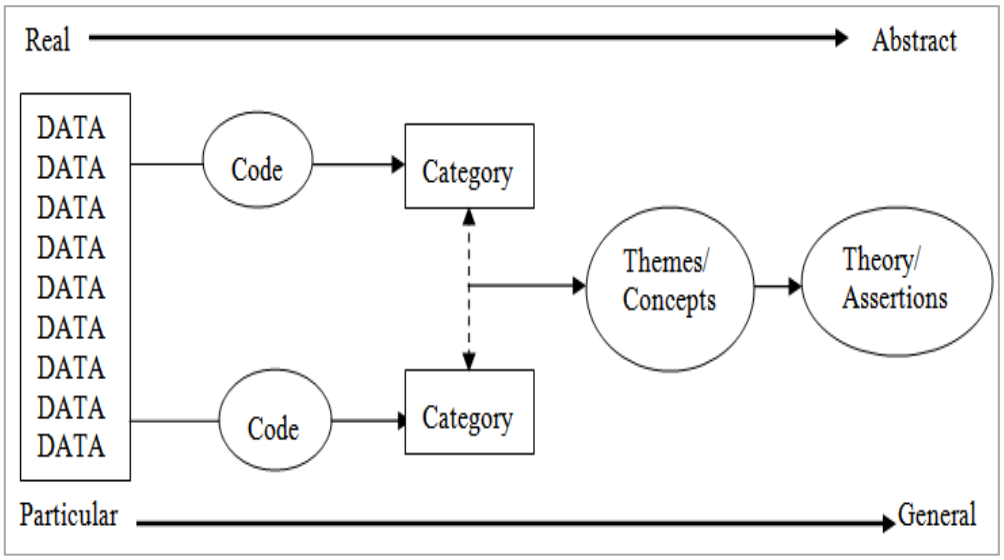


Figure 4.4: A streamlined codes-to-theory model adopted from Saldaña (2015)

The data collected through multiple case studies and their analysis enabled the generation of lists of internal small business issues and created theoretical concepts or justificatory knowledge. These are documented in Chapter 6. Findings from web feature assessments and their analysis were generated into lists of website issues and formed further justificatory knowledge or concepts. These are documented in Chapter 5. New theoretical concepts were again analysed using the MRT model (a strategic decision model in the conceptual DSS solution framework) to identify small business issues, needs, and DSS requirements. These analysis processes and DSS design methods are documented in Chapter 7.

Thus, the identified small business issues and needs informed the development of a DSS artefact for a solution to the research problem raised. The next section describes stage three of the research project, which involved the DSS solution design, development, and evaluation.

4.3.3 Stage three of the research design

The research design steps in stage three are shown in **Figure 4.5**. This stage was designed to address RQ2 and RQ3, to achieve objective three of the study**.** This stage was also linked with the development and selection phases of the MRT model which is an iterative process.

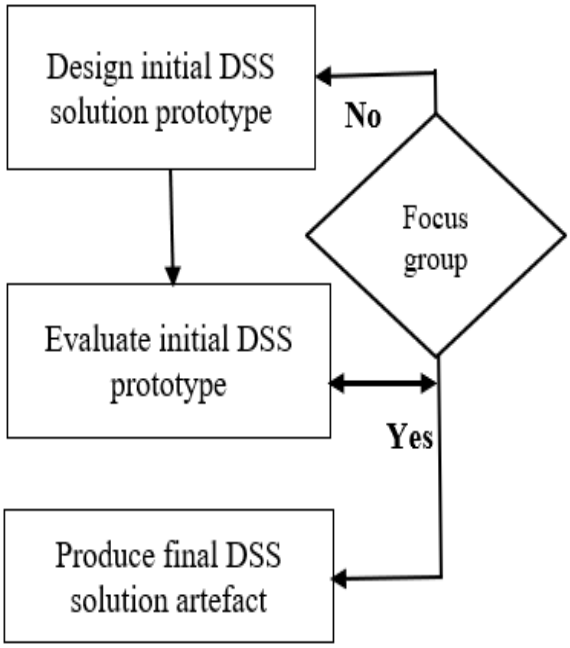


Figure 4.5: Steps for stage three of the research design

Progressing from the development and selection phases of the MRT model, the main goal of this stage of the study was to deliver a practical solution to address the research problem. Therefore, this stage comprised three steps: the design of the initial DSS prototype, evaluation of the prototype, and production of the final DSS solution artefact. These steps are outlined in the following sections.

4.3.3.1 Design the initial DSS solution prototype

According to March and Smith (1995), building is the process of constructing an artefact for a specific purpose. The initial DSS prototype instantiation was designed with various user-friendly UIs, which are documented in Chapter 8. The UI design aims were to create the various DSS features with relevant input windows to support a small business manager in performing tasks. In this stage, parameters for decision-making and outcome variables were ascertained. Another key option was to have a main window through which a user could manage the system, accessed in multiple ways. System options included save, add, edit, and delete decision-making parameters.

4.3.3.2 Evaluation of the initial DSS prototype

The initial prototype was evaluated by the researcher and the project supervisor, as well as by end-users. This evaluation is documented in Chapter 9.

4.3.3.2.1 Evaluation of the initial DSS prototype by the researcher and supervisor

The DSS prototype was initially tested by the researcher and project supervisor. They input the data (small business website features and competitor website features) into the system and carried out analysis using different UIs and fixing some errors.

4.3.3.2.2 Evaluation of the initial DSS prototype by end-users

The evaluation is the process of determining how well the artefact performs (March & Smith, 1995). In this stage of the development process, the data entered into the system to trial the data display functions and to confirm if the DSS features were performing well, such as yielding the expected outcome for an owner/manager. Owners/managers were invited to use the DSS prototype to determine if the system functionality met end-user requirements. It was important to understand the user experience in interacting with the system and identify any problems related to usability, efficacy, and performance of the prototype.

4.3.3.2.3 Data collection techniques and data source of the DSS prototype evaluation by end-users

A series of assessments were conducted in the focus group sessions with five owners/managers from small business B2C organisations. These focused on evaluating the initial DSS prototype instantiation. The detailed assessment processes, data collection, and analysis techniques and results are documented in Chapter 9.

4.3.3.3 Producing the final DSS solution artefact

In this step of stage three, the final DSS solution artefact was produced based on end-user feedback, as well the rectification of errors identified by the researcher and project supervisor. Finally, the "Welcome Window" was changed to create a professional look, as shown in **Appendix H:** End-user manual. The majority of users agreed that the DSS prototype was easy to use and useful for their businesses.

4.4 Data analysis tools

For qualitative data reduction and analysis, researchers usually use expensive commercially developed software, such as NVivo or Atlas.ti, which are purchase by institutions under licensing agreements (Bree & Gallagher, 2016). The limitation of using commercial qualitative software is that a postgraduate research student works under the licensing agreement of their institution and is not able to open the file once that agreement

expires. Consequently, this study used MS Office for data reduction using a colour coding technique following the streamlined codes-to-theory model (Saldaña, 2015). MS Word was considered suitable because it is cost-effective and widely accessible. Moreover, most of the respondents from small businesses provided short descriptions in their responses, thus it was not necessary to use NVivo software, which normally caters for vast amounts of qualitative data. Other researchers have used the MS Office suite for interview data coding and analysis with a colour coding method (Bree, Dunne, Brereton, Gallagher, & Dallat, 2014; Bree & Gallagher, 2016).

MS Word was used for making tables and graphs, as well as data reduction. MS Excel was used for data tabulation and visualisation. As already indicated a Google form was used for the web-based interview question design. The object-oriented programming language C# was used to implement the tool. Data were stored on a SQL Server. This all contributed to the DSS development.

4.5 Ethics approval

As this study involved conducting online interviews with owners/managers of small businesses, ethics approval was required from the Victoria University Human Research Ethics Committee (VUHREC). The researcher applied for ethics approval shortly after the confirmation of candidature. Ethics approval was received on 28 September 2015 (Ref. HRE15-216).

4.6 Chapter summary

This chapter has presented the research philosophy, methodology, and overall research design across different stages for achieving the research objectives. The research methodology, based on the theoretical groundwork, is the overall approach used in the research process for the collection and analysis of data. In this context, this chapter has presented and justified the research methodology adopted for this study, developing concepts that meet the needs of the problems identified in the small business domain. The particular research methodology, the DSR method, was introduced for small business problem identification and solution. Philosophical reasons for why this approach was appropriate for the research project were provided. DSR has become an important and widely used method within the IS research community. Notably, the HMPR seven guidelines for DSR are used extensively in IS research. Thus, this study adopted HMPR

DSR for the overall research design and development. This chapter also described details of data collection, data analysis methods, and tools used for data analysis, as well as ethical considerations of conducting the research.

Most importantly, the stages of research design with activities for achieving the research objectives have also been framed in this chapter. Stage one of this study was involved in reviewing the relevant literature in the problem domain, constructed kernel theories or justificatory knowledge that defined the small business problems, needs, and DSS-based solution. A conceptual DSS solution framework has also been designed in this stage for further analysis of the results from the empirical studies for a practical solution. Stage two of this study was involved in empirical studies through web content analysis and multiple case studies. These studies were highly important to identify the small business issues, needs, and DSS-based solution design requirements. Stage three outlines the DSS design and development steps, which were documented in Chapter 7, Chapter 8 and Chapter 9. The next chapter presents the first round of data collection of stage two, focused on an analysis of small business website features compared with their overseas competitors.

Chapter 5: Web Content Analysis and Results

This chapter describes identified issues on existing small business B2C websites. Problem identification related to website features informed the design of the new DSS-based solution. As discussed in the previous chapter, this study adopted the HMPR DSR guidelines. Guideline 5 recommends the use of rigorous methods in the design of artefacts. For the identification of small business website problems, needs and DSS requirements, this study collected appropriate data and applied analysis techniques for web content analysis. This generated a series of descriptive justificatory knowledge that informed the design of the DSS-based solution.

The chapter is structured in eight sections. Section 5.1 discusses the importance of contents on business websites. Section 5.2 explains and justifies CA as a method to analyse website content. Section 5.3 outlines the advantages and Section 5.4 limitations of the CA method and Section 5.5 reviews how the CA method can support the analysis of website content, particularly in examining website features as text formats using different techniques and data collection methods. Section 5.6 outlines the data sources and finding techniques, and Section 5.7 describes the CA results and their analysis. Section 5.8 outlines the summary of findings on CA, and finally, Section 5.9 provides the chapter summary.

5.1 The importance of website content

The content of an organisation's website is important as it has a direct impact on the visitor experience of the products or services on offer (Ip, Law & Lee, 2011; Miah, 2004). In the e-commerce environment, the most efficient communication channel is the website as it represents an interface between a company its customers and is the primary source of the customer experience. The website acts as a virtual place for promoting a business by displaying its product and price catalogue. It also represents the sales and distribution point. Therefore, the website is the functional platform of communication, interaction and transaction for online customers (Constantinides, 2002). Hence, the analysis of website content was important for addressing RQ1 of this study, with a focus on examining the current state of small business website features compared with their overseas competitor websites (external factor). This investigation was linked to the identification phase of the

MRT model in the conceptual DSS framework and informed the design of a new IS-based solution.

One of the objectives of this study was to identify the small business website issues within the B2C e-commerce environment that conveyed the DSS-based solution and design requirements. Rigorous methods were adopted to investigate and analyse small business website contents, such as features against their overseas competitors who sell to Australia. These well-developed methods and activities are documented in this chapter.

5.2 Content analysis

In the literature, researchers have defined CA in three basic categories (cited by Krippendorff, 2004, 2013):

1. Definitions that take content to be inherent in the text (Bazeley, 2013).
2. Definitions that take content to be the property of the text source, such as books, magazines, other websites, poems, newspapers, and email messages (Babbie, 2016; Krippendorff, 2004, 2013).
3. Definitions that view content as emerging during the process of a researcher analysing texts in a particular context (Krippendorff, 2013). Krippendorff (2004, p. 24) states: "Every content analysis requires a context within which the available texts are examined".

Therefore, "Each of these kinds of definitions leads to a particular way of conceptualising content and, consequently, of proceeding with an analysis" (Krippendorff, 2004, p. 19).

5.3 The advantages of a content analysis method

The main advantage of CA is that it provides a researcher with a precise method for quantifying contents of qualitative or interpretative texts in a simple and clear repeatable way (Myers, 2013). In addition, CA is an unobtrusive method (Krippendorff, 2004), allowing researchers to collect discrete data from websites without involving business directly (Alonso Mendo & Fitzgerald, 2005). Most importantly, the CA method is relatively simple and economical compared to other techniques (Holsti, 2008). For example, instead of spending time and resources using traditional methods for collecting data through interviews, surveys and focus groups, a researcher can download data quickly from the Web without the need to engage users (Kim & Kuljis, 2010). This

method is particularly appropriate if the necessary data is readily available, as it is in Web-based content (Holsti, 2008). For example, Burgess (2016) adopted the CA method for data collection in a study on small business websites.

Accordingly, the contents of small business and overseas competitor websites were analysed unobtrusively without involving the organisations.

5.4 The limitations of a content analysis method

Although the CA method has many benefits as discussed above, like any other method, it also has some limitations. A CA method can be seen as lacking a theoretical basis since the focus is on what is measurable rather than on what is theoretically significant. As a result, the research design must consider whether there is a relationship between the frequency of occurrence (Bryman & Bell, 2015). Although researchers can provide many theoretical answers to research questions, CA alone cannot give the answers. This limitation can be diminished if combined with another method that is more appropriate to measure those aspects, such as experiments, surveys, or interviews (Holsti, 2008). In the present study, in conjunction with the analysis of website features, data was also collected through multiple case studies with small businesses to achieve the research objectives. The next section discusses how a CA method can be applied to examining website features.

5.5 Applying a content analysis method to website content

Many studies have applied the CA method to the analysis of website content (Burgess, 2016; Herring, 2010; Kim & Kuljis, 2010; Parker et al., 2011). Some researchers have employed this method specifically for analysing website features (Alonso Mendo & Fitzgerald, 2005; Al-Qirim, 2007; Burgess, 2016; Fisher et al., 2007; Ying, Basil & Hunter, 2009).

However, researchers have faced difficulties when applying the CA method to the analysis of website content (Herring, 2010; Kim & Kuljis, 2010) due to the rapid growth and changes in web-based content in a dynamic environment (McMillan, 2000). This makes it difficult for sampling, coding and categorising website content (Herring, 2010). McMillan (2000) adopted Krippendorff's (1980) traditional CA method to address the

challenge of applying a CA method to the analysis of website content. This is summarised in five steps:

1. Formulates research questions and hypotheses.
2. Selects a sample.
3. Content categories are defined for coding.
4. Coders are trained, code the content, and the reliability of their coding is checked.
5. The data collected during the coding process are analysed and interpreted.

In addition, McMillan (2000) suggested that problems can be overcome by a rapid collection of data and quick downloading from websites. Parker et al. (2011) developed five major steps for qualitative CA based on a review of the literature. These are:

1. Defining the research objective and unit of analysis.
2. Selecting the contents.
3. Analysing the contents.
4. Interpreting the contents.
5. Drawing conclusions.

McMillan (2000) adopted Krippendorff's (1980) five steps, which he then adapted for a systematic analysis of website content. These are presented below.

5.5.1 First step: Formulate research questions

As stated by Krippendorff (2004,1980), all content analyses should be guided by research questions. McMillan (2000) concurred, saying that the first step of the CA method is to formulate research questions. Parker et al. (2011) suggested defining research objectives for the qualitative content analysis. In the context of the small business web content analysis, the research objectives of this round of data collection were:

- To identify the available features on Australian small business websites in the B2C e-commerce environment.
- To determine the available features on overseas competitor sites through which they sell to Australia.
- To compare the features of Australian small business websites with those of their overseas competitors.

5.5.2 Second step: Selection of the sample

In this step of the CA method, the researcher selects the sample (Krippendorf, 1980). In theory, drawing a random sample should not be difficult if the researcher draws a sample from offline sources (e.g., directories). However, the selection of samples may be one of the most challenging aspects of content analysis on the Web due to many websites growing explosively, and available directories being incomplete and often overlapping (McMillan, 2000). Therefore, selecting a valid random sample may be practically impossible.

Also, for random, systematic, stratified, probability, cluster, and snowball sampling, texts are sampled according to their sources, situation, time periods, categories, and intertextualities. All of these can be used without reading or analysing of sample texts. On the other hand, relevance or purposeful sampling aims at selecting all textual units that this current study adopted that contribute to answering the given research questions, as the resulting sample defines the problem that has been identified (Krippendorff, 2013).

Purposeful sampling was appropriate for the analysis of small business and overseas competitor website features. This technique is also known as comparison focused sampling, with a selection of samples that explain similarities and differences (Patton, 2015). Therefore, the researcher reviewed a sample of 25 small business website features to compare with the website features of 25 overseas competitors who sell to Australia.

5.5.3 Third step: Define categories of contents, units of analysis and coding units

The following sections define the categories of contents, units of analysis and coding units.

5.5.3.1 Define the categories of contents

In this step of the CA method, Krippendorf (1980) recommended defining the categories of content. Parker et al. (2011) agreed with the importance of selecting the type of website content to be analysed. Website content types are text, graphics, animation, and video (Kim & Kuljis, 2010). In the B2C e-commerce environment, small business website features were categorised using Angehrn's (1997) classification of information, communication, distribution and transaction (ICDT).

5.5.3.2 Units of analysis and coding units

McMillan (2000) identified two primary units of content assessment in the literature: context units and coding units. According to this author, coding units are the smallest segment of content counted in the content analysis. The context unit is the body of text material surrounding the coding units. For example, if the coding unit is a word, the context unit might be the sentence or the paragraph or the entire article in which the word appears. Many researchers use the context unit as the unit of analysis in which coding units are drawn. McMillan (2000) recommended that researchers define the units of analysis.

In the context of a comparative analysis of Australian small business website features against their overseas competitors, the four categories of ICDT were used as the coding units. The ICDT categories were the main categories and contained sub-categories. The ICDT categories are outlined in the **Appendix B**. The sub-categories were: small business website features and overseas competitor website features under ICDT categories, which are the context units or the unit of analysis. According to McMillan (2000), coding units mainly depend on the theory upon which the study is based, and the research questions being explored.

5.5.4 Fourth step: Train the coder and check the reliability of the coding

In the fourth step of the CA method, coders need to be trained and methods established to check the reliability of their coding (Krippendorff, 1980). Some researchers recommend involving no less than two coders to assess each website, compare results and decide on any dissimilarities that exist (Burgess, 2016; Ting, Wang, Bau & Chiang, 2013). Luna-Nevarez and Hyman (2012) recommended employing multiple coders to verify coder reliability. These authors employed three coders separately to evaluate 262 tourist destination websites. McMillan (2000) trained two coders to assist in coding website content, with instructions and coding sheets delivered by e-mail and coders given URLs for sites to be coded. However, the inter-coder reliability is a potential problem due to the rapid growth and changes in website content discussed earlier. McMillan's study suggested all coders should code on the same day and at the same time. Hashim, Hasan, and Sinnapan (2007) suggested training a single coder to ensure the reliability of the coding. Burgess (2016) recommended avoiding multiple coders because of the increases cost.

In the present study, the researcher requested an IT student to assist in the coding process while sitting in the same working space. This avoided additional cost. The MS Excel coding sheet already coded by the researcher was given to the student as well as the URLs for the 25-small business and 25 overseas competitor websites. Only one coding variation was found, with 'business name' placed under 'value added' features instead of under 'contact details'. This error was fixed.

5.5.5 Fifth step: Analysing and interpreting data

In the fifth step, researchers need to analyse and interpret research findings by employing the necessary procedures of the CA paradigm. However, statistical tests that adopt a random sample were not appropriate for website content analysis (McMillan, 2000). According to Krippendorff (2004), quantification is not a defining criterion for content analysis. The text is always qualitative. Categorising textual units is considered the most elementary form of measurement and a content analysis may well result in answers to a research question. In the present study, however, the sample was purposeful due to a particular context, and the qualitative content analysis approach was adopted as features on websites were text-based. CA is also a systematic approach in qualitative data analysis that looks for structures and patterned consistencies in the text (Myers, 2013). This study adopted a qualitative CA method for data collection. Contents were the small business, and overseas website features in text or word formats, because CA is a research method of textual data analysis (Cho & Lee, 2014). Also, CA is one of the qualitative data collection techniques in business and management research, additionally the systematic approach to qualitative data analysis (Myers, 2013). The next section describes the data sources (website sources) used and the finding techniques.

5.6 Website sources and finding techniques

This section includes two parts. The first part describes the source of small business websites and finding techniques. The second part describes the source of overseas sites and finding techniques.

5.6.1 Source of small business websites and finding techniques

Many small businesses use web portals, regional or business directories and social networking sites as part of their web presence (Burgess, 2016). As indicated previously, small businesses were selected from the online Yellow Pages of Australia, an online

business directory. Baygan (2001) also used this source for a small business index survey in Australia.

The Google search engine was used to search for the small business websites to be analysed. Although many search engines exist on the web (Rosenblatt, 2014), Google was selected as it is the most popular (Burgess, 2016; Orduna-Malea & Aytac, 2015; Orduña-Malea, Delgado López-Cózar, Serrano-Cobos & Romero, 2015; Rosenblatt, 2014). The Australian version of Google was used. Burgess (2016) also used this version in searching for Australian small business websites in different industry sectors.

When the small business website URL provided in the online Yellow Pages failed to link to a website, the full name of the business was enclosed with quotation marks and entered into Google. This technique was also employed by Burgess (2016). The benefit of using quotation marks is that it synchronises the text string precisely for easier searching. The present study also examined the first three pages in a Google search, a technique used in other studies (for example, Burgess, 2016; Vaughan & Romero-Frías, 2012). This is a precise method to find business websites quickly, although it does not always require a search on the second and third pages (Vaughan & Romero-Frías, 2012).

The current study found that many small businesses do not have websites, but provide their contact details and product information on social media and online business directories (e.g. Yellow Pages, True Local, Yelp, etc.). At least they have their business name, address, phone number and email on the Web and have a web presence.

5.6.2 Source of overseas websites and finding techniques

This step involved finding the source of overseas websites of businesses that sell to Australia. The most suitable source was the Whirlpool website http://whirlpool.net.au/wiki/international_stores_that_ship_to_australia.

Whirlpool is an online social site in Australia, which, through discussion boards (Parker et al., 2011), engages with a community of users who have used overseas online stores in last two years (Whirlpool, 2015). Therefore, these users add overseas online store names to the Whirlpool website. This online site contains databases of overseas websites of businesses that sell their products to Australia (Whirlpool, 2015).

The researcher searched the URLs of overseas websites through the Google Australian search engine using key phrases related to the research problem, such as: "many Australian consumers purchase from overseas websites." The Whirlpool website URL was found using this technique. Ultimately, 25 overseas competitor websites were selected from this site for analysis.

During the analysis of website features, coding involved each feature of the small businesses in the sample, as well as their overseas competitors. The researcher used a MS Excel sheet to store data and to create a database with the coding of the individual small business and overseas website features. A screenshot of the MS Excel sheet is shown in **Appendix C.** The next section discusses the findings and analysis.

5.7 Findings, discussion and analysis

This section describes the findings from the analysis of the extent or adoption level of small business website features versus the level of available features on overseas competitor sites. The study first outlined the results through analysing the website features. It then analysed the findings and finally developed a series of statements or justificatory knowledge. This knowledge informed the construction of the IS based solution. Descriptions and usefulness of some subcategory of website features are outlined in **Appendix D.**

5.7.1 Findings from analysing content related to information-based website features

Table 5.1 shows the findings from the content analysis of the information-based features of the sample of 25 small business and 25 overseas competitor websites.

Table 5.1: Information-based features available on small business and overseas websites

Categories of website features in the B2C e-commerce environment		**Features available on 25 small business websites**			**Features available on 25 overseas websites**		
Information-based main categories of website features	Information-based sub-categories of website features	Samples	(%)	Ave (%)	Samples	(%)	Ave (%)
Contact details	Business name with web presence	25	100	100	25	100	100
	Business activities	24	96	62	25	100	58
	Email address	18	72		11	44	
	Location with map	17	68		13	52	
	Telephone	22	88		19	76	

Categories of website features in the B2C e-commerce environment		Features available on 25 small business websites			Features available on 25 overseas websites		
Information-based main categories of website features	Information-based sub-categories of website features	Samples	(%)	Ave (%)	Samples	(%)	Ave (%)
	Fax	5	20		15	60	
Business information	Product description	12	48	33	21	84	82
	Service description	21	84		18	72	
	Static product review	1	4		15	60	
	Product catalogue	13	52		18	72	
	Policies	4	16		24	96	
	Mission	0	0		21	84	
	Company background	14	56		25	100	
	Employee background	8	32		18	72	
	Privacy policy	6	24		24	96	
	Client testimonials	3	12		19	76	
	Business images	22	88		25	100	
	Business videos	1	4		15	60	
	Print order form	1	4		24	96	
Added value	FAQ	1	4	34	15	60	86
	Product use instructions	2	8		24	96	
	Financial calculator	0	0		24	96	
	Mobile friendly	15	60		19	76	

The left-hand part (first two columns) of this table exhibits the "information-based" main category and subcategory of website features. The middle part shows the content analysis results regarding the level of "information-based" features available on small business websites. The right-hand part displays the levels of similar features available on their overseas competitor sites. The next section describes the results of the comparative analysis.

5.7.1.1 Comparative results on information-based website features

This section describes the results regarding the level of information-based features that were available on small business websites compared to their overseas competitors' sites. **Figure 5.1** provides a graphical representation of this comparison.

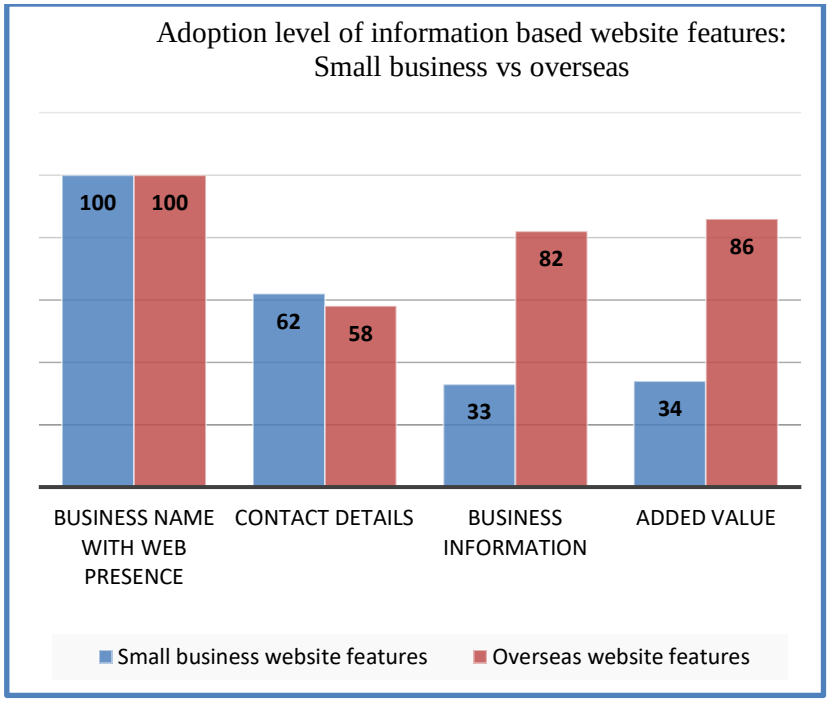


Figure 5.1: Comparison of the level of information-based features on small business websites vs. overseas websites

Comparative results on the information-based category of website features include the sub-categories, as follows:

- **Contact details:** This is one of the main sub-categories of information-based website features. This feature comprises business name, business activities, email address, location with map, telephone and fax numbers. Results show that 62% of small businesses have contact details categories on their websites, while overseas competitors have 58%.
- **Business information:** This feature comprises a series of components (as listed in **Table 5.1**)**.** Results show that the only 33% of small businesses have business information related features on their websites, whereas overseas competitors have 82%.
- **Value added:** This feature includes frequently asked questions (FAQ), product use instructions and financial calculators. Results show that only 34% of small business websites have value-added features, while overseas sites 86%.

The percentage (62%) of small businesses which adopted 'contact details' was higher than their overseas competitors (at 58%) because small businesses may prefer to sell their products to local customers. The Senate Economic Legislation Committee (TSELC,

2013) in Australia found that most small businesses operate in one location and sell goods or services to nearby customers. The Committee (TSELC, 2013) also found that 55% of small businesses in local directories provided contact details on the local directory websites using email addresses, location with maps (75%), and telephone numbers (100%) to communicate with local customers.

This study also found that unlike Australian small business websites, nearly all overseas sites used business information related and value-added features as they are selling their products not only to local customers, but also to those in other countries, including Australia. The above findings and analysis suggest that:

Significant issues exist on Australian small business websites related to insufficient information-based features compared with their overseas competitors.

5.7.2 Findings from analysing content related to communication-based website features

Table 5.2 shows results of the content analysis in the communication-based category of features available on Australian small business and overseas websites.

Table 5.2: Communication-based features available on small business and overseas websites

Categories of website features in the B2C e-commerce environment		**Features available on 25 small business websites**			**Features available on 25 overseas websites**		
Communication-based main categories of website features	Communication-based subcategories of website features	Samples	(%)	Ave (%)	Samples	(%)	Ave (%)
Contact the business	Email form	13	52	35	21	84	71
	Email order form	1	4		18	72	
	Customer enquiry form	12	48		17	68	
	Sign up for newsletter form	9	36		15	60	
Customer reviews	Customer posting reviews direct to website	1	4	4	12	48	48
Social networking	Social networking online	13	52	52	25	100	100
Online	Bulletin board	3	12	12	15	60	68
	Blog	3	12		19	76	

5.7.2.1 Comparative results on communication-based website features

This section describes the results relating to the level of communication-based features, available on small business websites compared to their overseas competitors' sites. **Figure 5.2** provides a graphical representation of this comparison.

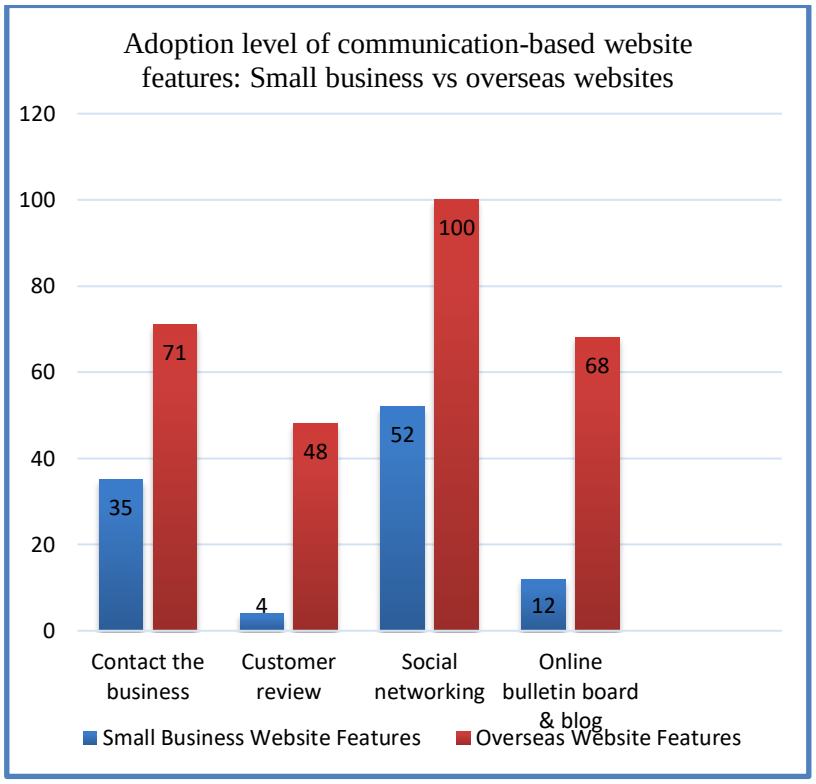


Figure 5.2: Comparison of the level of communication-based website features on small business vs overseas websites

The communication-based sub-categories were contact the business, customer review, social networking and online bulletin board and blog. Comparison results are provided as follows:

- C**ontact the businesses:** Only 35% of small business have this feature on their websites, compared to the majority (71%) of overseas sites.
- **Customer review:** Only a few small business websites (4%) have customer review features, compared with nearly half (48%) of overseas websites.
- **Social networking:** Half of the small business websites (52%) have social networking features on their websites, compared with all overseas sites (100%).
- **Online bulletin boards and blogs:** Few small business websites (12%) have online bulletin boards and blogs, compared with 68% of the overseas websites.

Website feature sub-categories under contact the businesses comprised email forms, email order forms, customer enquiry forms, and sign-up for newsletter forms. These features are essential for a company in communicating with potential customers in the online retail environment. A considerable number of overseas websites (71%) used different online forms to assist customers in contacting them, while only 35% of small businesses used online forms. These findings suggest that online shoppers have limited access to many small business websites due to the lack of other essential communication channels using different online forms.

The limited number of small business websites with customer review features (4% compared with 48% of their overseas competitors) shows that owners/managers of small businesses are not innovative when it comes to improving their product and service quality through customer reviews.

Social networking sites are one of the important communication channels for companies wanting to interact with their customers. However, only 35% of small businesses have social network connections, while all their overseas competitors' websites link to social network sites. A considerable number of overseas sites (60%) used bulletin boards to interact with their customers, allowing them to send messages and announce upcoming events. However, only 13% of Australian small businesses adopted this feature. The above findings and analysis suggest that:

Significant issues exist on Australian small business websites related to the lack of communication-based features compared with their overseas competitors' websites. The inadequacy of such features turns off significant numbers of potential consumers.

5.7.3 Findings from analysing content related to transaction-based website features

Table 5.3 shows the findings for the level of transaction-based features that were available on 25 small business websites and 25 overseas competitor sites.

Table 5.3: Transaction-based features available on small business and overseas websites

Categories of website features in the B2C e-commerce environment		**Features available on 25 small business websites**			**Features available on 25 overseas websites**		
Transaction-based main categories of website features	Transaction based subcategories of website features	Samples	(%)	Ave (%)	Samples	(%)	Ave (%)
Online database	Real-time catalogue	8	32	27	25	100	87
	Online-ordering	8	32		25	100	
	Automatically record customer preference	4	16		15	60	
Payments	Real-time credit card payment	6	24	15	25	100	91
	Internet banking	0	0		22	88	
	Online voucher redemption	2	8		22	88	
	PayPal	7	28		22	88	

5.7.3.1 Comparative results on transaction-based website features

Figure 5.3 provides a graphical representation of the level of transaction-based features available on small business websites compared with their overseas competitors' sites in the online retail environment. The figure highlights the significant contrast between the two sample groups related to online database features and payment features. The comparative results are outlined below.

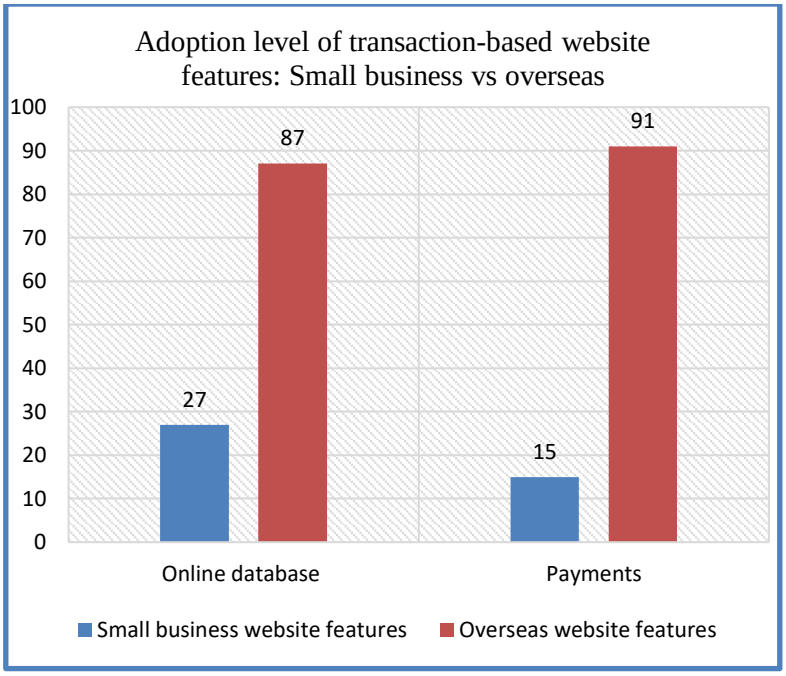


Figure 5.3: Comparison of the level of transaction-based features on small business vs. overseas competitor websites

- **Online databases:** Twenty-seven percent (27%) of small business websites have online database features in the B2C e-commerce environment, compared with 87% of overseas sites.
- **Payments:** Only, 15% of small business websites have payment features in the online retail environment, compared with 91% of overseas sites.

The online database is important for transactions, allowing companies to maintain a real-time catalogue, online ordering and automatically record customer preferences. These are critical functional website features for supporting B2C online businesses in their interaction with potential customers. However, only 27% of Australian small businesses have online database features on their websites, while most of the overseas sites (87%) have such features. As a result, many consumers in Australia may prefer to visit overseas sites.

Moreover, one of the significant functional website features in the B2C e-commerce environment is the payment system for the execution of business transactions. Payment feature options include real-time credit card payments, Internet banking, online voucher redemption and PayPal. This study found that only 15% of Australian small businesses have payment, compared with 91% of their overseas competitors. All offshore sites offered real-time credit card payments, and the majority (88%) offered payment through

PayPal, and through the Internet banking (88%). The above findings and analysis suggest that:

Significant issues exist on Australian small business websites related to the shortcomings of transaction-based relevant features compared with their overseas competitors. This may influence consumers to visit overseas sites.

5.7.4 Findings from analysing related to distribution-based website features

Table 5.4 shows the findings for the content analysis of distribution-based features available on small business and overseas websites.

Table 5.4: Distribution-based features available on small business and overseas websites

Categories of website features in the B2C e-commerce environment		**Features available on 25 small business websites**			**Features available on 25 overseas websites**		
Distribution-based main categories of website features	Distribution-based subcategories of website features	Samples	(%)	Ave (%)	Samples	(%)	Ave (%)
Web-based distribution	Online download of digital goods & content	0	0	0	0	0	
E-services	Automated delivery of online services	1	4	4	17	68	82
	Online physical product tracking	1	4		24	96	

5.7.4.1 Comparative results on distribution-based website features

Figure 5.4 provides a graphical representation of the level of distribution-based features available on small business websites compared with their overseas competitors' sites.

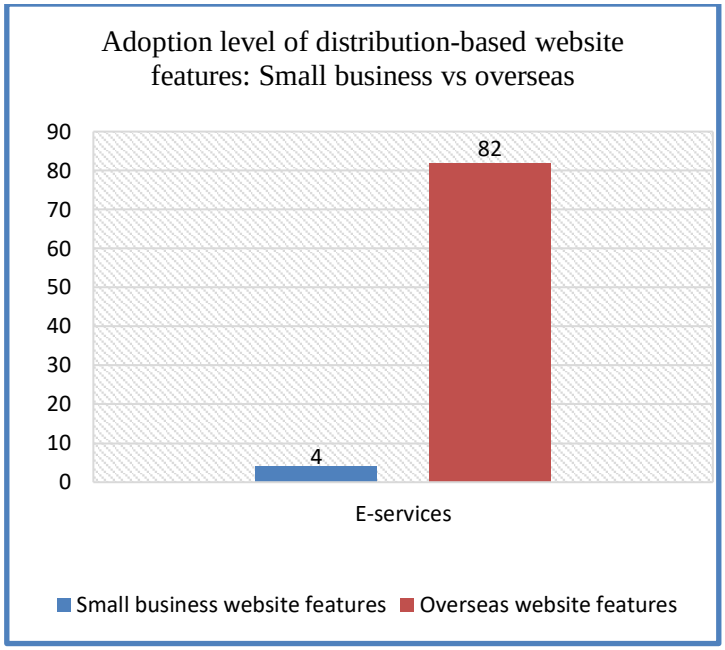


Figure 5.4: Comparison of the level of distribution-based features on small business websites vs overseas competitor websites

In the present study context, the sample companies selected were not selling any digital goods or contents and software. The sub-category of e-services relates to automated delivery of online services and online physical product tracking. Results of the comparative analysis show that only a few small business websites (4%) had e-service features, compared with the majority of overseas sites (82%).

E-services are essential functional website features in the B2C e-commerce environment for after-sales delivery services. Therefore, the findings suggest that:

Significant issues exist on Australian small business websites related to the shortcomings of distribution-based features compared with their overseas competitors. This may influence consumers to buy from overseas websites.

5.8 Summary of findings

This section describes the summary of findings that ultimately generated the justificatory knowledge aligned with the DSR. This informed the design of a DSS-based solution to small business website problems. **Table 5.5** presents a summary of findings using Angehrn's (1997) ICDT model. It outlines the significant results based on the content analysis of 25 small business website features and 25 of their overseas competitors' website features.

Table 5.5: Summary of findings from the content analysis using the ICDT model

Overall small business website feature adoption levels (25%) in the B2C e-commerce environment			B2C web features	Overall overseas website feature adoption levels (80%) in the B2C e-commerce environment		
Added value (34%)	Business information (33%)	Contact details (62%)	I	Contact details (58%)	Business information (82%)	Added value (86%)
Social networking (52%)	Customer reviews (4%)	Contact the business (35%)	C	Contact the business (71%)	Customer reviews (48%)	Social networking (100%)
Payment (15%)	Online database (27%)		T	Online database (87%)		Payment (91%)
Web-based distribution: E-services (4%)			D	Web-based distribution: E-services (82%)		

Figure 5.5 provides a graphical representation of the comparative results' summary using ICDT categories. This study found that the overall adoption level of ICDT categories of features on small business websites was significantly lower (25%) than that of their overseas competitors (80%). This suggest the following new theoretical or justificatory knowledge:

Significant issues exist on Australian small business websites related to the inadequacy of ICDT-based features compared with their overseas competitors. This may influence consumers to buy from overseas websites.

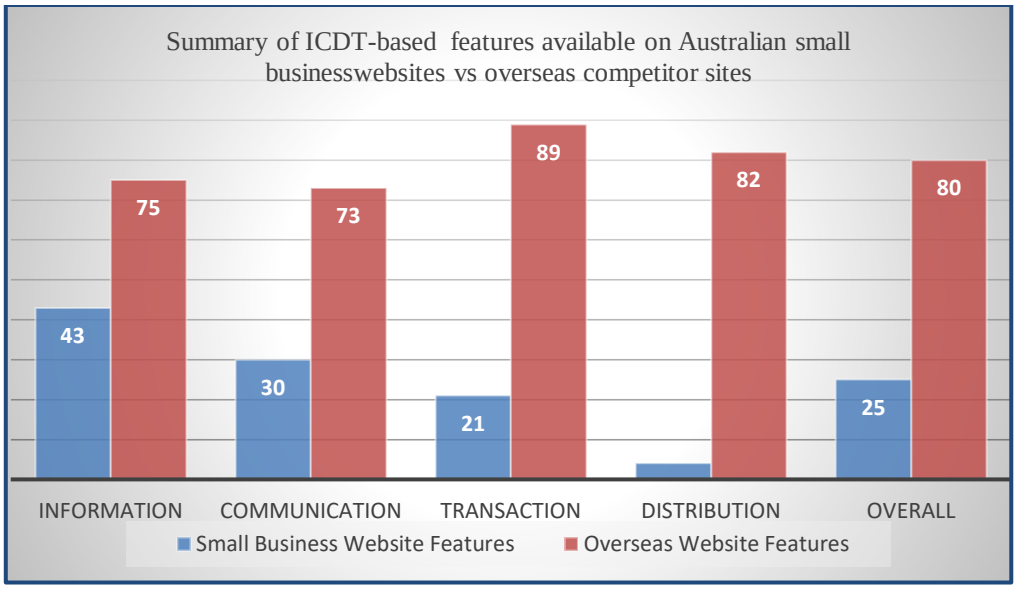


Figure 5.5: Comparative results' summary of the adoption level of ICDT-based small business website features vs overseas competitors

In order to answer the RQ 1, the objective of this study was to investigate the issues or factors that may influence Australian consumers to purchase from overseas websites rather than small business websites in the B2C e-commerce environment. The results revealed the significant issues that exist related to inadequate ICDT categories of features available on small business websites compared to their overseas competitors. Categorically, the small business websites were inaccessible to online consumers in the B2C e-commerce environment. Problems of identification related to insufficient features existing on the small business websites informed the design of the DSS-based solution. The results also have recommended the small business DSS design requirements, including the components of the DSS architecture.

5.9 Chapter summary

The main contribution of this chapter was to identify the practical issues that persist on small business websites relating to inadequate competitive and accessible features. Identifying the problems related to website features informed the requirements of a new DSS-based solution. Using the content analysis paradigm, the units of analysis were considered to be small business website features and overseas website features. The ICDT categories were used in the analysis. This round of data collection helped identify the research problem, specifically small business problems and needs.

The next chapter describes the internal analysis through conducting case studies with small businesses in the B2C environment in Australia.

Chapter 6: Case Studies Findings and Data Analysis

This chapter presents the results and analysis of multiple case studies with small businesses in the B2C e-commerce sector. The purpose of conducting the case studies was to identify internal decision-making factors and support needs in small business organisations. These factors would help define the key features of the DSS solution artefact, designed to address both the gaps in the literature and the practical issues of decision-making.

This chapter also elaborates on the reasons for adopting a multiple case study method instead of other approaches. It also reiterates and outlines the data collection techniques to articulate research experience and review the findings to produce the series of justificatory knowledge. The chapter concludes with a summary.

6.1 Data analysis processes

This study acknowledges the streamlined codes-to-theory model developed by Saldaña (2015) for qualitative data reduction and analysis in systematic ways. Saldana (2015) not only suggested qualitative data reduction practices through data coding and categorising, but also recommended qualitative analysis by developing concepts and theories. This study applied a colour coding method, as well as data coding and categorising using MS Word. In qualitative data, codifying is a process that permits data to be divided, grouped or categorised in a systematic order (Saldaña, 2015).

Patton (2015, p. 534) stated that, “a fundamental view of research is a careful separation of descriptions from interpretations”. Therefore, data analysis should involve describing the findings, answering “why” questions, assigning significance to particular results, and putting patterns into an analytical framework (Patton, 2015). Moreover, in the DSS research domain, case studies are used as a method of qualitative descriptive research. DSS case study research at its best leads to informed descriptions and interpretive theory development (Power, 2016). Accordingly, results are described first, then findings explained, and significance is connected to specific results. Finally, interpretive theory or new justificatory knowledge (kernel theories) was constructed.

6.2 Findings

The aim of conducting case studies was to determine the small business internal issues and needs concerning strategic decision-making in the selection of competitive features on their websites. This study also followed the DSR philosophy, in which HMPR guideline 2 recommended identifying business problems and suggested an IS-based solution. Based on these issues and needs, this study could then design a practice-based DSS solution artefact to meet small business contextual needs.

The next sections present data from the responses of small business owners/managers. This is followed by an analysis of results and the construction of new justificatory knowledge based on the real-life case study research.

6.2.1 The experience of case study data collection

The strategy used in this research was to collect case study data via email to save time and money, and to allow extensive reach to all parts of Australia. This technique was convenient for both the researcher and participants. Direct emails were sent to owners/managers with a URL link to the interview questionnaire, which was designed using *Google* Forms, as well as an invitation letter and relevant documents related to the research project. Phone calls were made to owners/managers before sending the email.

The researcher also contacted small business community groups on Facebook and LinkedIn and posted the questionnaire URL on these sites. The Facebook groups were the Victorian Small Business Network, Small Business Australia, and Brisbane Small Business.

In addition to this, the researcher visited many small retail businesses in Melbourne, asking them to contribute to the research project. The main intention of the direct visit was to build trust. However, most of these respondents declined to participate as they were busy and do not have enough time to complete the interview questionnaire. Many owners/managers also stated that they would be unable to help as they were going overseas for their holidays for two to three months.

6.2.1.1 Responses from the sample and analysis

Eleven responses were received after sending approximately 150 direct email invitations between 15 January and 16 May in 2016. The researcher therefore failed to get responses

from twenty small businesses, which was the intended sample size. This is because small businesses are a difficult group to engage in formal face-to-face or online activities (Smith, 2012). The researcher confronted such engagement difficulties while conducting the multiple case studies with small businesses in Australia. For instance, one small business owner in Australia replied: *"Thank you for thinking of us, but unfortunately not interested."* Another replied from Australia: *"I did receive your email, but I will not be participating. Please remove me from your listing. It is a policy of mine that I do not contribute to any questionnaires of any sort. Good luck with your research."*

As asserted by Patton (2015, p. 522), "in qualitative research, analytical insights crop up during the data collection phase and the beginning of the qualitative data analysis." Based on this observation and the above real-world practices, new justificatory knowledge was constructed:

The lack of interest, responsiveness, and engagement in research and development by small business owners/managers in the B2C online sector in Australia could be another significant factor explaining why they are unable to make any strategic decisions that are necessary for their business performance.

Email/web-based data collection is more efficient than face-to-face, as small business owners/managers are busy and have no time for direct interviews.

6.2.2 Part I of the questionnaire: Findings based on small business profiles

Table 6.1 outlines the findings based on owner/manager responses related to their business profiles. Small business profiles comprise a series of attributes. These are: company name, physical address, mission statement, whether they had a website, geographic coverage and number of employees. All business names were coded as Business A, Business B, etc. Business addresses are not shown due to privacy and ethical considerations in the conduct of this research. Their physical presence was indicated with a 'Yes' or 'No', but the researcher held all valid documentation in a secure place.

As shown in this table, all the small businesses except one had physical addresses, and most of them had websites and mission statements. Some small businesses sold locally and in particular market segments. Only a few companies sold overseas and to specific countries (e.g., Singapore, Pacific Islands, and Vietnam).

Table 6.1: Owners/managers' responses based on company profiles

Business name	Business address	Mission statement	Business website	Geographic coverage	Number of employees
Business A	Yes	Yes	Yes, but under construction	Melbourne	Five
Business B	Yes	Yes	Yes	Australia-wide	One
Business C	Yes	Yes	Yes	Intends to sell worldwide, but this business is currently selling in Sydney.	Not provided in the interview script. This business is owner-operated (as advised by the owner on the phone).
Business D	Yes	Yes	Yes	Australia-wide	Two
Business E	Yes	Yes	Yes	NZ, Australia plus Pacific Islands	Eight
Business F	Yes	Yes	Yes	Singapore, Vietnam and Australia	Less than twenty
Business G	Yes	No	Yes	Melbourne	Less than twenty
Business H	Yes	No	Yes	Australia-wide	Two
Business I	Yes	Yes	Yes	Melbourne	Eight
Business J	Yes	No	No/directory	Melbourne	Two
Business K	No	Yes	Yes	Australia-wide	One

6.2.2.1 Results and analysis

Figure 6.1 provides a graphical representation of some of the key findings, with colour coding related to the number of small business attributes of company physical address, existing websites, mission statements, and whether they sold locally or overseas in the online retail environment. Although most of the small businesses had websites, only two of them sold products to particular overseas countries. These empirical findings confirm that the majority of small companies prefer to sell their products locally. As confirmation of this, the Senate Economic Legislation Committee (SELC, 2013) in Australia found that most small companies operate in one location, sell goods or services to nearby customers, and have limited market power.

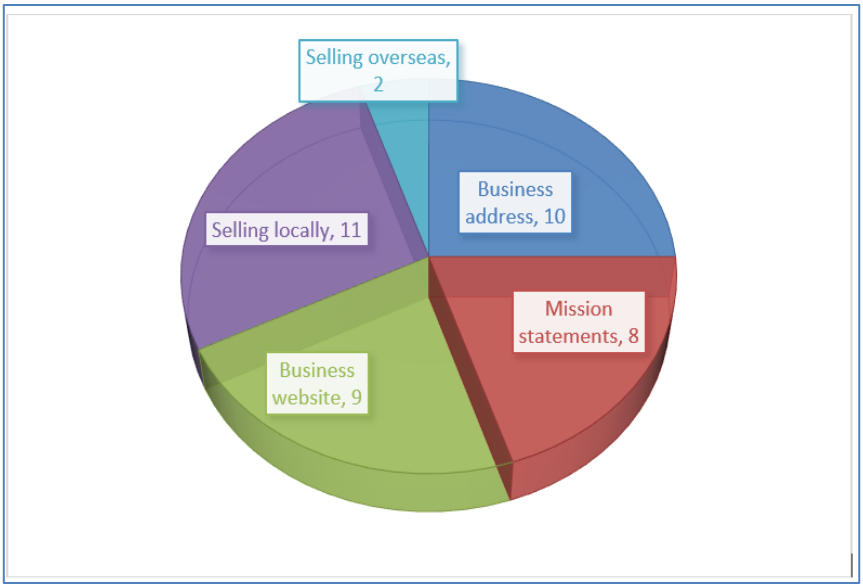


Figure 6.1: Key findings based on small business profiles

Based on the above findings and analysis, new justificatory knowledge was constructed:

A significant internal issue was identified concerning selling products in the wider market, with the majority of small businesses preferring to sell their products in local markets, despite most of them having websites.

6.2.3 Part II of the questionnaire: Findings based on small business owner/manager profiles

A profile summary of eleven small business owners/managers comprised a series of traits. These were: their roles in the organisations, gender, education levels and ICT skills. Owner/manager profiles are summarised in **Table 6.2.**

Table 6.2 Small business owner/manager profiles in the B2C e-commerce environment

Business names	**Respondents' roles**	**Gender**	**Education levels**	**ICT skills**
Business A	Owner/manager	Female	Bachelor Degree	Enough ICT skills necessary to get the job done.
Business B	Manager	Male	Secondary School Certificate	Yes. Did ICT in school but did not mention specific skills.
Business C	Owner	Female	Secondary School Certificate	Microsoft Office: Word and Excel. Other: Google chrome, Facebook, my website, emails, and Gumtree True Local page for business.

Business D	Owner	Male	Bachelor of Computer Science	Bachelor of Computer Science
Business E	Owner/manager	Male	Other	General knowledge and skills of website creation and development.
Business F	Owner/manager	Male	Year 12	Yes, basic knowledge about computers, electronic communication, Internet skills, moving files.
Business G	Owner	Male	Year 12	Basic knowledge of computers, proficiency in using software, electronic communication, and Internet skills.
Business H	Manager	Male	Secondary School Certificate	Basic computer use, email communication, Internet skills.
Business I	Manager	Female	Bachelor Degree	Proficient in the use of computers, Internet, electronic communication, file sharing and security.
Business J	Owner	Male	Other	MS Office, Internet browsing, Facebook, faxing, printing, copying, emailing.
Business K	Owner	Female	Bachelor Degree	Adobe suite: Photoshop, Illustrator, InDesign Internet skills.

6.2.3.1 Results and analysis

Figure 6.2 provides a graphical representation of some of the key findings related to the series of profile attributes of a number of small businesses. The findings indicate that the majority of small businesses are owner-operated. This could explain why they were busy most of the time and why some refused to contribute to the research project due to time constraints. The researcher frequently noted the word 'busy' during the collection of data through the case studies.

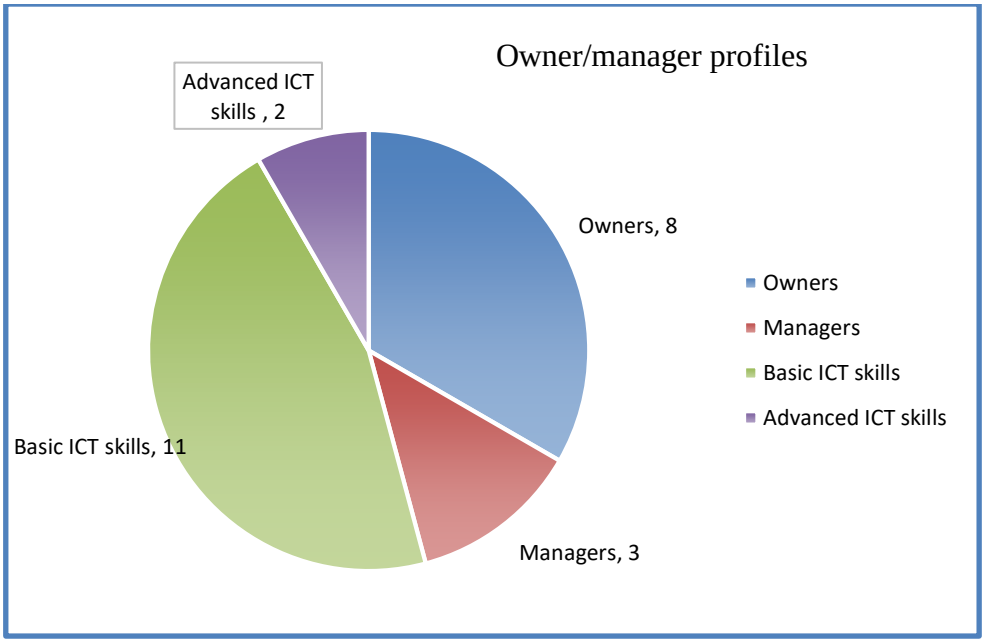


Figure 6.2: Key findings based on small business owner/manager profiles

Although all owners/managers had basic ICT skills, as shown in above figure, the majority lacked knowledge about how to use advanced technology. Only two small business owners had experience and expertise in website creation and management. Burgess et al. (2009) also found that many small business owners/managers lacked the competencies to use advanced technology in setting up their website features. Therefore, new justificatory knowledge was constructed based on the empirical findings and analysis:

Significant internal issues exist in many small businesses concerning inadequate competencies and knowledge among owners/managers in the use of advanced ICT, particularly in the selection of relevant features on their websites. Most are too busy due to their owner-operator status.

6.2.4 Part III of the questionnaire: Findings based on business models, owner/manager awareness of online shopping problems in Australia and their experiences

Owner/manager responses related to their adopted business models, awareness of online retail sector problems in Australia, and their difficult experiences in the sector, are outlined in T**able 6.3.** They responded with a simple 'Yes' or 'No' when asked about their awareness of sector problems and some of them stated their experiences.

Table 6.3: Owner/manager adopted business models, and awareness and experience of online retail sector problems in Australia.

Business name	Business model	Problem awareness	Owners/managers' experience
Business A	Direct to consumers via website (plan to develop), shop and Facebook	Yes	This business imports products from India. Expenses associated with imports are added to the item cost, including postage, customs, and employee and outgoing costs. This owner articulated that other websites selling the same products from overseas are cheaper as overseas sellers do not have these costs, making the overseas competitor's products more affordable.
Business B	Face-to-face and sell warehouse products online	No	Does not have any experience.
Business C	Did not provide an answer	Yes	This business has been struggling to make a good profit due to lower exchange rates with the Australian dollar, and because people want to buy cheap clothes. This small business imports products from Pakistan and sells them online. But the fabric imported from Pakistan is costly due to the lower value of the Australian dollar. This company also lost money as the owner ordered clothing through Facebook for a customer from another party, and never received the products. Ultimately, the company paid back the money to the customer.
Business D	Confidential, would prefer not to disclose the model	Yes	Understand online business opportunities and challenges as business channels change. This owner personally purchases online from Australia as well as from overseas websites.
Business E	Sells products and services	No comment	If the model suits the type of business, the company will adapt the model to cater for the particular product.
Business F	Sells products direct to customers as well as provides repair services	Yes	This company does not have any difficulties as their business has been established for a long time and they have many existing customers.
Business G	Direct sells to local consumers and services	Yes	This owner has been experiencing difficulties as overseas websites sell a greater range of products compared with them.

Business H	Direct sells to consumers (online and shop)	Yes	This owner considers eBay and their product range are key problems for their company.
Business I	Direct to consumers via shop and online	Yes	This business competes with a lot of overseas online retailers. Often souvenirs are much cheaper from overseas. Currently, this company does not know the solution to this problem.
Business J	Offline	Yes	They know of problems from reading the newspapers. But they do not have any personal experience in this area.
Business K	Selling design clothing online direct to consumers	Yes	This business is experiencing difficulties as the majority of people buy cheap clothes from overseas businesses rather than buying from Australian companies.

6.2.4.1 Results and analysis

Figure 6.3 provides a graphical representation of some of the key findings from a number of small businesses as outlined in the table above. Understanding their business models, their awareness of problems in the online retail sector and their difficult experiences, would assist in the development of the DSS-based solution in this study.

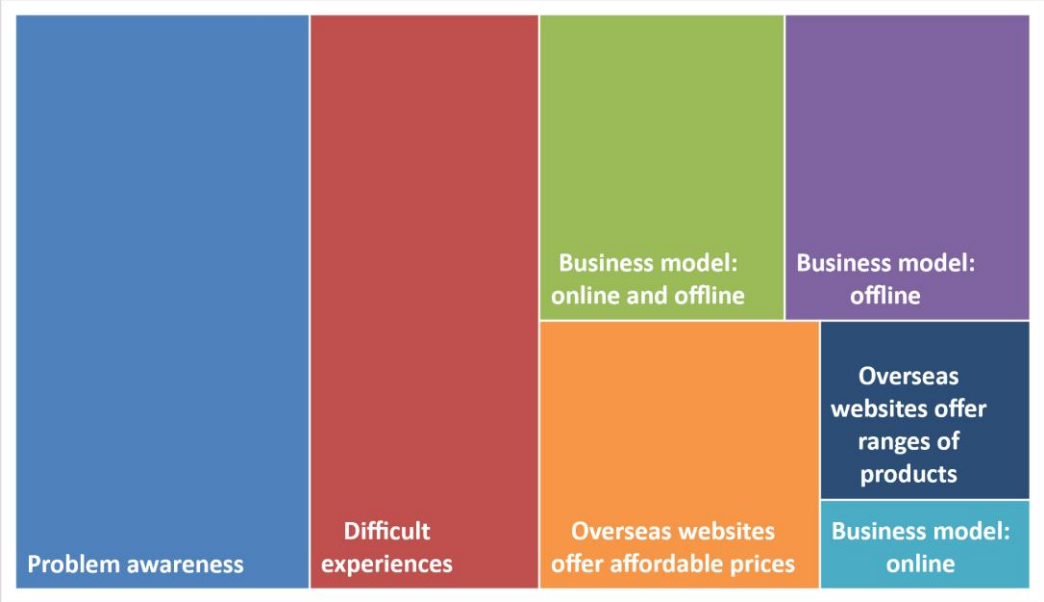


Figure 6.3: Key findings based on owner/manager awareness and experience of problems in the online retail sector and adopted business model

According to above figure, almost all small businesses knew about problems in the online retail sector in Australia. The majority of them expressed their difficulties in this

environment. For example, one of the owners noted that they had to offer their products to customers at higher prices than their competitors due to the associated costs of importing goods into Australia. This meant that customers were more likely to purchase the same products from overseas websites. Three other owners/managers stated that cheaper prices were the primary reason why many Australians preferred to buy from offshore sites. Two small business owners/managers expressed their difficulties due to overseas websites offering a greater range of products than them. In their own study, Forrest and Sullivan (2012) found that the Australians buy products from overseas websites for many reasons, including affordability and product range.

To help understand the context in which small businesses faced problems in the sector, those in this study were asked about their business models. A business model determines how a company will make profits throughout its operations, based on its capabilities and competencies (Newth, 2012). Only two of the small businesses in this study refused to disclose their business models. Four small companies sold their products online and offline (through a physical store); four through a physical store alone; and one sold entirely online. These findings indicate that the majority of small businesses in this study preferred to sell through their physical stores. This could have an impact on Australian consumers choosing to shop overseas, through the convenience of websites. These findings and analysis informed the construction of new justificatory knowledge:

Most small businesses knew about problems in the online retail sector in Australia and the majority shared their difficult experiences. However, the majority of Australian small businesses in this study preferred to sell from physical stores, as indicated by the business models they adopted.

6.2.5 Part IV of the questionnaire: Using SWOT matrices

The current research project focuses on managerial issues relating to strategic decision needs in the competitive B2C e-commerce environment, predominantly in the selection of competitive features on small business websites and the creation of a DSS-based solution. Typically, managerial strategic decisions are made based on internal and external environmental investigations of business organisations (Mintzberg et al., 1976). Consequently, Part IV of the interview questionnaire was designed using SWOT (strengths, weaknesses, opportunities, and threats) matrices to examine small business decision-making competencies when addressing the external business environment. A

detailed description of the questionnaire design was presented in Chapter 4 and the questionnaire is provided in **Appendix A.**

6.2.5.1 Findings based on owners/managers' knowledge about internal and external business environmental factors

Table 6.4 shows small business responses in relation to their knowledge about the internal and external business environment and associated factors.

Table 6.4: Knowledge about the internal and external business environment and associated factors

Business name	Knowledge about internal business environmental factors	Knowledge about external business environmental factors
Business A	• Lack of resources available to meet objectives of the business • Lack of experienced staff • Intend to develop a website, but website development is time consuming and requires a lot of motivation and patience	• Competitors do not have proper websites
Business B	• Computer system accessing stock and information from other stores	• Access to suppliers' information and stock on hand levels
Business C	• No response	• No response
Business D	• Does not have any understanding or knowledge • But acquired information needed to create a business online • Takes risks to create a functioning business	• Does not have any understanding or knowledge
Business E	• Constantly looking at the way their website operates to be relevant to the current generation	• Does keep a watch on competitors' websites
Business F	• No, but use their own extensive business experiences	• No response
Business G	• No	• No
Business H	• No	• No
Business I	• This manager has no knowledge about the internal and external business environment, but the owner has good knowledge about the environment	• No
Business J	• Business running data. • Twelve-year experiences • Use own knowledge	• Newspapers • Suppliers • Accountants • Friends • Customers
Business K	• No response	• No response

The left-hand column of this table lists the businesses anonymously, the middle column outlines the owner/manager responses about their knowledge about the internal business environmental factors, and the right-hand column lists answers in relation to their knowledge about external environmental factors.

6.2.5.1.1 Results and analysis

Figure 6.4 provides a graphical representation of owners/managers' understanding and knowledge about internal business environmental factors.

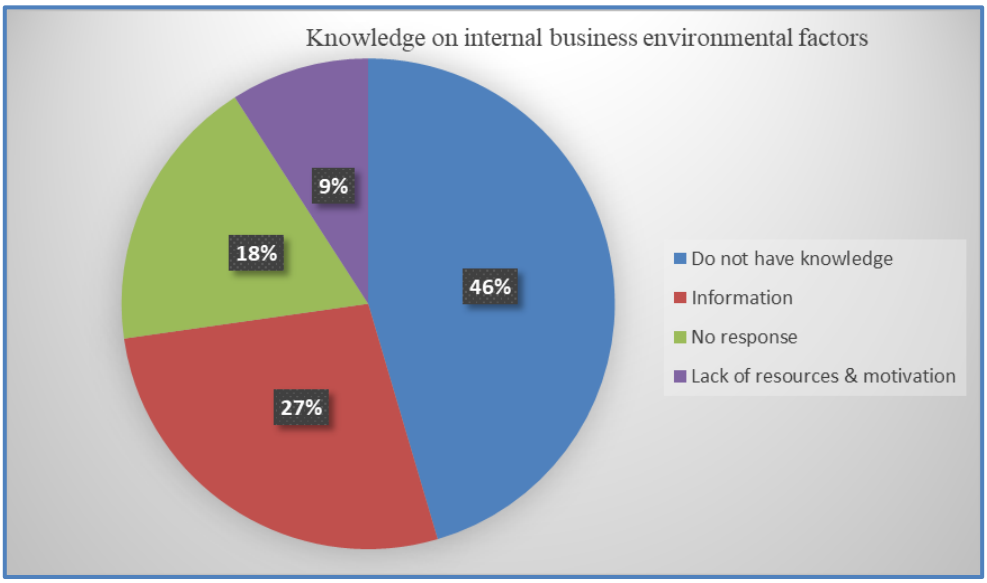


Figure 6.4: Knowledge about the internal business environment and associated factors

- **Knowledge about the internal environment and associated factors:** Nearly half of the businesses (46%) had no knowledge of the internal business environment and related factors. Just three of eleven respondents understood that internal environmental factors relate to information and data. Only one business identified that internal factors related to a lack of resources and motivation. Many owners/managers provided some implicit understanding of internal factors, including the importance of their extensive business experience, the owner's knowledge of the business environment, using their own knowledge, and taking risks to run their business.

Figure 6.5 provides a graphical representation of owners/managers' knowledge of the external business environment and related factors, as sourced from **Table 6.4**.

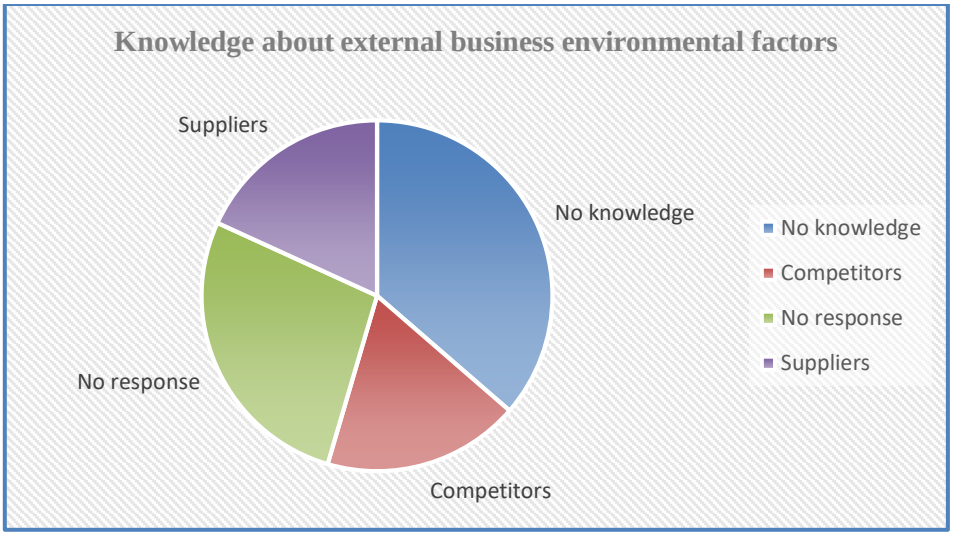


Figure 6.5: Knowledge about the external business environment and associated factors

- **Knowledge about the external business environment and related factors:** Four of the eleven small businesses articulated that they had no knowledge about the external business environment and associated factors; three respondents did not respond. Only two owners/managers referred to competitors as an external environmental factor. Two respondents considered suppliers as an external environmental factor and one referred to newspapers, friends, accountants, and customers as environmental factors.

Based on the above results and analysis, new justificatory knowledge was constructed: *The lack of knowledge among the majority of owners/managers about internal and external business environments and associated factors is significant in the context of their inability to make strategic decisions in the B2C e-commerce environment.*

6.2.5.2 Findings based on small business internal strengths and strategies to leverage those strengths to maximise opportunities

Table 6.5 shows owners/managers' responses about their internal strengths or resources and strategies to use their resources to maximise opportunities in the B2C e-commerce environment.

Table 6.5: Owners/managers' responses on small business internal strengths and strategies to leverage those strengths to maximise opportunities

Business name	Internal strengths or resources	Strategies to leverage strengths or resources to maximise opportunities
Business A	• Existing brands with huge ranges	• Trying to sell products through websites.

	• Email • Keeping cost lower by using ICT	• It will reduce business renting cost. • Email marketing
Business B	• Simple point of sales (POS) system that everyone can learn • Access to stock levels across the business	• Nil
Business C	• Learned a lot over the years • Facebook has been a big part of the business • Providing stall after Ramadan organised by community group	• Try to offer the best price with good quality
Business D	• Do not have many strengths • Not a successful business • Still trying to make a mark in the online business	• Nil
Business E	• Existing brands with huge ranges	• Business website is a source for customer to get relevant information regarding the highly technical and expensive products the company sells
Business F	• Existing brands with huge ranges • Existing consumers • Selling products directly to consumers via website and face-to-face. • Email	• Looking for a knowledgeable IT expert who also can understand the business. • Developing a good website • Email as communication channel • No response
Business G	• Existing local customers	• Facebook presence • Using local directory • Keeping cost lower using own knowledge
Business H	• Word of mouth, email, phone	• Using own knowledge
Business I	• Cheap products • Well-known location • Personal shopping experience	• Nil
Business J	• Try to fulfil customer demands	• Update knowledge from business data and environment
Business K	• Graphic designer • Good planner • Competing with cost • Selling products directly to customers in online marketing	• Marketing on Facebook • Asking customers for constant feedback • Sales competitions • Keep doing well and sometimes good luck

The middle column of this table outlines the business responses related to internal strengths or resources. The right-hand column presents their responses about strategies to use their resources to create more opportunities. The next section describes the results relating to small business internal resources.

6.2.5.2.1 Results on small business internal strengths or resources

Figure 6.6 provides a graphical representation of results about internal resources or strengths as identified by small businesses in this study.

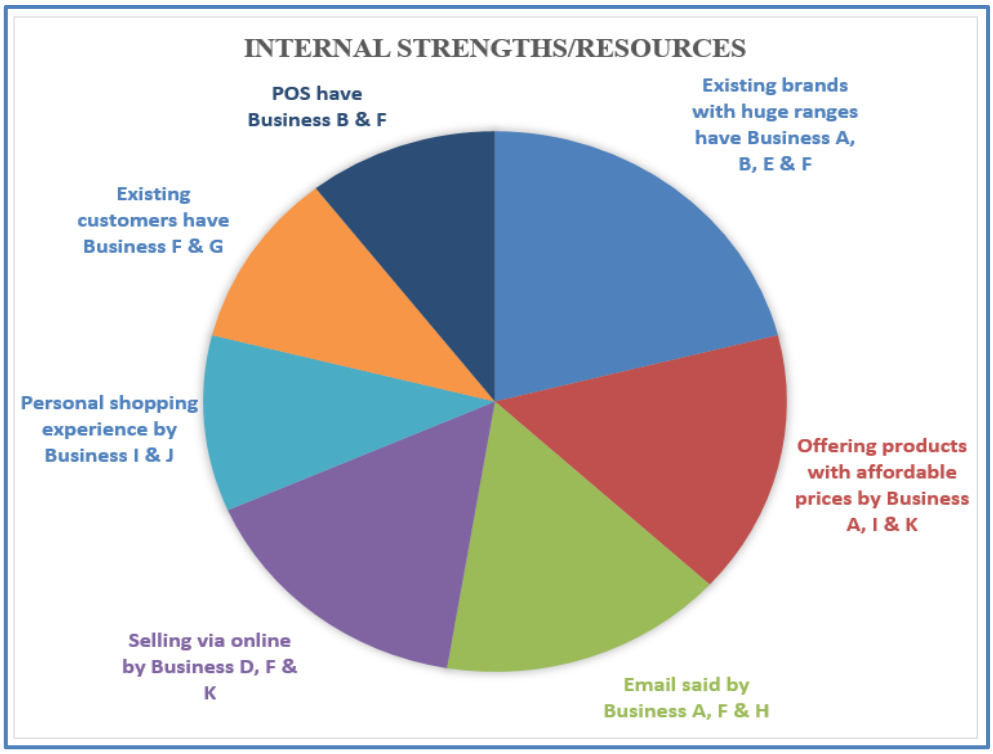


Figure 6.6: Small business internal strengths or resources

- **Existing product brands with a huge range**: Four businesses (Business A, Business B, Business E and Business F) had existing brands with extensive ranges. This represented an internal strengths or resource.
- **Offering products to customers at affordable prices:** Three businesses (Business A, Business I and Business K) offered products to customers at affordable prices, considering this an internal strength.
- **Email communication**: Three businesses (Business A, Business F and Business H) considered email to be one of their internal strengths.
- **Selling products through websites**: Three businesses (Businesses D, Business F and Business K) claimed their internal strength was selling their products through websites.
- **Point of sale (POS):** Two small businesses (Business B, and Business F) claimed POS was one of their internal strengths.
- **Existing customers**: Two businesses (Business F and Business G) considered having existing customers as one of their internal strengths.

- **Providing personal shopping experience to customers**: Two small businesses (Business I and Business J) claimed their internal strength was providing a personal experience to customers.

Other identified internal strengths included extensive business experience, selling through Facebook, working with good planners and graphic designers, having a popular location and selling through community groups. One of the owners/managers stated that theirs was not a successful business.

6.2.5.2.2 Results on small business strategies to effective use of internal resources

Table 6.6 provides the results relating to small business strategies to efficiently use internal resources or strengths to maximise business opportunities. The left-hand column of this table shows some common internal resources for small businesses, the second column from the left displays the sample size with these resources. The right-hand column shows the individual business strategy to use resources to maximise opportunities.

Table 6.6: Small business strategies for the effective use of internal resources to maximise business opportunities

Internal strengths or resources	Sample out of 11	Business name	Strategies for the efficient use of internal strengths or resources to maximise opportunities
Existing brands with an extensive range	4	Business A	• Anticipated developing a website to sell products to wider markets and market through email
		Business B	• No response
		Business E	• Provide relevant information about highly technical and expensive products sold on its website
		Business F	• Intend to hire someone with both IT and business knowledge • Developing a good website
Offering customers affordable prices	3	Business A	• Plan to develop a website to reduce rental costs
		Business I	• No response
		Business K	• Marketing on Facebook • Sales competitions
Email	3	Business A	• Using email as a marketing channel
		Business F	• Using email as a communication channel
		Business H	• Using own knowledge
POS system	2	Business B	• No response
		Business F	• No response
		Business D	• No response

Selling via websites	3	Business F	• Intend to hire staff with IT skills and business knowledge • Plan to develop a good website
		Business K	• Asking customers for constant feedback
Personal shopping experience	2	Business I	• No response
		Business J	• Update information from business data and environment
Existing customers	2	Business F	• No response
		Business G	• Facebook presence • Using local directory • Keeping cost lower using own knowledge

- **Small business strategies to use an extensive range of products as internal resources to maximise opportunities:** Two small businesses (Business A and Business F) had a strategy to develop a website to sell a range of their products. Business A also had a strategy of email marketing and Business F was looking for an employee with both IT and business knowledge. Although Business B had a range of products, which were its internal resources, it failed to respond when asked about opportunities to maximise its strengths. Only Business E had a well-developed website, and its strategy was to provide relevant information on that site about products and services.

- **Small business strategies to offer products at affordable prices to maximise opportunities**: Three small businesses (Business A, Business I and Business K) articulated that their internal strength was selling products at affordable prices. Business A had a plan to develop a website, thus reducing rental costs and enabling the offering of reasonable price to customers. Business K had a strategy for marketing products on Facebook and participating in sales competitions. Business I did not disclose any strategies for maximising business opportunities by offering more affordable prices.
- **Strategies to maximise opportunities using email as an internal resource**: Business A used email as a marketing channel; Business F used email as a communication channel; and Business H used email where appropriate.
- **Strategies to leverage opportunities through POS**: Although two small businesses (Business B and Business F) articulated their internal strengths as selling products through POS systems, they did not disclose their strategies to maximise opportunities.

- **Strategies to use the internal strength of a website to maximise business opportunities**: Three small businesses (Business D, Business F and Business K) asserted that their internal strength was selling products via websites. Business D did not disclose how to make strategies to use this resource to maximise opportunities. Business F had a plan to hire an IT expert with business knowledge, and Business K had a strategy to ask customers for constant feedback.

6.2.5.2.3 Results analysis

Based on the above findings, only four small businesses of the eleven studied had an extensive range of products, which were seen as their internal strength or resources. However, just one in four small businesses had a strategy to increase this strength by providing relevant products and services information on their website. This owner also considered the website as the information source for its customers.

Although, three small businesses offered products at affordable prices, only one of the owners had a strategy for marketing through Facebook and offered competitive prices through competitions. Others had the intention to develop a website to assist in saving rental costs so that they could offer more affordable prices. However, these businesses did not have any strategies to increase internal strengths by making their websites more accessible or to improve sales by reducing prices. Even though three small businesses believed their internal strengths or capabilities related to selling through their websites, none of them knew how to improve those websites. Based on the above findings and critical analysis, new justificatory knowledge was constructed:

Although a few small businesses had internal strengths or resources, including an extensive range of products, email, the capability to offer products at affordable prices, and selling through websites, only one business had a strategy to provide relevant information on its website to appeal to consumers.

6.2.5.3 Findings based on small business internal weaknesses and strategies to counter weaknesses by exploiting opportunities

Table 6.7 presents the eleven small business responses regarding their internal weaknesses and the strategies used to address them in order to create opportunities in the B2C e-commerce environment.

Table 6.7: Owner/manager responses on internal weaknesses and strategies to address problems for exploiting opportunities

Business name	Internal weaknesses or problems	Strategies for countering weakness and exploiting opportunities
Business A	• Lack of finance • Lack of ICT skills	• Planning to online presence to reduce infrastructure costs and reach more people
Business B	• Do not always update the system	• Need to update the system to include product sizes, waterproofing etc.
Business C	• Trust on Facebook • Facebook fraud	• Meeting supplier face-to-face to build trust
Business D	• Nil	• Nil
Business E	• The lack of strategic planning for using appropriate systems and technology • The lack of strategic business decision-making in the online business environment	• Use targeted customer visits and relationships to achieve results
Business F	• The company does not have enough time to create a social web presence • Lack of ICT skills	• Looking for staff with good ICT skills and an understanding of creating a social web presence as well as knowledge about the business • Use their extensive business experience and knowledge to make strategic decisions
Business G	• Not selling online	• Customer services
Business H	• The lack of strategic planning for using appropriate systems and technology	• Quality products and services offered
Business I	• Having to compete with larger organisations makes keeping price low very difficult	• Make the business as simple as possible and minimise costs and business hours
Business J	• Limited time for online presence. • Fear of health problems due to too much use of computer	• No strategy
Business K	• Lack of knowledge for business planning • Lack of funds • Business name is unknown to the public • Lack of equipment	• Looking for a job to raise funds for the business • Doing pre-orders, thus get money upfront for customers' items • Personally, promote and increase awareness of the brand

6.2.5.3.1 Results on small business internal problems and strategies to address them

Common findings on internal problems, as articulated by small businesses, are presented in **Table 6.8**. The left-hand column of this table presents such common issues as lack of ICT skills, the inability to make strategic decisions in the online environment, and the lack of time and finance. The second column from the left shows the number of businesses

that had these common problems and requirements. The right-hand column lists the individual strategies used to address these issues and to create opportunities.

Table 6.8: Internal weaknesses/problems and needs, and small business strategies to address them to create opportunities

Internal problems and needs	Sample size 11	Business name	Strategies for countering weakness and exploiting opportunities
Lack of ICT skills	4	Business A	• This business was planning an online presence to reduce infrastructure costs and reach more people
		Business E	• No strategy
		Business F	• Looking for staff with good ICT skills and business knowledge
		Business H	• No strategy
Lack of strategic planning in the online business environment	3	Business E	• Building relationships with targeted customers to achieve results
		Business H	• Offering quality products and services.
		Business K	• Personally, promote and increase awareness of the brand
Lack of finance	2	Business A	• Strategy to create an online presence that can assist in reducing infrastructure costs and reach more customers
		Business K	• Looking for a job to raise funds for the business • Doing pre-orders, thus getting money up front for customer items
Limited time	2	Business F	• Looking for staff with good ICT skills and an understanding of creating a social web presence, as well as knowledge about the business
		Business J	• No strategy

- **Lack of ICT skills:** Four small businesses lacked ICT skills, which they considered an internal problem. They had different strategies to address this issue and create opportunities. The strategy of Business A was to develop a website for reducing infrastructure costs, while Business E and Business H had no strategy. Only Business F had a plan to hire an employee with ICT skills and business knowledge.
- **Lack of finance and time**: Two small businesses expressed concern about the scarcity of finance. Business A had a strategy to develop a website to reduce infrastructure costs. Business K was looking for a job and doing pre-orders, thus they were getting money upfront from customers to meet their financial crisis. Two small businesses articulated that they had little time to create an online presence. Business

F considered hiring an employee with ICT skills, business knowledge and experience in the online social world. Business J did not express a strategy.

- **Lack of strategic planning in the online business environment:** Three businesses articulated that one of their internal weaknesses was a lack of strategic planning in the online business environment. These three companies had their own strategies to address this issue. The approach of Business E was to resolve the issue through relationship building with target customers to achieve the better business outcomes. The strategy of Business H was to offer quality products and services to customers in the online business environment. Business K chose to do personal promotion of their brand.

6.2.5.3.2 Results analysis

As this research centred on the lack of competencies in making strategic decisions in the online retail business environment, gathering information about small business understanding of the business environment was critical. However, results show that none of the small businesses had strategies to analyse the business environment or its associated factors. Generally, they were not interested in their competitors' initiatives to reach potential online retail customers.

Developing business strategies is critical to meet the continuously changing demands of the external business environment. Many organisations address such needs internally to support their business performance (St-Jean et al., 2008). Many factors that determine the capacity of a small firm to grow depend on an owner/manager's competence and the strategic decision-making skills to manage the resources available to its organisation (Mazzarol et al., 2009). Researchers have found that small businesses are constrained by a lack of resources (time, finance, and expertise) and a lack of strategic decision-making capabilities when focusing on the efficient use of IT and web presence (Fisher et al., 2007; Burgess et al., 2009). Although some small business owners/managers in this study had a business strategy, in most cases they were irrelevant in terms of addressing their internal problems and in the creation of their effective web presence. Based on these findings and the critical analysis, new justificatory knowledge was constructed:

Although many small businesses had significant internal issues, including a lack of strategic decision-making competence in the online retail environment, few ICT skills,

and limited time, their strategies were not relevant to address these significant problems in the B2C e-commerce environment.

6.2.5.4 Findings based on external opportunities and small business strategies to exploit them

Table 6.9 shows the eleven business responses relating to external opportunities and strategies to exploit such advantages in the B2C e-commerce environment. The middle column shows business responses related to their awareness about such prospects. The right-hand column shows their strategies to optimise use of such possibilities for operational requirements.

Table 6.9: Owners/managers' responses to external opportunities and strategies to optimise use of such opportunities

Business name	External opportunities	Strategies to optimise use of opportunities
Business A	• To sell products via websites	• By using ICT
Business B	• Websites and eBay store	• Changing the website to make it newer • Expanding at the eBay store
Business C	• Gumtree, True Local • Website and email • Social media (Instagram, Facebook)	• Recently opened an Instagram account • Have these accounts and websites • Consultant maintains the website
Business D	• A wide market and more reach to potential customers through website.	• Did not disclose the strategy
Business E	• Connecting more customers through websites	• Mail outs and search engine optimisation (SEO)
Business F	• Selling products to Australia, Singapore and Vietnam	• Looking for an IT expert who has business knowledge
Business G	• Not interested	• Not interested to sell online
Business H	• Word of mouth, email and phone	• Personal experiences and knowledge
Business I	• Operating through website • Social media marketing	• Increase customer-based website • Grow social media profile • Repeat customers
Business J	• The business has a good relationship with customers • Word and mouth marketing through family and friends	• This business has happy customers who buy and come back again
Business K	• Selling products online to reach wider markets • Promote business through social media to reach broader markets	• Promotion through social media

6.2.5.4.1 Results and analysis

Table 6.10 displays some typical findings, as categorised from **Table 6.9.** The left-hand column of **Table 6.10** illustrates some collective thoughts of owners/ managers regarding external opportunities. The second column from the left shows the number of small business responses and their coded names. The right-hand column shows small business strategies to optimise use of related opportunities.

Table 6.10: Some common external opportunities in the online retail environment and strategies to optimise use of these

External opportunities	**Number of small businesses: 11**		**Strategies to optimise use of external opportunities**
Selling through websites	7	Business A	• By using ICT
		Business B	• To integrate the existing website • Expanding eBay store
		Business C	• Consultant maintains the website
		Business D	• Does not want to disclose strategies
		Business E	• Mail outs and SEOs
		Business I	• Increase customer-based website
		Business K	• Nil
Expanding wider market through websites	4	Business D	• Does not want to disclose the strategy
		Business E	• Mail outs and SEOs
		Business F	• Looking for an IT expert who has business knowledge
		Business k	• Promotion through social media
Social media	3	Business C	• Recently opened an Instagram account
		Business I	• Grow social media profile
		Business K	• Promotion through social media

Specific opportunities were identified by small businesses in the online retail environment. Opportunities for improving their businesses included selling through websites, and the expansion of trading markets via websites and using social media. However, each of the businesses had a different strategy for the efficient use of websites, although some of these were irrelevant. Only, Business B took an approach that integrated websites, and Business F considered hiring an IT expert with business knowledge. Yet none of the businesses focused on how to select competitive features on their retail websites to reach potential customers. Based on the above findings and critical analysis, new justificatory knowledge was constructed:

Although the majority of small businesses indicated that there were external opportunities to increase sales via websites, their strategies were not designed to take advantage of such opportunities.

6.2.5.5 Findings based on external threats and small business strategies to minimise them

Small business responses about external threats in the B2C e-commerce environment and strategies to minimise them are presented in **Table 6.11**.

Table 6.11: Small business responses on external threats and strategies to minimise them

Business name	External threats	Strategies to minimise external threats
Business A	• Competitor and consumer technology use	• To compete with competitors by using ICT
Business B	• Other local stores that have new and easy to use websites	• To see what advantages competitor systems have over ours and see what we can do to be better
Business C	• Lots of businesses are selling the same clothes	• Provide extra services to our customers (e.g., make clothes any size through stitching)
Business D	• Lots of established competition	• Nil
Business E	• Consumers have different choices via websites	• Building relationships with customers • Maintaining web features • Added benefits (servicing and support)
Business F	• Product importing costs • Government policies on imported products	• Use their own knowledge and extensive experience
Business G	• eBay and Gumtree	• Customer service • Try to offer products with lower prices and free services
Business H	• Do not bother about external threats as they have local customers	• Nil
Business I	• Cheaper overseas websites • Easy to compare prices with Australian and overseas competitors	• Price match • Approach suppliers and negotiate cheaper products
Business J	• Suppliers selling their best products to other big shops exclusively • City council does not provide efficient support to small businesses	• Build relationships with more good suppliers and find better products
Business K	• Other brands sell cheaper clothing	• Compete as much as the business can • But, does not know how to do much about it

	• Other brands have higher range of stock • Other brands have funds to support business and advertising	

6.2.5.5.1 Results and analysis

Figure 6.7 provides a graphical representation of findings related to external threats, showing that more than half of the businesses (54%) identified competitors as a threat in the B2C e-commerce environment. However, some of them (46%) identified other external risks, including consumers' technology use and the different choices available to them, product import costs, government policies, cheaper products offered by competitors and difficult negotiations with suppliers.

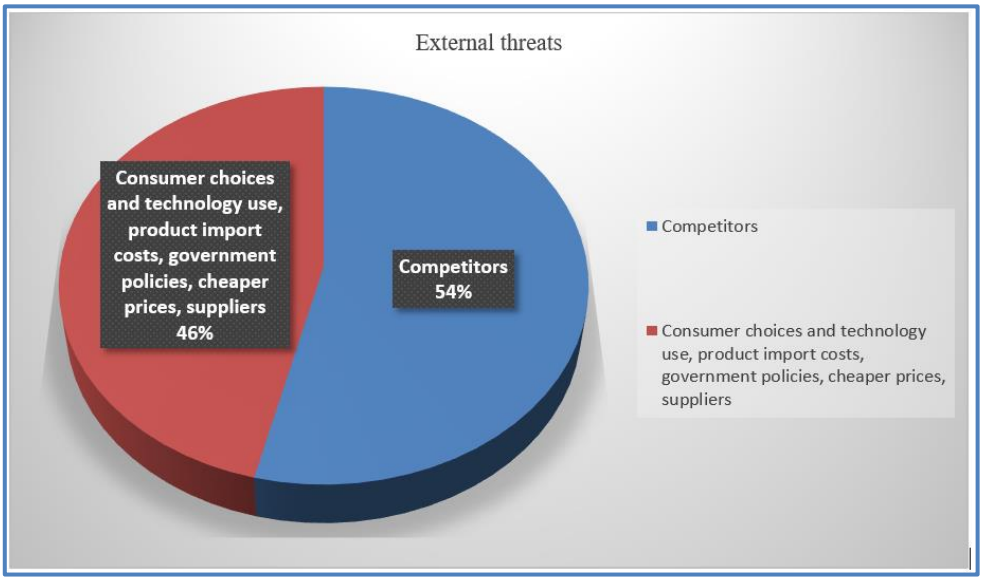


Figure 6.7: Key findings related to external threats

Figure 6.8 provides a graphical representation of how some small businesses addressed external threats. This figure shows that only three of eleven small businesses had a strategy to improve their systems to match those of their competitors. The remaining businesses had different strategies. For example, three companies provided free service to support customers. Two companies offered affordable prices. The other five small businesses considered customer relationship building, the use of extensive business knowledge and experience, improved customer service, and negotiating with suppliers, as important strategies.

Figure 6.8: Small business strategies to minimise external threats

Although the majority of small businesses said external threats were their competitors, as already indicated, only three (Business A, B and E) had a strategy to minimise risks by improving their websites to match those of their competitors. However, these three did not focus specifically on website features. For example, Business E concentrated on managing website features, but it did not indicate how to make strategies to select features on its website. Based on these findings and the analysis, new justificatory knowledge was constructed:

Although the majority of small businesses recognised competitors as external threats, most lacked systematic strategies to minimise the impact of these threats by competing in the B2C e-commerce environment.

6.2.5.6 Findings based on owners/managers' awareness about overseas competitors and the products they sell to Australia

Small business responses on their awareness about overseas competitors and what products they sell to Australia are shown in **Table 6.12.**

Table 6.12: Small business awareness about overseas competitors and their products

Business name	Overseas competitor websites identified as selling to Australia	Products being sold to Australia by overseas competitors
Business A	• eBay, Hotmail	• Clothing and accessories
Business B	• Nil	• Nil
Business C	• Nil	• Women's clothing
Business D	• Concentrates first on local competition	• A range of menswear fashion
Business E	• Unknown	• Unknown
Business F	• Only knows about e-Bay	• Not interested in overseas competitors

Business G	• Not interested, but only knows about e-Bay	• Similar electronic products coming through eBay
Business H	• Nil	• Do not bother about overseas competitors
Business I	• No idea	• No idea
Business J	• Do not have overseas competitors	• No idea
Business K	• Kmart, Target, T-Bar	• Answered with "What?"

6.2.5.6.1 Results and analysis

The majority of small businesses lacked awareness about overseas competitors and the products they sold to Australia. For example, Business K considered Kmart, Target, and T-Bar as overseas competitors, although they are Australian-based retail companies. Only Business A saw eBay as an overseas competitor, selling clothing and accessories, as well as other products. Business D concentrated on local competitors. Other businesses were not concerned about competitors and their products. Based on these findings and analysis, new justificatory knowledge was constructed:

Most of the small businesses did not know much about their overseas competitors or the products they sold to Australia. Yet, these are critical issues in terms of understanding the external business environment and associated factors.

6.2.5.7 Findings based on owner/managers' knowledge of the adoption levels of features on overseas websites and their strategies to maintain features on their own websites

Table 6.13 presents small business responses about overseas website features and their strategies to maintain their own website features.

Table 6.13: Small business responses about their knowledge of features on overseas websites and strategies to maintain their own website features

Business name	Owner/manager knowledge about the adoption levels of features on overseas websites	Owner/manager strategies to maintain their website features
Business A	• Product information featured through catalogues • Communication features are online emails, phones, and other email addresses • Transactions, such as payment features • Distribution features, such as product tracking	• To build websites with well-developed website features
Business B	• Nil	• Nil
Business C	• Nil	• Nil

Business D	• Nil	• Nil
Business E	• Unknown	• Nil
Business F	• Not interested in overseas competitors	• Looking for people who have IT and business knowledge
Business G	• Not interested	• Not interested in selling online
Business H	• Not interested in overseas competitors	• Nil
Business I	• Interactive catalogue • Free shipping	• Two staff manage the website
Business J	• Not relevant	• If the business makes more profit, it will introduce a website. At this moment, we do not want to waste time as the business is very small and is still satisfied with the present condition. If my son and daughter get involved, the owner they will help them.
Business K	• They advertise the same products	• To use Shopify to tell the owner who visited the company website and what were the most visited items

6.2.5.7.1 Results and analysis

Figure 6.9 provides a graphical representation of the results concerning owners/managers' knowledge about the features available on their overseas competitors' websites. As shown, the majority of small businesses (71%) were non-responsive, or they did not know about, or were not interested in, the features on overseas competitor websites. Only Business A had some knowledge of its competitors' website features. Business I simply knew about the catalogue and free shipping features that overseas sites had, and Business K only knew about product information features.

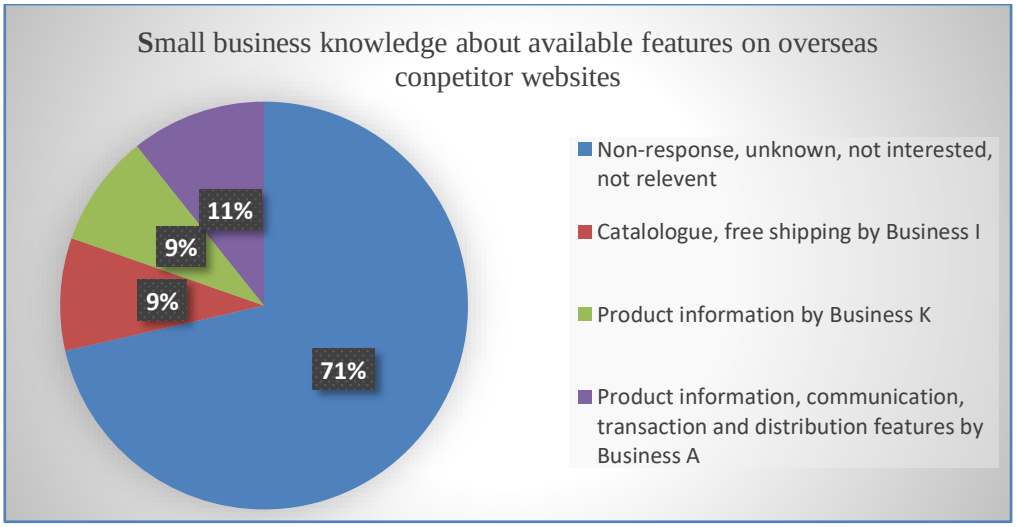


Figure 6.9: Small business knowledge about features on overseas competitor websites

Figure 6.10 provides a graphical representation of results regarding small business strategies on how to maintain their website features. The majority of businesses were non-responsive and lacked concern about their website features. Only a few had strategies for managing their websites. For example, Business A had a strategy to create a well-developed website. Business F intended to hire staff with IT skills and business knowledge. Business I and Business K used Shopify and two employees managed their websites. Business J indicated that they would develop a website if they improved their profits.

Figure 6.10: Small business strategies to maintain their own website features

The results indicate that the majority of small businesses had little knowledge about the features on overseas competitor websites. Also, they paid little attention to the type of features required on their own websites. Moreover, they lack of knowledge about how to maintain website features systematically. Despite the fact that overseas competitor websites represent an external environmental threat to small businesses in the B2C e-commerce environment, only Business A had some awareness of the features adopted by overseas websites. Nonetheless, this owner did not indicate how to develop strategies to maintain features on its website. Hence, supported by these results and analysis, new justificatory knowledge was produced:

Most of the owners/managers had inadequate knowledge about the available features on overseas competitor websites. In addition, they did not know how to manage their website features systematically. Many of them were not interested at all in website features.

6.2.5.8 Findings based on the level of adoption of features on small businesses websites

Table 6.14 presents the responses of eleven small businesses concerning the level of adoption of ICDT categories on their websites in the B2C e-commerce environment.

Table 6.14: Small business responses regarding ICDT categories of features available on their websites

Business name	Extent of information (I)-based features on websites	Extent of communication (C)-based features on websites	Extent of transaction (T)-based features on websites	Extent of distribution (D)-based features on websites
Business A	Contact details	Email and telephone address, Facebook connection	Direct and phone payment	Collect products from the shop
Business B	Make access easier from mobiles and tablets	Four times a year an email sent to all members	Purchase products from warehouse, retail store, needs updating	Products sent by post and confirmation sent by email
Business C	This business has own website	Had no time to update website features	Nil	Nil
Business D	Through marketing	Through marketing each month	Nil	Nil
Business E	SEO	Contact form or enquiry button	Use a quoting system with follow-up contact	Nil
Business F	Told to see the website	Nil	Nil	Nil
Business G	Nil	Nil	Nil	Nil
Business H	Nil	Nil	Nil	Nil
Business I	Nil	Nil	PayPal/credit card options	Free shipping on orders over $120; express shipping options
Business J	Nil	Nil	Nil	Nil
Business K	Use Shopify to assist in identifying if anyone visits the business website and what the most visited items are	Does not have these features. Uses social media to communicate with customers	Shopify provides all transaction features and identifies who abandoned their shopping cart	Does not have distribution features

6.2.5.8.1 Results and analysis

Figure 6.11 provides a graphical representation of results relating to ICDT categories available on small business websites. Many small businesses were non-responsive when addressing this question. A high non-responsive rate was recorded in relation to distribution-based features. Only three of eleven small businesses responded. Among them, Business A distributed products from its shop, and both Business B and Business I distributed through shipping or post. Business B also communicated via email after shipping products. Only Business I used PayPal and credit cards as payment methods for completing transactions.

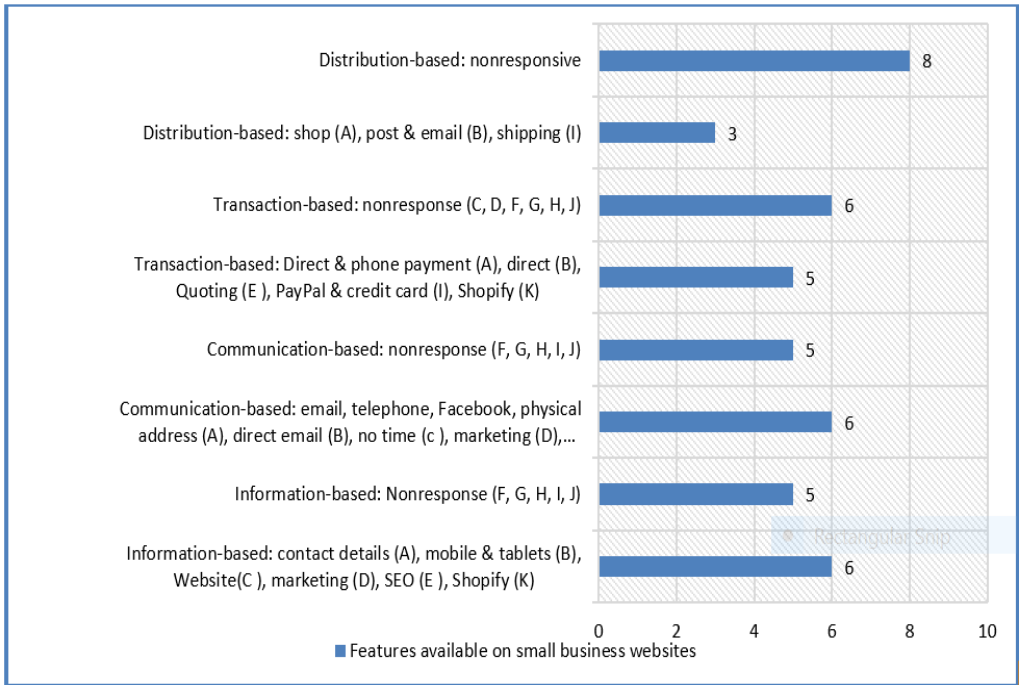


Figure 6.11: Features available on small business websites

Six of eleven businesses used different communication techniques. Among these were telephone, physical address, social media, direct emails, enquiry forms, and through marketing. Information-based features were used, including contact details, mobile and tablet, website, marketing, SEO, and Shopify. These results and their analysis indicate that most of the small businesses in this study had limited ideas about what features were available on their websites and their requirements. Hence, new justificatory knowledge was constructed:

Most small business owners/managers had inadequate knowledge about the ICDT-based features available on their websites, and many of them were unconcerned about their own website features.

6.2.5.9 Findings based on owners/managers' strategic decisions to select relevant website features in the B2C E-commerce environment

Table 6.15 outlines owner/manager responses about how to select competitive features on their websites in the B2C e-commerce environment.

Table 6.15: Small business strategies to select relevant features on their websites

Business names	Owners /managers' strategies to select relevant features on their websites
Business A	• To keep an eye on competitors
Business B	• Keeping website simple and clear • Keeping as few steps as possible for selecting items and paying • Making searching for items easy and quick
Business C	• Website is made by a web designer
Business D	• External consultants from time to time give feedback to improve website
Business E	• Select simple cost-effective solutions
Business F	• SEO, Google review
Business G	• Not interested in going online
Business H	• Extensive knowledge
Business I	• Try and keep website as clean and as simple as possible
Business J	• No strategy
Business K	• Does not focus on web features, focus on brands that are offered by other companies and match their brands with those of their competitors

6.2.5.9.1 Results and analysis

Figure 6.12 provides a graphical representation of different small business strategies for how to select features on their retail websites.

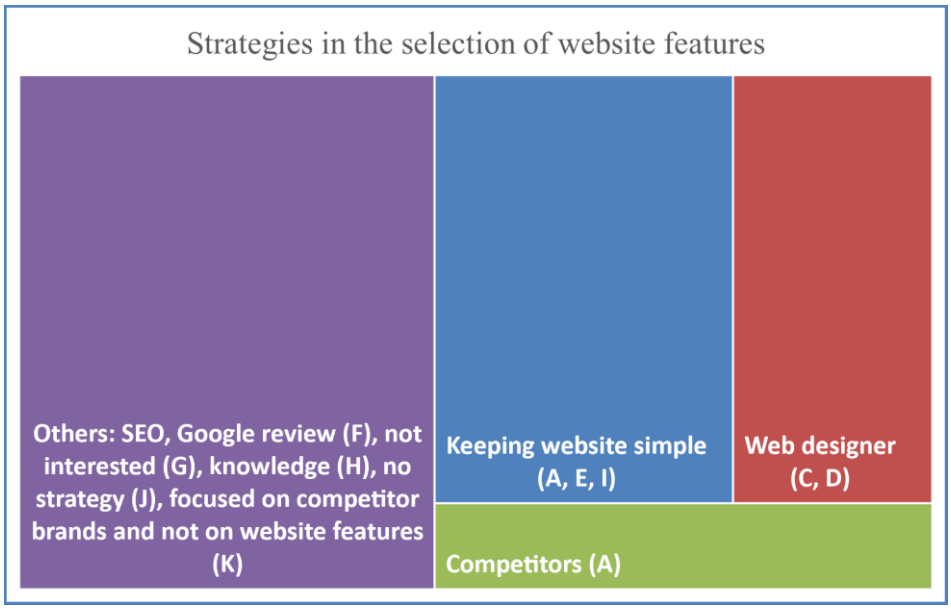


Figure 6.12: Small business strategies in the selection of features on their websites

- **Keeping websites simple:** Three businesses (Business A, Business E and Business I) had strategies for keeping their websites simple.
- **Seeking web designer support:** Two businesses (Business C and Business D) had strategies to seek support from web designers.
- **Focusing on competitors:** Only Business A had a strategy to keep an eye on competitors. The competitor is one of the critical external business environmental factors that need to consider for strategic business decisions.

- **Others:** Five businesses had individual views about managing website features:
    - Business F focussed on SEO and Google review. SEO is the process of optimising the company website to get it noticed by search engines (SE), and shown on SE result pages (SERPs) when people are looking for what businesses offer (Carrel, 2013).
    - Business H had extensive knowledge.
    - Business G not been motivated to sell online.
    - Business J had no strategy.
    - Business K focused on brands offered by competitors and was not interested in website features.

Based on these results and analysis, new justificatory knowledge was constructed:

The majority of small business owners/managers had inadequate or irrelevant strategies for the selection of competitive features on their websites. These results and analysis informed the development of a support system, or a new DSS-based solution, to assist businesses in making strategic decisions in the B2C e-commerce environment.

6.3 Summary on small business internal issues and needs

Table 6.16 presents the summary of findings related to small business issues and needs. The summary was developed using the streamlined codes-to-theory model developed by Saldana (2015) and shows the fourteen constructed justificatory pieces of knowledge. These pieces of knowledge were produced from the eleven case studies using an inductive data analysis technique, as part of the qualitative research.

Case studies were carried out to answer the RQ 1 of the study. Also, the second objective of this study was formulated to investigate the relationship between the factors that

influence Australian consumers purchasing from overseas websites and owners'/managers' strategies to select competitive features on their websites in the B2C e-commerce environment. A series of justificatory knowledge presented in this table from an analysis of the case study results confirms the significant issues that exist within small business communities in Australia. The issues include the lack of knowledge of most business owners regarding internal and external business environments and related factors. Most lack knowledge about their website features and their competitors who sell to Australia. They have no knowledge of how to select competitive features on their B2C websites. The majority have a lack of time and interest in research and development. These can be significant factors. As a result, they are unable to formulate strategies for an effective presence in the B2C e-commerce environment. The results were confirmed as a DSS-based solution, design requirements, and components of the DSS architecture.

Table 6.16: A summary of small business internal issues presented using the streamlined code-to-theory model

Code	Categories	New justificatory knowledge based on findings
Small business internal factors/issues and needs	Owners/managers' lack of responsiveness and engagement in research and development	*The lack of interest, responsiveness, and engagement in research and development by small business owners/managers in the B2C online sector in Australia could be another significant factor explaining why they are unable to make any strategic decisions that are necessary for their business performance.*
	Small business owners/managers were busy and had no time	*Email/web-based data collection is more efficient than face-to-face, as small business owners/managers are busy and have no time for direct interviews.*
	Small business profiles	*A significant internal issue was identified concerning selling products in the wider market, with the majority of small businesses preferring to sell their products in local markets, despite most of them having websites.*
	Small business owner/manager profiles	*Significant internal issues exist in many small businesses concerning inadequate competencies and knowledge among owners/managers in the use of advanced ICT, particularly in the selection of relevant features on their websites. Most are too busy due to their owner-operator status.*
	Business model of small businesses and owners/managers' awareness of online shopping problems in Australia and their experiences	*Most small businesses knew about problems in the online retail sector in Australia and the majority shared their difficult experiences. However, the majority of Australian small businesses in this study preferred to sell from physical stores, as indicated by the business models they adopted.*
	Owners/managers' understanding and knowledge about internal and external business environments	*The lack of knowledge among the majority of owners/managers about internal and external business environments and associated factors is significant in the context of their ability to make strategic decisions in the B2C e-commerce environment.*
	Small business internal strengths and strategies to use strengths to increase opportunities	*Although a few small businesses had internal strengths or resources, including an extensive range of products, email, the capability to offer products at affordable prices, and selling through websites, only one business had a strategy to provide relevant information on its website to appeal to consumers.*

	Small business internal weaknesses and strategies to counter weaknesses to maximise opportunities	*Although many small businesses had significant internal issues, including a lack of strategic decision-making competence in the online retail environment, few ICT skills, and limited time, their strategies were not relevant to address these significant problems in the B2C e-commerce environment.*
	Small business external opportunities and strategies to achieve them.	*Although the majority of small businesses indicated that there were external opportunities to increase sales via websites, their strategies were not designed to take advantage of such opportunities.*
	Small business external threats and strategies for minimising them.	*Although the majority of small businesses recognised competitors as external threats, most lacked systematic strategies to minimise the impact of these threats by competing in the B2C e-commerce environment.*
	Owners/managers' awareness of overseas competitors and the products they sell to Australian consumers	*Most of the small businesses did not know much about their overseas competitors or the products they sold to Australia. Yet, these are critical issues in terms of understanding the external business environment and associated factors.*
	Owners/managers' knowledge and understanding of overseas competitor web features and management of their own website features	*Most of the owners/managers had inadequate knowledge about the available features on overseas competitor websites. In addition, they did not know how to manage their website features systematically. Many of them were not interested at all in website features.*
	Available levels of ICDT-based features on small business websites in the B2C e-commerce environment	*Most small business owners/managers had inadequate knowledge about the ICDT-based features available on their websites, and many of them were unconcerned about their own website features.*
	Owners/managers' strategic decisions in the selection of relevant features on their websites in the B2C e-commerce environment	*The majority of small business owners/managers had inadequate or irrelevant strategies for the selection of competitive features on their websites. These results and analysis informed the development of a support system, or a new DSS-based solution, to assist businesses in making strategic decisions in the B2C e-commerce environment.*

6.4 Chapter summary

This chapter described the results and analysis based on multiple small business case studies in the online retail sector in Australia. The goal was to identify small business internal issues and their strategic needs, particularly in the selection of competitive features on their websites in the B2C e-commerce environment. The study used the inductive data analysis method as part of the qualitative research. Qualitative inductive analysis generates results, analysis, new concepts or theories from the specific data of a qualitative study. This study employed the streamlined codes-to-theory model for qualitative data reduction and analysis purposes. The study also adopted the constructivist research philosophy in DSR, which focused on constructivism rather than statistical methods. Ultimately, a series of new justificatory knowledge or concepts were constructed relating to small business internal issues and needs. This series informed the development of a DSS-based solution to meet small business needs.

The next chapter describes the DSS requirement analysis and design methods.

Chapter 7: DSS Requirements Analysis and Design Methods

This chapter describes the DSS requirement analysis, and reviews various development methods, used to create a new DSS for small business strategic decision-making. The chapter is organised as follows. Section 7.1 describes small business problems and needs, using the conceptual DSS framework for the purpose of identifying a practical DSS requirements analysis. Section 7.2 reviews the development and evaluation methods to identify those most appropriate to the DSS. Finally, section 7.3 provides the chapter summary.

7.1 DSS requirement analysis

This study was evolutionary and centred on small business problems, needs and DSS based support requirements. Support is required in the context of strategic decision-making related to the selection of competitive website features in the B2C e-commerce environment. Therefore, before the initial DSS prototype development, an analysis of small business website features against some their overseas competitors was completed. Thus, the study identified significant issues on small business websites, which were documented in Chapter 5. This study also examined internal problems and needs by employing multiple case studies to identify how much small business owners/managers have awareness and knowledge about the business environment and related factors. Moreover, it was important to know how they made their strategic decisions in the selection of competitive features on their websites in the B2C e-commerce environment, as discussed in Chapter 6. A series of new justificatory knowledge was constructed related to small business problems, needs and the DSS prototype requirements. Owners/managers were also invited to the evaluation of the initial DSS prototype to test the usefulness and efficacy of the artefact prototype. This is discussed in Chapter 9.

7.1.1 DSS requirement analysis method

As discussed, a series of justificatory knowledge emerged from the results of the case studies, and web content analysis was further discussed and analysed using the MRT model (Mintzberg et al., 1976) in the conceptual DSS framework. The rationale for this analysis was to identify small business issues, needs, and DSS requirements. The MRT model is well-known in the strategic management literature. Many influential factors

associated with decision-making processes are also part of the MRT Model, and one of these factors is environmental forces. Other factors addressed by the model related to the decision process are iterative, concerned with understanding and processing information (Power, 2009). Relevant findings and their analysis using three decision-making phases (identification, development, and selection) of MRT model are described in the following sections.

7.1.1.1 The identification phase

This phase relates to two management activities: recognition and diagnosis. The recognition activity initiates the decision-making process, as problems and opportunities in the business environment are recognised by the organisation.

In terms of a problem recognition routine, this study found that all small businesses had some awareness and knowledge of problems in the online retail sector in Australia. However, the majority of them lacked the competencies and analytical knowledge to address them. In terms of an opportunity recognition routine, although the majority of the small businesses believed their opportunities related to stimulating retail sales via websites, their strategies were incompatible with accomplishing this. They failed to set up interactive websites in the dynamic B2C e-commerce environment.

Researchers argue that managers require more information and knowledge in the diagnosis routine activity, as they need to be able to describe and explain the previously recognised problems and opportunities (De Wit & Meyer, 2010; Mintzberg et al., 1976). Therefore, additional information is crucial for a small business in making its decisions strategically in the B2C e-commerce environment. A strategic decision focuses on analysing both the internal and external business environment and associated factors (Mintzberg et al. 1976; De Wit & Meyer, 2010). Strategic decisions also involve qualitative judgements and using intuition before finally making decisions (Bonczek, Holsapple, & Whinston, 1981).

However, many small business owners/managers lack awareness and analytical knowledge about the internal and external business environment and associated factors, as identified in the multiple case studies. Analytical knowledge and its acquisition from the business environment is essential for a manager to improve business performance.

Knowledge acquisition must connect to the source of knowledge and whether it is found internally or externally (Oliver, 2008).

7.1.1.1.1 Small business internal issues, needs and DSS requirements analysis

Internal environmental analysis involves understanding strategic issues crucial to the success of an organisation. This analysis also determines the importance of each of these issues and identifies the strengths and weaknesses of the organisation concerning each of these factors. Finally, this analysis assists managers in preparing a strategic advantage profile for their organisation and comparing it with profiles of successful competitors within the industry (Srivastava & Verma, 2012). Rosenblatt (2014) considered internal issues, including system user concerns and problems with existing systems. Other small business internal issues also investigated in this study, include:

- Owners/managers as system users' competence related to strategic decision-making in the B2C e-commerce environment.
- Focused issues on their existing systems related to competitive features that need to be available on their B2C websites.
- Owner/managers' knowledge about the business environment and associated factors.
- Concerns about small business internal strengths and issues and how they use resources to maximise opportunities and address their internal problems strategically in the B2C e-commerce environment.

Although some small businesses in this study had a wide range of products, which were considered an internal strength or resource, only one had a strategy to provide relevant product information on their website through which consumer interactions could be maximised. The majority of the small businesses had internal issues relating to a lack of skills in using advanced technology, but their strategies were not designed to address this. The most significant problem for them was the lack of understanding and poor analytical knowledge about the business environment.

While the majority of small businesses considered opportunities to increase sales via websites, and were aware of competitors as an external threat, their strategies did not reflect the importance of these opportunities. Moreover, many of the small businesses

were uninterested in overseas competitors who sold products to Australia, and only a few of them thought about local competitors.

This study also found that the majority of small businesses lacked strategies in the selection of competitive features on their websites. Most of them depended on web designers and consultants, who were secondary decision-makers. Nearly all of them lacked awareness about the level of adoption of features on their overseas competitors' websites. Moreover, most of them did not know what features were available on their own websites. Owners/managers were preoccupied with everyday business operations and were time poor. They had little opportunity to engage in research and development. In line with this finding, Buxton and Walton (2014) recognised that small businesses might find it challenging to collect market research data due to limited time.

7.1.1.1.2 Small business external environmental factors and DSS requirement analysis

Researchers have recommended external business environmental factors, such as new technologies, customers, suppliers, the economy, competition and government policies (Pedersen & Sudzina, 2012; Rosenblatt, 2014; Thierauf, 1988). In the context of analysis of the external business environment and associated factors, this study considered small businesses who had to deal with overseas competitors with websites that competed with their own, a significant external business environmental factor.

From the B2C e-commerce perspective, the online environment must be attractive, with adequate website features so its consumers can choose, perform, and enjoy their shopping experience (Bilgihan & Bujisic, 2015; Abdallah & Jaleel, 2015). One of the significant challenges of many small businesses in Australia, as evident in the case studies, has been forming strategies to create effective retail websites. The lack of strategy formation is centred on the selection of competitive features on their websites. As already discussed, the present study focused on an analysis of the external business environment and associated factors. It found that significantly lower levels of ICDT categories of features were present on small business websites compared with their overseas competitors.

Again, as already discussed, small business problems and support needs within the B2C e-commerce environment informed the development of a DSS-based solution. This DSS was designed to help small businesses accumulate information from the external business environment and process it into knowledge. This would ultimately support better strategic

decision-making, particularly in relation to selecting more competitive features on their websites.

7.1.1.2 The development phase

The development phase of the MRT model in the conceptual DSS framework involved two sets of activities to produce one or more solutions. First was the search activity, aimed at finding ready-made solutions. Second was the design activity, which sought to develop new solutions or modify ready-made ones. In the development phase, a manager can formulate or develop a decision model, set the criterion for the choice, and search for alternatives. However, many small businesses had inadequate knowledge about the business environment and related factors. These factors are significant for making decisions strategically through the development of a support system for achieving organisational goals.

A UCDE method was adopted, as developed by Miah et al. (2014), for the overall development of the DSS deigned in this study for small business decision-makers. The initial DSS prototype instantiation was also evaluated with the involvement of owners/managers as end-users.

7.1.1.3 The selection phase

The selection phase of the MRT model in the conceptual DSS framework is characteristically a multi-stage iterative process of decision-making. An authorised decision-maker is involved in this phase in making strategic decisions. In the present study context, the authorised decision-maker is a small business owner/manager responsible for making strategic decisions about the selection of competitive features on their website in the B2C e-commerce environment.

The evaluation phase of the initial DSS prototype allowed small business decision-makers to confirm the usability, efficiency, and performance. This would determine whether the artefact was adequate for their strategic needs. Consequently, these activities involved acquiring knowledge through analysing the external and internal B2C e-commerce environment, and activities that required further prototype improvements.

This study adopted the HMPR guidelines in DSR for the overall research design, with HMPR guideline 5 suggesting the use of rigorous methods that are vital in both the construction and evaluation of the design artefact. Ultimately, an evolutionary and

prototype approach was used for the new DSS artefact design, development and evaluation, employing UCD principles. As a consequence, small business owners/managers were invited to evaluate the DSS prototype. The next section introduces the different approaches used to select the most appropriate methods to design, develop and evaluate the new DSS solution artefact to meet small business strategic needs.

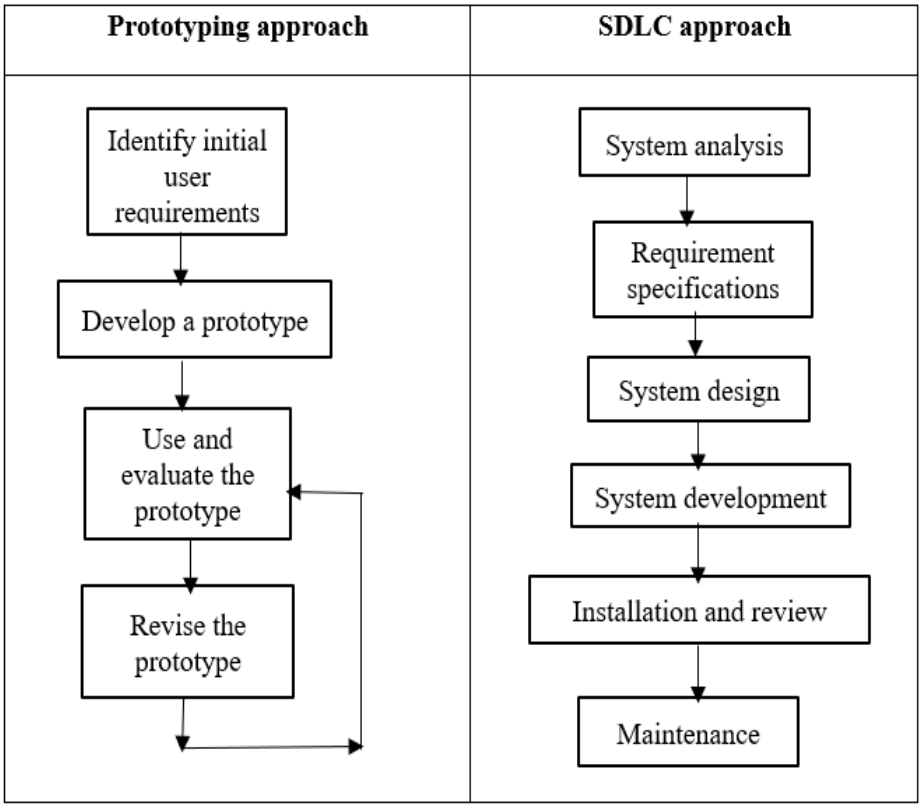
7.2 DSS development approaches

A variety of approaches have been employed over the years for system development in the IS research domain, each with strengths and weaknesses. The most commonly used approach is the system development life cycle (SDLC) (Kroenke, Bunker, & Wilson, 2014). This method is also known as the traditional system development approach (Turban, Sharda & Delen, 2011). However, in the small business strategic decision-making problem context in the dynamic B2C e-commerce environment, SDLC was not suitable. This is because this method is generally used for large projects (Kroenke et al., 2014), and the process is lengthy and involves many stages (Turban, Aronson, Liang & Sharda, 2007).

Some researchers have also asserted that the development of a DSS from the SDLC approach is not the best option because of its rigidity and the volume of project documentation needed (Brandas, 2011). Moreover, DSS requires a different design practice than the traditional system development approach and the traditional method is recognised as inadequate because there is no single theory of decision-making involved (Sprague, 1980). Moreover, a decision is related to the rapid change of the condition that decision-makers encounter in the business environment. Thus, for such fast decision-making, a designer cannot define in advance what the functional requirements of the system should be. A DSS needs to be built with short, rapid feedback from users to ensure that development is progressing precisely through iterative processes. The iterative process is known as the prototype approach, where prototyping is one of the fundamental principles of the UCD of the system (Gulliksen et al., 2005). This will be discussed later. Consequently, again SDLC was not considered suitable for the development of the new DSS because the B2C e-commerce trading environment is rapidly changing and strategic decisions need to be made quickly.

Some other approaches have come to light to resolve the limitations of the SDLC approach. Methods include monolithic, incremental, rapid application development (RAD), evolutionary (Kroenke et al., 2014), joint application development (JAD) (Rosenblatt, 2014), and prototyping (Okoli & Carillo, 2012). As already indicated, the evolutionary and prototyping methods were considered suitable for the intended design and development of a small-scale system for small business owners/managers for their strategic decision needs in the rapidly changing B2C e-commerce environment.

Figure 7.1 shows the differences in various phases between prototyping and SDLC approaches. The left-hand part of this figure outlines the steps of the prototyping method, and the right-hand side shows the steps of the SDLC approach. In the prototyping method, multiple case studies and web content analysis were carried out initially to identify the DSS user requirements. Next a DSS prototype was developed, as documented in Chapter 8. Also, owners/managers were invited to use and evaluate and finally revise the prototype. These activities are discussed in Chapter 9.



Source: Alavi (1984, p. 559)

Figure 7.1 Different stages of prototyping and SDLC approaches

The following sections discuss the other system development approaches: monolithic, incremental, JAD, RAD, evolutionary and prototyping.

7.2.1 The monolithic system development approach

This approach is appropriate when requirements are understood within a stable environment, and with little innovation and limited scope (Kroenke et al., 2014). This method was not suitable for the small business DSS development because the B2C e-commerce environment is highly competitive and rapidly changing, with strong competition and a broad scope of factors. Thus, an innovative approach to system development was required for the contextual needs of small business.

7.2.2 The incremental or agile system development approach

Although the incremental or agile development approach attempts to develop a system incrementally by building a series of prototypes and constantly adjusting them to user requirements (Kroenke et al., 2014), this method was not applicable to the small business DSS development because:

- It involves delivering a series of stand-alone subsystems.
- Systems are operational, and it takes a long time to produce the system.
- The system is appropriate for a large and complex application (Kroenke et al., 2014).

In the small business context, a small-scale DSS type was developed for one user.

7.2.3 The joint application development approach

The main benefit of JAD is that it is a team-based approach. It is a user-oriented system development paradigm supporting the gathering of information, business needs and defining new system requirements. Therefore, JAD seeks the active participation of users for the system development, while SDLC seeks advice from users only when their input or approval is obligatory. As a result, JAD is more expensive than SDLC, but users are only involved until defining system requirements, not in the evaluation phase (Rosenblatt, 2014). Consequently, JAD was not suited to the small business IS development because this approach was expensive for small businesses. Owners/managers were also involved in the evaluation phase of the DSS prototype development.

7.2.4 The rapid application development approach

Although the RAD approach recommends consistent user involvement, rapid implementation of the system, adaptation to user needs (Ayed, Ltifi, Kolski & Alimi, 2010) and prototyping, it delivers a series of stand-alone subsystems that are comprehensive and complex for a business solution (Kroenke et al., 2014). Therefore, JAD was not suitable for the small business DSS development in this study, which sought to develop a small-scale solution for a small business decision-maker to improve single decision-making tasks.

7.2.5 The evolutionary prototyping system development approaches

The evolutionary prototyping was suitable method for small business DSS design, development, and evaluation. The main advantage of the evolutionary system development approach is that phases of this method are related to producing quick prototype systems that are fully functional (Kroenke et al., 2014). Prototyping, as adopted in this study, is also an appropriate approach because a prototype is a smaller-scale working model of the user's requirements, or a system development method in the IS research domain (Haag & Cummings, 2009).

Evolutionary development considers the aetiology or set of causes that are particularly concerned with the forces or factors that motivate users in the DSS adaptation process. Causal factors can originate from the business environment or be cognatic causal factors relating to the decision-maker (Arnott, 2004). Cognitive decision support aims to help managers in their decision-making from a human cognitive perspective. Therefore, cognitive aspects help managers in thinking, being familiar with the environment, understanding, and reusing their experience. Decision-making is becoming increasingly difficult in the contemporary business environment, and a cognitive style plays a significant role in assisting decision-makers in understanding business environments (Chen & Lee, 2003). This is evident in the following ways:

- Managers think about a system when they learn more about the decision tasks by using the system and interacting with a system analyst.

- They also think of new system requirements through conversations with other managers or consultants, particularly if the consultant is a domain expert rather than an information system expert.

- Attending conferences, seminars and training courses could also provide a cognitive cause of DSS evolution.

- Ultimately, this interaction and participation influences managers in thinking about the DSS.

Therefore, the decision task may lead to ideas that cause evolutionary changes to the system (Arnott, 2004; Miah, 2008).

Many owners or managers of small businesses do not have interactions with system analysts and other managers, as the majority of small companies are owner-operated. They are also busy most of the time, as found in the case studies. Most of them lack the time and resources to attend conferences, seminars, and explore research and development opportunities. Thus, this study initiated the building of a user-friendly DSS-based solution to assist in improving analytical and decision-making abilities in the B2C e-commerce environment because most small business owners/managers (who were the primary users of the system) lacked competence in using advanced technology.

Most importantly, evolutionary system development is iterative (Seffah, Gulliksen & Desmarais, 2005), with the prototype developing in parts or completed for a particular case (Beaudouin-Lafon & Mackay, 2003). Evolutionary and prototyping methods use the UCD approach, which allows for the creation of iterations while working with users, who also evaluate the design solution before finalising it. Therefore, an iteration should contain a proper analysis of users' needs and the context of use. The iteration is also related to evaluation, with documented specific suggestions for modifications following the results of the assessment (Seffah et al., 2005). Some researchers have recommended that iteration activities need to be informal (Gulliksen et al., 2005). These researchers also suggested that an iteration could be as short as half an hour, as long as it contains all three steps of design, evaluation, and redesign (Gulliksen et al., 2005).

The evolutionary approach also utilises judgement modelling, which creates contextual business needs. The model provides insight into the decision process, suggests decision variables, and establishes a learning-based, participatory implementation strategy (Alavi & Henderson, 1981). Therefore, prototyping represents a common reference point for both users and designers by which to identify potential problems and opportunities early

in the development process. Ultimately, prototyping is a practical way to encourage user participation in a project (Alavi, 1984).

Based on the above discussions, the evolutionary prototyping method was considered appropriate for small-scale system development for a small business owner/manager in the rapidly changing B2C e-commerce environment. The next section details the UCD methods, as evolutionary and prototype system development approaches are two critical methods that adopt UCD principles (Gulliksen et al., 2005).

7.2.6 UCD principles for DSS solution design, development and evaluation

DSS has been seen as a successful concept and implemented in several forms over the last decades (Arnott & Dodson, 2008). However, many researchers perceived that they do not always bring a productive outcome for their target users (Arnott & Pervan, 2014; Arnott & Pervan, 2012; Arnott & Dodson, 2008; Hosack, Hall, Paradice, & Courtney, 2012). Many failures in DSS projects are due to utilising unfit design methods and a lack of user involvement (Nelson, 2007; Dwivedi et al., 2015). Also, a lack of understanding of their reality in the design process creates an inequality between the end user and designer motivations, and poor implementation approaches (Arnott & Dodson, 2008; Arnott & Pervan, 2012).

The method of DSS design and development traditionally establishes the importance of the decision, or the system, or the support part of the systems. Therefore, various methods for DSS design and development have been offered based on these concepts. Methods include decision-centred design, system-centred design, support-centred design, and UCD. The decision-centred design focuses on portfolio management. The system-centred design comes from the software engineering field. The support-centred design suggests early implementation and testing of the system to provide necessary support to users. In the UCD method, the main principles include beginning with a significant decision problem, using a short life cycle, evolving the system with multiple sequences and continuously evaluating (Courbon, 1996). Moreover, the UCD approach ensures not only decision-making tasks but also considers the decision-makers' involvement in the decision-making process (Zarate, 2013). The current study fits under the UCD method because of user involvement before the DSS design and in the evaluation processes. Therefore, it was initially focused on user decision problems and business needs, which informed the DSS requirements.

The UCD has also been seen as a socio-technical approach. This philosophy does not use specific methods for design and focuses on the social and cognitive analysis of human activities (Baek et al., 2008). As already stated, UCD focuses on the decision-maker's cognatic causal factors (Niu et al., 2009). According to Niu et al. (2009), cognatic style represents the human mental model that creates situation awareness among managers about the business environment. These researchers implied that analysis of the business environment is a critical factor in making a successful decision. The situational awareness of a small business manager about the business environment and the analysis of the situation for making decisions are major concerns of the present study. Knowledge representation suggests the need to formalise knowledge in a symbolic form that can be interpreted (Klein & Methlie, 1995).

Many researchers also consider UCD as a design philosophy. This philosophy places users at the centre of the design process from the stages of planning and designing the system requirements to implementation and testing the product (Baek et al., 2008; Beaudouin-Lafon & Mackay, 2003; Gulliksen et al., 2005). Prototyping approach supports these processes by allowing users to understand and use the system before it is built. Designers can identify functional requirements, usability problems, and performance issues early and improve the design according to the user-specific needs (Beaudouin-Lafon & Mackay, 2003). Usability is considered the ability of the user to use the system to carry out a task successfully (Albert & Tullis, 2013).

End-user engagement is essential in this study because DSS research originated from DS research. From its inception, DSS research has involved designing and implementing innovative IT-based systems (Keen & Gambino, 1983). Therefore, for the small business DSS design, development and evaluation concepts, a DSR methodology was adopted, as discussed in Chapter 4. Many DSS researchers have outlined the specific requirements for developing user-centric DSS-based solutions for accomplishing more practical outcomes, such as user relevance (Arnott & Pervan, 2012; Arnott & Dodson, 2008; Hosack et al., 2012; Miah et al., 2014).

According to Gulliksen et al. (2005), UCD is based on some fundamental principles. These include user focus, active user involvement, evolutionary system development, prototyping, and a user-centred approach. Iivari and Iivari (2011) identified four dimensions of user-centeredness in the UCD literature. These are UCD as user focus,

UCD as user work centeredness, UCD as user involvement, and UCD as system personalisation.

The UCD as user work centeredness focuses on the relationship between people, technology, work requirements and organisational constraints in work settings, where people have a set of skills and shared practices based on their experience of working with others. The UCD as system personalisation focuses on the diversity of users who use the system (Iivari & Iivari, 2011). Therefore, these two dimensions of user-centeredness were inappropriate for the small business DSS development because the majority of the businesses were owner-operated. They had inadequate skills for using advanced technology. Moreover, the artefact was designed as a small-scale DSS, only for the use of a small business owner/manager for their strategic decision support needs.

The UCD as user-focus and user involvement were appropriate for a small business DSS development for the following reasons. The UCD as user-focus places the person at the centre and emphasises the number of users using the system. Thus, when the system has one or only a few users, it is easy to detect them and to match the system according to their needs (Iivari & Iivari, 2011). This form of UCD is also "focusing on cognitive factors (such as perception, memory, learning, problem-solving, etc.,) as they come into play during people's interactions with the interface" (Shahar et al. 2006, p. 119).

Iivari and Iivari (2011) also stated that most studies viewed UCD as user involvement as an integral part of the UCD method for DSS design and development. Many researchers have also suggested DSS development with the engagement of industry and decision-makers (Arnott, 2006; Arnott & Pervan, 2012; Hosack et al., 2012). In IS design, user involvement is expected to lead to more accurate user requirements, and features that meet the user's needs, as well as greater acceptance of the system, and enhanced ease of use (Kujala 2003; Mao et al., 2005).

Courbon (1996) emphasised that the success in DSS design is associated with user involvement, which can be effective for appropriate method selection. Miah (2004) acknowledged that in the UCD method, user support and involvement is important in developing products to match their requirements.

Therefore, it can be argued that the involvement of small business owners/managers was vital in the initial and final phases of the DSS design and development. To identify

problems, user needs and system requirements, case studies and web content analysis were carried out prior to the DSS prototype design. This study also investigated owner/manager understanding, knowledge and analytical skills related to the business environment and associated environmental factors, such as situation awareness (SA) and the mental model (Niu et al., 2009). This approach was required for the successful system design and development to meet contextual business needs. Finally, the involvement of owners/managers was vital for evaluating the DSS prototype artefact in order to produce the final version.

As evident in the above discussions, the UCD as user focus and involvement, and the evolutionary prototyping approach was the suitable method for a DSS design, development and evaluation that directly engaged with owners/managers as end-users.

Predominantly, UCD as user-focused and involvement was a suitable approach because the main principles of UCD include a significant decision problem of a user: using a short life cycle for designing a system, developing the system with an iterative process, as well as evaluation (Courbon, 1996). UCD is also recommended with the engagement of industry and decision-makers for a DSS development (Arnott, 2006; Arnott & Pervan, 2012; Hosack et al., 2012). An evolutionary prototyping method is associated with the UCD approach, which allows for the creation of iterations while working with users, who also evaluate the design solution before finalising it (Seffah et al., 2005). Prototyping is also a smaller-scale system development method in the IS research domain while working with DSS users (Haag & Cummings, 2009). The prototyping method represents the implementation of an artefact aimed at demonstrating the suitability of the artefact according to user needs (Peffers, Rothenberger & Kuechler, 2012). The current study fits the UCD method because of user involvement before the DSS prototype design and in the evaluation processes. Accordingly, the study was initially focused on owner/manager (user) decision problems and business needs through case studies, which led to a small-scale DSS prototype development and evaluated by them. Therefore, the SDLC method was unsuitable because it is used for large projects and the process takes a long time (Kroenke et al., 2014).

7.3 Chapter summary

This chapter described and analysed small business issues and needs for the DSS solution. It also reviewed development methods. The MRT strategic decision-making model in the conceptual DSS framework was used for the requirement analysis. Many approaches have been employed for system development in IS research. The most commonly used approach is the SDLC. However, this was considered unsuitable for the small business DSS design, development, and evaluation because SDLC is used for large projects and the process takes a long time. Other approaches were also reviewed. These were monolithic, incremental or agile, JAD, RAD, and evolutionary and prototyping. The evolutionary and prototyping approaches were considered suitable for the small business DSS development because these methods fit into the UCD approach. Prototyping is also a smaller-scale system development method in the IS research domain while working with DSS users. This activity allows iterations in different DSS development phases before finalising the system. In the UCD method, user support and involvement are vital for developing products to meet their requirements. The design and development procedures of the new DSS solution artefact are presented in the next chapter.

Chapter 8: A New DSS Artefact Design and Development

The main objective of this thesis is to develop a new DSS solution to address decision-making issues and lack of support among B2C small business owners/managers. The solution artefact is the website features evaluation DSS (WFE-DSS). The WFE-DSS was designed to assist an owner/manager in improving his/her strategic decision-making competencies, especially in the selection of competitive features on its website within the B2C e-commerce dynamic environment. This chapter outlines the context of the initial WFE-DSS prototype design and development, then explains the objectives of the DSS solution design and development. The chapter also describes artefact instantiation development procedures. Ultimately, the functional model of the WFE-DSS, with various user interfaces, is discussed followed by a chapter summary.

8.1 The context of the WFE-DSS design and development

Although small business owners/managers are considered key decision-makers of their operational requirements (Burgess et al., 2009; Parker & Castleman, 2009), they process and practice limited information, are time poor and unable to create and accumulate new knowledge from the business environment. These inadequacies were highlighted through the case studies with small businesses, which were conducted prior to the WFE-DSS prototype design and development. While knowledge management (KM) practice is an integral part of making business strategies (Adler, 2008; Singh & Kant, 2008), owners of small businesses lack understanding of KM and its practices (Bolisani, Scarso & Zięba, 2015; Bolisani, Scarso & Zięba, 2016; Yew Wong & Aspinwall, 2004). The KM concept originated from the strategic management literature as an emergent approach for doing strategic planning (Adler, 2008; Bolisani et al., 2016). KM is the competence of an organisation to develop, integrate, share and utilise knowledge resources to achieve a sustainable advantage (Huff, Floyd, Sherman & Terjesen, 2009). However, small businesses have higher rates of failure than larger businesses and limited access to information when needed (Duan & Xu, 2009).

In the IS research domain, KM is about capturing, codifying, and disseminating knowledge across organisations to enhance value, creating a performance-based

knowledge system for making strategic decisions (Adler, 2008). The codification of knowledge is the process of storing knowledge in a systematic form (Huff et al., 2009).

Sometimes, interactions among people can support knowledge capture and transfer across organisations. Knowledge can be obtained through training, monitoring, and discussions and can be transferred using software applications (Adler, 2008). In the small business problem domain, a user-friendly small-scale application (instantiation) could be perfect for accumulating knowledge from the business environment. This is because most small businesses are owner-operated (DIISRTE, 2012; SBCB, 2013), they do not have different functional units (SBCB, 2013), or expert management levels, and have few skilled human resources (Duan & Xu, 2009; SBCB, 2013).

Singh and Kant (2008) asserted that the lack of technological set-up is one of the barriers to the implementation of KM practice in many organisations. Similarly, many small businesses show a scarcity of skills and technical resources for practicing KM in supporting their strategic decisions. The present study identified these inadequacies through multiple case studies with small firms in the online retail sector. Many of these small businesses did not even want to engage with the research project. Consequently, challenges were encountered all through the data collection stage, which sought to identify small business internal issues, needs, and the analysis of DSS requirements.

Moreover, in the competitive business environment, many small businesses have confronted intense competition in comparison to large firms. Many small companies are also competing with large companies, particularly within the highly competitive global market (Yew Wong & Aspinwall, 2004). This has created a bottleneck for many small businesses in the online retail sector in Australia, since many Australian consumers purchase from overseas websites as discussed early in this thesis. These challenges suggested that need for a user-friendly DSS-based solution to help the small business community in strategically managing their effective online presence.

As mentioned previously, this study followed the DSR methodology and adopted the HMPR DSR guidelines comprising seven phases of activities, with guideline 2 suggesting the development of a technology-based solution to address important business problems. Also, guideline 1 recommended designing an artefact in the form of a construct, a model, a method or an instantiation. Therefore, this study's main goal was to design and develop

a new DSS solution artefact (instantiation) to assist owners/managers of small businesses in making strategic decisions to select competitive features on their B2C websites.

8.2 Objectives of the new DSS solution artefact design and development

Decision-makers are the central component of the decision-making process as they are accountable for analysing problems and creating opportunities within the turbulent business environment. Therefore, many organisations have been changing to create a competitive advantage in a challenging environment of increasing competition and globalisation (Hall, 2008). In such a context, organisations must efficiently manage and use their information resources to remain competitive (Meredith, O'Donnell & Arnott, 2008). Consequently, organisations need to use IS artefacts that can assist in information processing. As such, a DSS may assist decision-makers to formulate effective and efficient decisions to achieve business goals (Hall, 2008).

Little research attention has been given to the accumulation of information and knowledge through the analysis of internal and external business environment, particularly in addressing small business problems and needs. This type of knowledge is significant for making strategic decisions (Alyoubi, 2015; Srivastava & Verma, 2012; Thierauf, 1988). Notably, the knowledge must be sourced from the external environment of an organisation (Khan & Khalique, 2014).

Therefore, a small business must analyse information and accumulate knowledge from the external business environment about its successful competitors' website features (e.g., data from external sources) to identify current and desired website features in the online B2C environment. In due course, a business could decide what features it needed on its own website to maximise consumer interactions. However, most of the small businesses in this study lacked awareness and knowledge about the level of adoption of features on their websites and those of their overseas competitors. It is vital to make small business websites much more interactive and user-friendly to allow benchmarking against their successful e-commerce competitors. Therefore, a decision support artefact could assist them to create awareness and provide sufficient knowledge about what type of features available on their websites when compared with their successful competitors in the fast-moving e-commerce retail environment.

Mazzarol et al. (2009, p. 320) suggested that "small business owners/managers should seek to benchmark their business against the industry best practice, but a clear strategic vision must support such benchmarking". As defined by Greene and Stellman (2013, p. 181), "Benchmarking is a way of comparing the processes and practices used in building software with the practices and processes in other organisations so an organisation can figure out the best ideas for improvement".

The objective of a DSS is to assist managers with appropriate decision support and improve the practice of decision-making (Arnott & Perven, 2008). A DSS also helps to analyse business data, allowing the user to make decisions more efficiently (Nowduri, 2011). In the small business decision-making problem domain, data is sourced from the external business environment for comparative analysis with similar existing data.

DSS is a subfield of the IS discipline (Eom, 2007; Miah, Debuse & Kerr, 2012) and is a well-recognised research and development method in this field (Liu et al., 2010). Seven major DSS subfields have emerged from the IS literature. According to Arnott and Pervan (2005, 2008), DSS can be classified based on technology, theory foundations, user populations and decision tasks. Their seven subfields are as follows:

1. **Personal DSS (PDSS)**: A PDSS is usually a small-scale system developed for one manager, or a small number of independent managers, to support one decision task.
2. **Group support system (GSS)**: GSS facilitates decision support in meeting the combined needs of groups and DSS technologies to facilitate the effective working of groups.
3. **Negotiation support systems (NSS)**: The primary focus of NSS is group work, providing decision support for the purpose of negotiating between conflicting parties.
4. **Intelligent decision support systems (IDSS)**: IDSS is the application of artificial intelligence (AI) techniques to decision support.
5. **Knowledge management-DSS (KMDSS)**: KMDSS provides support for decision-making by aiding knowledge storage, retrieval, transfer, and application. It supports individuals and organisations and provides inter-group knowledge access.

6. **Data warehousing (DW)**: DW provides large-scale data infrastructure for decision support.
7. **Enterprise reporting and analysis systems**: This DSS provides specialised assistance in the form of executive information systems (EIS), business intelligence (BI) and, more recently, in the form of corporate performance management systems (CPM). BI tools access and analyse data warehouse information using predefined reporting software, queries, and analysis tools.

Although DSS solutions are widespread in various areas of business, their existence in small businesses is still far behind that of larger firms. While many studies have been concerned with the requirement of DSS for small companies, most of them have adopted existing solutions and approaches, which are appropriate for large-scale enterprises and inappropriate for SMEs (Grabova, Darmont, Chauchat & Zolotaryova, 2010). These same studies have recommended that small businesses need cheap, lightweight architecture and tools (e.g., hardware and software).

Thus, this study initiated the design of a small-scale IS solution which is knowledge-based and a PDSS type for owner/manager strategic decision-making in the B2C e-commerce environment. This type of DSS was considered suitable for small businesses because the technology that enabled the development of a PDSS was personal computers and relatively user-friendly software applications, especially database software. It is less complicated and remains relevant in practice compared with other systems, especially its user-built models and data-analysis systems (Arnott, 2008).

Moreover, a PDSS is a form of IT-based management support system (MSS), in which a small-scale system develops for one manager or a limited number of independent managers to support one important decision-making task (Arnott & Pervan 2005, 2008). A PDSS can also build in the social and organisational environment (Arnott & Pervan, 2005), while emphasising helping the individual manager rather than attempting to assist the entire organisation (Arnott, 2008). The present study focused on the small business B2C e-commerce environment in developing the WFE-DSS, which was a small-scale IS designed only for an owner/manager as the DSS user.

Most importantly, "the major contribution of PDSS to IS theory is evolutionary system development" (Arnott, 2008, p. 131), which the present study has adopted. The notion is

that “a DSS evolves through an iterative process of system design and use has been central to the theory of decision support systems since the inception of the field” (Arnott, 2008, p. 131). DSS theories are propositions, principles, and classification systems that explain empirical phenomena. An accepted theory of DSS can help to build a better DSS (Power, 2005). Therefore, the present study employed evolutionary and prototyping system development approaches under UCD principles (Seffah et al., 2005) as discussed in Chapter 7. As a result, the current study developed the WFE-DSS as a small-scale application only for a small business decision-maker. Prototyping is a smaller-scale system development method in the IS research domain (Haag & Cummings, 2009).

A PDSS was ideal because users of this kind of DSS are usually senior or middle-level managers (Arnott, 2008) and can provide a wide variety of information, including competitive information (Liu et al., 2010). Competitive information is essential for a small business owner/manager in making strategic decisions within the B2C e-commerce environment. Users are administratively influential, optimistic and knowledge workers and assemble knowledge to support their needs from alternative sources, both internal and external to their organisations. Besides this, a PDSS remains an essential aspect of IT-based management support in both academic research and contemporary organisations (Arnott, 2008).

A strategic DSS design requires significant amounts of information and strategy must involve analysis, critical thinking and a formal process. Thus, the design of an IT artefact can support improvements in strategic planning (Power, 2016). However, according to Arnott and Pervan (2012), only a few (10 percent) researchers developed a PDSS for strategic decision-making; the majority (75 percent) developed a PDSS that was used for operational management problems, mainly focused on large firms.

Similarly, Duan and Xu (2009) argued that the focus of researchers in the small business manufacturing sector was generally on the use of a DSS at the operational decision-making level rather than at the strategic level. Many researchers have applied techniques used for large organisations to small businesses, without recognising the different decision support needs for a small business. Moreover, problems inherent in providing support to small business management have been discussed more commonly from a social or economic viewpoint. Very few studies have addressed decision support needs in the context of the use of IT.

This study focuses on a small-scale solution, which is knowledge-based PDSS type, involving end-users following UCD principles. Ultimately, this knowledge would support a small business in making its website interactive and efficient in the B2C e-commerce environment.

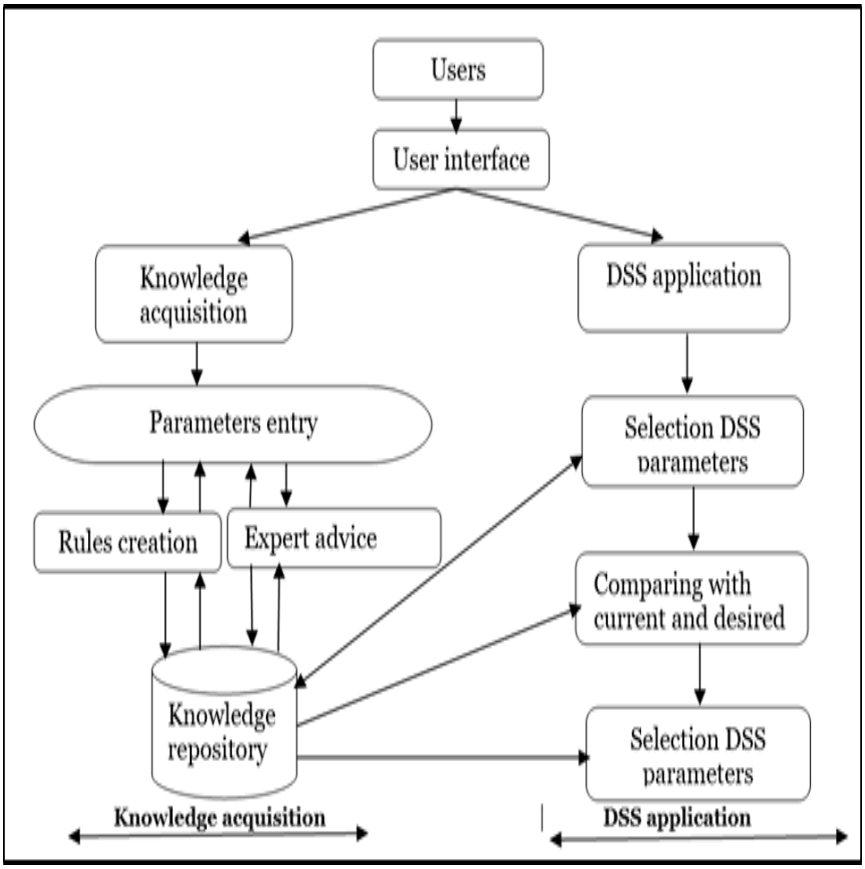
8.3 Design and development procedures

This section describes the artefact design and development procedures, which consist of two parts. The first part describes the design and development principles, and the second part describes support components for the design and development of the new WFE-DSS instantiation.

8.3.1 Design and development principles

The WFE-DSS was designed and developed based on UCD principles, focusing on user-specific needs. Accordingly, owner/manager involvement was vital for the artefact design, development and evaluation through the evolutionary and prototyping approaches. Their participation was also crucial in the problem identification phase (e.g., intelligence phase). Notably, UCD principles recommend evaluating the organisation and understanding its needs through analysing the organisational environment. Importantly, a UCD approach suggests conducting a gap analysis through which researchers can identify some of the weaknesses in the existing systems and processes (Battle & Lockheed, 2005).

The WFE-DSS artefact as an instantiation was designed and developed following the UCDE method, developed by Miah et al. (2014). The significant characteristics of the UCDE method are: the secondary design activities that focus on decision-support parameters (such as issues); the conduct of comparative analysis of current and desired states; and its ability to obtain expert analysis and generate reports for business decision-making. The UCDE offers two major functional layers: knowledge acquisition and DSS application. These two layers are shown in **Figure 8.1.**



Source: Miah et al., 2014, p.269

Figure 8.1: Design principles of the WEF-DSS artefact as an instantiation

8.3.1.1 The knowledge acquisition layer

The knowledge acquisition layer allows access to knowledge in the system, with decision-making rules developed using knowledge from the problem domain. Knowledge is a collection of specific facts, procedures, and rules. Knowledge acquisition is the process of accumulation, transfer, and transformation of problem-solving expertise from experts or documented knowledge sources to a computer program. This helps construct or expand the knowledge base (KB). A KB is the assembly of all the information and knowledge of a particular field of interest. Traditionally, a KB refers to the data and set of rules used by an expert system (Power, 2014).

In the small business context, database (DB) knowledge was created by adopting ICDT (Anghrn, 1997) categories of website features **(**discussed later and presented in **Appendix E**), which can improve accessibility to an organisation's website for its users (Miah, 2004). These features were recommended by Burgess (2016) for Australian small business retail websites. The DB and KB are described in later sections.

8.3.1.2 The DSS application layer

The DSS application layer allows a small business owner/manager to interact with the system and enables them to build strategic decision supports. Activities in this layer assist an owner/manager to select decision support parameters from the knowledge repository, with knowledge accumulated from the external and internal sources. This allows for a comparative analysis of current and desired website features and expert analysis through generated reports to help business decision-making. Accordingly, an owner/manager can accumulate knowledge from the external business environment through a comparative analysis of the website features of its overseas competitors (e.g., the external source of knowledge) with its own. This is the secondary design activities constructed the functional model of the WFE-DSS, as presented later.

The UCDE allows a particular application to be built by end-users in the selection of relevant system components. In other words, the generic DSS architecture can help to produce a specific artefact at the secondary level using the design components (Miah et al., 2014).

8.3.2 Components of the WFE-DSS prototype artefact

This section reviews various aspects of the DSS to identify relevant support components for the WFE-DSS prototype design and development in the B2C e-commerce environment. Sprague and Carlson (1982) developed DSSs in various research fields using data, models, dialogue, and decision-makers, known as the DSS architecture. A DSS also comprises decision models, a database, and a decision-maker's judgement in an improved, interactive modelling process to reach a particular decision by a specific decision-maker (Marakas & O'Brien, 2014).

Most importantly, a DSS is an information processing application designed for strategic decision-making rather than operational use. A DSS also uses databases with query and KM tools for indexing and searching text databases that support management decisions (Power, 2010). Stair and Reynolds, (2010, p. 22) described a DSS as "an organised collection of people, procedures, software, databases, and devices used to support problem-specific decision-making". In essence, a DSS is not only a technological development, it is a philosophy of IS development and use (Arnott & Pervan, 2005).

Some support components required for DSS architecture have been recommended by researchers in the DSS field. These are outlined in **Table 8.1.**

Table 8.1: Support components of the DSS solution development environment

Studies	Support components in the DSS environment
Duan & Xu, 2009	• The database • The model-base • The user-interface • The users
Eom, 2007	• Human decision-makers • Computer systems
Accorsi, Manzini, & Maranesi, 2014	• Database • User interface
Power, 2016	• Database • Model base • Knowledge base • Communication • Document storage and management
Marakas, 2003	• A database management system • A model base management system • The interface engine and the knowledge base • User interface • Users
Delen, Sharda & Efraim, 2010	• The data component • The model component • Interface component
Beneki & Papastathopoulos, 2009	• Database management capabilities with access to internal and external data, information, and knowledge • The model component • Simple user interface designs that enable interactive queries, reporting, and graphing functions
Marakas & O'Brien, 2014	• The database • The decision models • Interactive modelling process • Decision-maker • Decision-maker judgement
Krol & Tarnopolsky, 2002	• Reliable data • Knowledge base • Interference (reasoning) engine • User interface

As shown in this table, the majority of researchers have concentrated on four main components: databases (Accorsi et al., 2014; Delen et al., 2010; Duan & Xu, 2009; Marakas, 2003; Marakas & O'Brien, 2014; Power, 2016); models (Delen et al., 2010; Duan & Xu, 2009; Marakas, 2003; Marakas & O'Brien, 2014; Power, 2016); users (Duan & Xu, 2009; Eom, 2007; Marakas, 2003); and the user interface (Accorsi et al., 2014;

Delen et al., 2010; Duan & Xu, 2009; Eom, 2007; Marakas, 2003). Among these researchers, only Marakas and O'Brien (2014) considered decision-maker judgement as a DSS component, and a few researchers have studied the knowledge-based component (Beneki & Papastathopoulos, 2009; Krol & Tarnopolsky, 2002; Power, 2016).

Although the model base component has a similar role to the database, including storing, organising, sorting and returning the data relevant for a particular context of managerial decision-making, it also produces the quantitative data for the decision (Marakas, 2003). Therefore, many researchers create mathematical models describing the operations of the organisation at various functional levels (Delen et al., 2010). In the small business strategic decision context, the model component is not suitable for the artefact development due to the qualitative nature of the study. Moreover, small businesses do not have various management levels and lack skilled human resources.

In the small business decision support design and development environment, targeting owner/manager strategic decision support and business needs, the WFE-DSS is a user-friendly system comprised of many components. These include a user as a human decision-maker and their judgement, the user interface (UI), the database and the knowledge base. These components are shown in **Figure 8.2.**

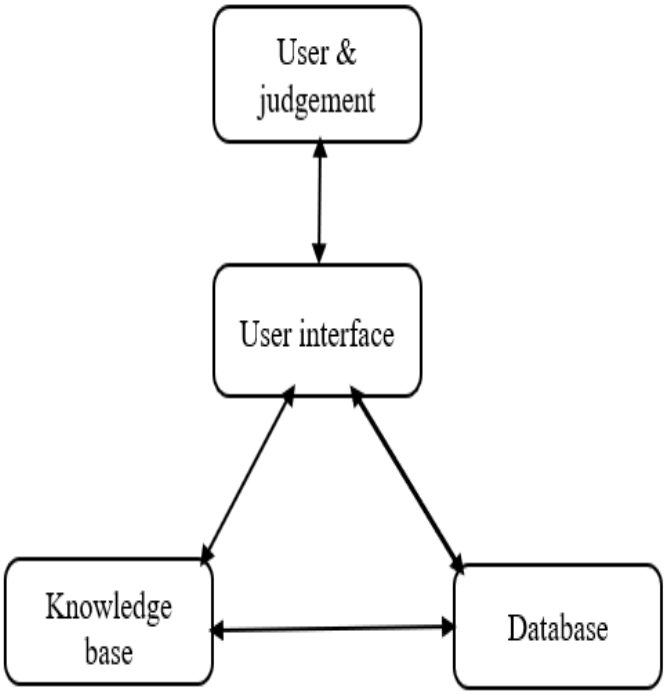


Figure 8.2: WFE-DSS components

8.3.2.1 User as human decision-maker and its judgements

A DSS user, as a rule, is a decision-maker in a decision process (Holsapple, 2008). DSS has been differentiated from other computer-based systems in two fundamental ways. First, it focuses on decision-making and second, it involves an interactive practice method requiring both the system and the decision-maker to contribute to the decision process (Pick & Weatherholt, 2013). Some researchers also have described a DSS user as an information processing machine (Dix, Finlay, Abowd & Beale, 2004). Therefore, understanding the DSS as only computer hardware and software is misleading. The human decision-maker is a critical component of the DSS, using their judgement throughout the decision-making process (Eom, 2007). The primary purpose of a DSS is not to replace managers' ability to make decisions, but to improve the effectiveness of their decision-making (Duan & Xu, 2009).

As cited by Duan and Xu (2009), many researchers have stated that models and analytical tools to assist managers in making decisions and solving problems are essential components in the development of a DSS. However, Duan and Xu (2009) argued that this claim can be contradicted when the decision is strategic. A strategic decision demands analytical knowledge for resolving organisational problems, and typically, strategic decisions are less structured. This type of decision is centred on the analysis of the business environment (Beynon-Davies, 2013; Mintzberg et al., 1976). Cognitive style or a mental model plays a significant role in assisting a decision-maker to understand the business environment (Chen & Lee, 2003). Cognitive style is also known as a KM technique of human mental models that have received extensive research attention within DSS research (Niu, et al., 2009).

In this study, owners/managers were essential contributors in the development of the WFE-DSS through the two phases of problem recognition (or the intelligence phase) and prototype evaluation.

8.3.2.2 User interface

The UI is an essential functional component of the overall system (Marakas, 2003). This component of a DSS creates communication and interactions between the user and computer system (Rosenblatt, 2014). This is also called the dialogue component or human-computer interface. An interface is a set of commands or menus through which a user communicates with a program (Power, 2014). As the primary functions of a DSS are

information processing and decision-making, an interface, therefore, is a problem processing system between the problem domain (language system syntax) and the knowledge representation rules (problem domain knowledge) (Bosman, 1987). Besides this, the UI is critical for creating user satisfaction, supporting business functions and system effectiveness (Rosenblatt, 2014). System effectiveness is a measure of context through which a system achieves its goals (Stair & Reynolds, 2014).

In this study, the user-friendly interface was developed for an owner/manager's interaction with the WFE-DSS. User-friendly is an evaluative term indicating that the DSS user assesses the UI as easy to understand and use (Power, 2014). User-friendly can also be a simple design representation of the UCD principle. Therefore, the design must be represented in such a way that users can easily understand the system features (Gulliksen et al., 2005).

The UI is a crucial component of the WFE-DSS design and development environment, supporting communication and interaction between a system and its user (e.g., an owner/manager of a small business). The various UIs of the WFE-DSS are discussed later in this chapter.

8.3.2.2.1 User interface design

The different UIs were created using C#.NET or C#. C# (pronounced 'C sharp'), supported by the Microsoft Visual Studio programming environment, which is a part of the .NET Framework (Wang & Wang, 2014). This enabled the design and implementation of Windows Forms applications with text formats (Wang & Wang, 2014), which were ICDT categories of website features.

Some researchers have also recommended using natural language to build the UI for a manager's situation awareness (SA) input, and this input data needs sourcing from the business environment (Niu et al., 2009). SA provides an in-depth understanding of the current decision situation based on the results of data analysis and is an essential condition for decision-making (Niu et al., 2009).

The Microsoft Visual Studio is a comprehensive software package, available in most companies (Powers & Snell, 2008), and is a Windows-based application (Wang & Wang, 2014). It is also a cost-effective software option, with reliable technical support through Microsoft forums and other online groups (Stellman & Greene, 2010). Using qualitative

views in assigning website features, many small business owners preferred to work with the MS Windows platform, so C# was suitable for the UI development.

The UI component of the WFE-DSS was also initiated by rapidly designing a non-functional interface. Non-functional requirements (NFRs) describe how the system works and the conditions needed for system performance, usability, and usefulness (Glinz, 2007). Chung and do Prado Leite (2009) defined NFRs as software quality features, including functionality, usability, reliability, performance, and supportability. However, NFRs are difficult to test, and they need to be evaluated subjectively. Accordingly, NFRs are vital to successful system development and can be evaluated by different people (Chung, Nixon, Yu & Mylopoulos, 2012). The NFRs of the prototype instantiation (WFE-DSS prototype) were evaluated using the UCD principle with the participation of small business owners/managers in focus group sessions. The evaluation processes are documented in Chapter 9.

The UI displayed all ICDT (information, communication, transaction, and distribution) categories of website features (41 features), as presented in **Appendix E**. Other windows or interfaces with sets of commands or functional menu tabs are discussed later in this chapter and the end-user manual in **Appendix H.**

8.3.2.3 WFE-DSS database

The DB component of a DSS supports storing, organising, grouping, and returning data to a particular context of managerial decision-making (Marakas, 2003). A DB is an assembled collection of facts and information consisting of two or more related data files (Stair & Reynolds, 2014), and is a reliable way to store and manage data (Coronel & Morris, 2016). A DB is a self-describing collection of integrated records, including tables, plus relationships among the rows in those tables, and metadata (data that describes data) (Kroenke et al., 2014). The metadata also provides a description of the data characteristics and the set of relationships that link the data found within the DB. The metadata stores information about the name of each data element, and the type of values (e.g., numeric, dates or texts) stored on each data element. Therefore, the metadata provides information that complements and expands the value and use of the data (Rob & Coronel, 2009). In the small business DSS DB development context, the type of data values were texts on each data element, such as website features in the B2C e-commerce environment.

DB also stores a collection of end-user data, which are raw facts of interest to the end-user (Rob & Coronel, 2009). The end-user is an owner/manager of a small business and the end-user's data includes small business website features and competitor website features. Moreover, a DB stores metadata through which end-user data are integrated and managed (Rob & Coronel, 2009). The WFE-DSS database layer also included the metadata that described the usefulness of the website features through the UI, which is discussed later in this chapter.

8.3.2.3.1 Data sources and database design

It is essential to understand data characteristics in the process of DB design. There are two views of the data within the system: the business view of data as a source of information; the designer's view of the data structure, its access, and the activities required to transform the data into information (Coronel & Morris, 2016; Rob & Coronel, 2009).

Most importantly, relevant information derived from raw facts or data is crucial in making satisfactory decisions (Rob & Coronel, 2009). Thus, a decision-maker can use data from the internal and external sources of the organisation (Delen et al., 2010). Some researchers have suggested that the decision support DB should be created mainly by extracting data from the operational DB and by importing additional data from external sources (Coronel & Morris, 2016; Rob & Coronel, 2009). However, in strategic decision-making, the information needs in DSS settings lead to the requirement of a different kind of DB than those from the operational environment (Courtney, 2001). Therefore, data must be found for the DB from external sources to help determine the strategic direction of a business (Bonczek et al., 1981; Courtney, 2001; George, 2008). External data can relate to competition, market share, and government regulations, as well a company's own database or organisational databases (Delen et al., 2010). For strategic decision support requirements, therefore, a small business must use competitor website features as raw data, sourced from the external B2C e-commerce environment. Competitor data needs to be compared with small business website features to assist in the selection of relevant features on small business retail websites.

In this study, a small database was built using the ICDT categories of website features, and data structures in text formats. Power (2010) suggested using query applications for DSS development when designing a small-scale DB for a small firm's decision support

requirements. The small DB is one of the components of DSS that has desktop DB option with query tools (Delen et al., 2010; Power, 2010). An example of a query application is structured query language (SQL), which is perfect for all DB management system (DBMS) (Rob & Coronel, 2009; Wang & Wang, 2014).

A DBMS is made up of software that operates databases and provides storage, access, security, backup and other facilities to meet end-user requirements (Singh, 2015). The DBMS is also involved in the organisation and manipulation of data in a DB (Bonczek et al., 1981). Most importantly, a DBMS provides the internal processes for the external applications to build on them. Thus, end-users do not have direct access and interaction to the DBMS, but they can interact with the DBMS through external interfaces with related parameters. A DBMS has many components, a major one of which is the external UI (Singh, 2015). This suggests that a DBMS is not only a collection of programs that manipulate the database, it also provides an interface between the database and its users (Stair & Reynolds, 2016), creating an interface between the DB and decision-makers (Stair & Reynolds, 2017).

A small-scale DB is one of the components of the WFE-DSS. The small DB has an external interface related to the ICDT categories of features as parameters. These external interfaces create interactions between an owner/manager of a small business and the DB, as shown in **Appendix E** with functional descriptions.

Another significant part of the DBMS is the language engine or processor. The language engine relates to data definition, manipulation, and queries. The SQL is one of the query languages; therefore, language representations are fed into a DBMS through proper interfaces (Singh, 2015). The present study adopted the DSR approach for the overall research design and one of the technological innovations of DSR is DBMS (Hevner et al., 2004). Therefore, the DBMS has a remarkable influence on the IS development, design, and implementation. In this way, the technological innovation supports the information processing capabilities of an organisation (Hevner et al., 2004; Hevner & Chatterjee, 2010).

The query language, SQL, was used for the WEF-DSS development of the small business strategic decision requirement with a small-scale DB. SQL is a popular language that can be used for creating, updating and querying databases because it works with DBMS

software (Stair & Reynolds, 2016; Wang & Wang, 2014). A query is a piece of script that commands the DBMS to retrieve required data from the DB, including generating integrated data from normalised tables (Wang & Wang, 2014).

It is also an enquiry created by an end-user, using a database in the form of SQL code. A query is a non-procedural language that is used by a DBMS to manipulate its data (Rob & Coronel, 2009). Queries can be executed to retrieve competitor website features and small business website features. In SQL, the SELECT commands are used to implement queries to retrieve data based on conditions. The general structure of a SELECT query is illustrated in **Figure 8.3.**

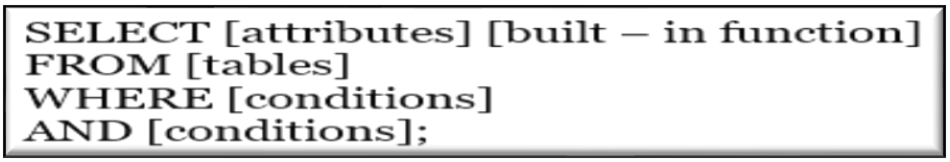


Figure 8.3: The general structure of a SELECT query

A WHERE clause, as shown in this figure, may have multiple conditions connecting through Boolean operators (e.g., AND/OR) (Wang & Wang, 2014). There are two conditions or states in Boolean algebra: true (or present) and false (or absent) (Ragin, 2013). Accordingly, when a business owner runs a query to assess its website, a SQL statement can be executed, with its conditional expressions that evaluate true or false. The typical Boolean-based comparative analysis addresses the presence or absence of conditions under which a particular outcome can be obtained (Ragin, 2013). Therefore, small business website features that are absent or present are determined by using Boolean-based comparative analysis. A summary of hardware and software requirements are presented in **Appendix F.**

8.3.2.4 The knowledge base component

Another distinct component of the DSS architecture is the DB technique of KM (Holsapple, 2008). In his study, Jones (2006) acknowledged KM as a foundation of DSS. A KM-based DSS supports an individual, as well as an organisation, in making decisions and with knowledge storage, retrieval, transfer, and application development (Arnott & Pervan, 2005, 2008). The KB component of a DSS performs tasks innovatively (Holsapple, 2008), recognises problems and solutions, as well as providing the functions to manage problem-solving activities (Marakas, 2003).

A KB is similar to a DB, storing facts and figures (Bidgoli, 2015), and is known as the knowledge engine. This has raw data, rules, procedures and logical structures to store knowledge in a re-usable form (Power, 2002). A KB ultimately keeps track of rules and explanations associated with facts or data (Bidgoli, 2015). Accordingly, a KB is the collection of facts, rules, and procedures organised into schemas (Power, 2014). A schema is a logical group of database objects including tables, indexes, views and queries, which are related to each other. A schema belongs to a single user application (Rob & Coronel, 2009).

The KB component of a DSS is crucial for small business strategic decisions because the strategic decision-making is an information-intensive process (Alyoubi, 2015). A decision-maker needs a significant amount of information for its strategic decision-making (Power, 2016), where information is the knowledge derived from data (Kroenke et al., 2014). Accordingly, an organisation must know what information or data are essential for its strategic decisions. This activity is described as the strategic knowledge acquisition process (Pietrzak et al., 2015). Consequently, it is clear that information and knowledge are vital for business performance. As best practice, many businesses collect information and transfer it into knowledge (De Wit & Meyer, 2010).

Knowledge acquisition is often associated with the source of knowledge, whether internal or external (Oliver, 2008). Knowledge acquisition begins with sourcing knowledge from the external environment of the organisation and transforming it into a representation. Knowledge representation (KR) studies the formalisation of knowledge and processing, using techniques of automated reasoning, and allowing a computer system to produce a conclusion (Stephan, Pascal, & Andreas, 2007). However, Davis, Shrobe, and Szolovits (1993) claimed that KR first enables an entity (e.g., individual, study etc.) to define the effects by reasoning about the world rather than taking action on it. Second, KR provides ontological answers to questions about the world. Third, it is a fragmented theory of intelligent reasoning with logical recommendations. Fourth, it is a medium of computation in which thinking is accomplished. The contribution is production guidance (a KR), providing related information with recommended interferences. Finally, it is a medium of human expression that is a language in which people reflect upon the world.

Increasingly, managers are recognising the need for creating, storing, protecting, disseminating and reusing knowledge to obtain competitive advantage for their

organisation (Jones, 2006). Therefore, the KB component of the DSS is significant and can support an owner/manager in making a strategic decision based on data from external sources.

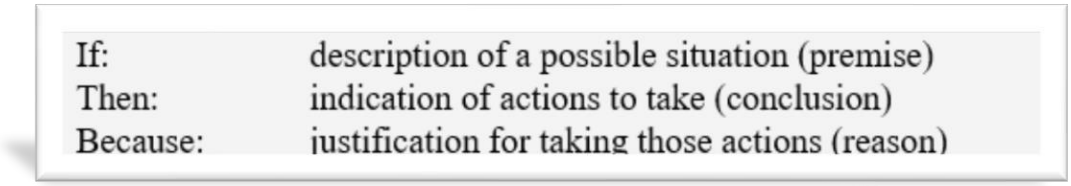
However, small businesses are comparatively slow in implementing systematic KM practices (Bolisani, et al. 2015; Bolisani, Scarso & Zięba, 2016; Yew Wong & Aspinwall, 2004). KM is the task of developing and utilising both the tangible and intangible knowledge resources of an organisation. Tangible assets include information and experience-based knowledge about customers, suppliers, products, and competitors. Intangible resources include the competencies and knowledge resources of people within the organisation. KM also represents the organisational strategies aimed at creating maximum benefit from its tangible and intangible resources, to learn from past experiences (whether successful or unsuccessful) and to build new knowledge (Menkhoff, Wah & Loh, 2004). Therefore, the KB-DSS in this study could help a small business manager gain experience and create knowledge about its competitor website features compared to its own website.

KM is one of the most frequently discussed topics in business literature (Menkhoff et al., 2004; Yew Wong & Aspinwall, 2004), and is an emerging discipline that aims to support organisational members to acquire, share, and enhance knowledge to achieve business objectives (Moreno & Cavazotte, 2015). However, KM studies in the small business sector are comparatively few in the literature, as most are focused on large companies (Evangelista, Esposito, Lauro & Raffa, 2010; Yew Wong & Aspinwall, 2004). Although many SMEs have the vision to pursue KM practice, IT-based knowledge information systems are often neglected (Menkhoff et al., 2004). Some researchers have suggested that SMEs need to adopt KM practices for strategic decision-making, using computer-based knowledge storage systems (Evangelista et al., 2010; Menkhoff et al., 2004; Yew Wong & Aspinwall, 2004). Notably, many small businesses need to build knowledge repositories because they lack understanding of KM practice (Yew Wong & Aspinwall, 2004). A knowledge repository is a tool used for effective and efficient implementation of KM systems in a company (Litvaj & Stancekova, 2015). The KB component must consist of the following types of knowledge (Bidgoli, 2015):

- **Factual knowledge:** Facts related to the particular discipline, subject or problem.

- **Heuristic knowledge:** Rules related to a problem or discipline. Heuristic data is not formal knowledge, but it helps to find a solution to a problem without following a rigorous algorithm. Heuristic knowledge consists of common sense, rules of thumb, instinct and judgement.
- **Meta-knowledge:** This is knowledge about knowledge.

A KB is a collection of facts, rules, and procedures organised into representations. The KB component of DSS architecture involves KR, known as 'if-then rules', and a system design consideration using rapid development tools (Miah et al., 2014). Rules systematise knowledge into 'premise-conclusion sets' (if-then rules), in which the premise is a Boolean expression, and the conclusion is a series of statements (Vassev & Hinchey, 2011). Holsapple (2008) also asserted that, under a particular condition, rules demonstrate the reasoning knowledge that tells us what conclusions are valid when a given situation exists. Therefore, rules offer a straightforward approach for representing such fragments of knowledge. Rules have a basic form, as shown in **Figure 8.4**



Source: Holsapple, 2008

Figure 8.4: A basic form of rules

In this format, if the possible situation can be determined to exist, then the indicated actions should be carried out for the reasons given. In other words, if the premise is true, then the conclusion is valid. A significant advantage of rule-based KR is its extreme simplicity, which makes it easy to understand the knowledge content (Holsapple, 2008). The next section describes how knowledge has been created.

8.3.2.4.1 Rule-based system development, algorithm specification and knowledge creation

The development of the DSS has been seen as a hybrid of rule-based, knowledge-based, algorithm-based and heuristic-based systems, merged to provide diagnosis, analysis, and advice for decision-makers (Sol, Cees & de Vries Robbé, 2013). Therefore, the essential task in the design of a rule-based system is the knowledge acquisition process, and a rule-based approach could be used to improve the man-machine interface (Bernard, 1988). A

rule-based system is typically a set of statements and is more than of if-then rules (Poggi & Tomaiuolo, 2012) or a knowledge base (if-then rules) (Bernard, 1988; Miah et al., 2014) upon which a system acts.

Rule-based systems are used when rules are stored in a DB as a set of known facts or data about a problem being solved. In this study, this problem related to identifying the current state of small business website features as facts with those of their competitors to realise the most competitive features that are available or unavailable on small business websites (e.g., desired objectives). The rules are recommendations based on the knowledge stored in each website.

The rules for the WFE-DSS artefact were built by populating the knowledge base (SQL-DB) with suitable rules. These were developed using approximately 41 website features (see **Appendix E**). An example of a rule in pseudocode for the algorithm involved in the method is provided in **Figure 8.5.** This rule shows the design principles for developing the WFE-DSS artefact instantiation.

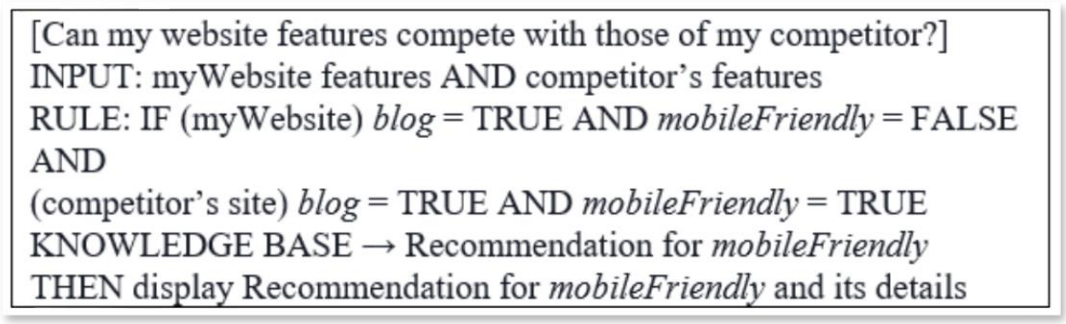


Figure 8.5: An example rules in pseudocode for the WFE-DSS

The example above illustrates the comparison of two website features (e.g., blogs and mobile friendly). The WFE-DSS comparison works with all 41 website features, with each variable in the KB being of the binary data type. If the feature on the websites exist, then the representation is TRUE; if they do not exist, then the representation is FALSE. These values are determined through the interface selected by the user to help determine how competitive its website is against its competitors.

Each feature was displayed through the UI in sections, based on the ICDT classes of features, along with the two possible options for the user (Yes [TRUE] or No [FALSE]). These are presented in **Figure E1** and **Figure E2** in **Appendix E.**

Much of the emphasis on rule-based systems is on the design of efficient search procedures. As a result, often the importance of the knowledge acquisition process is not fully understood by prospective users of the technology (Bernard, 1988). To make this process effective, therefore, small business owners/managers were invited to evaluate the WFE-DSS through focus group sessions. Thus, appropriately, a small business decision-maker could evaluate his/her own website features against that of their overseas competitors (e.g., external data source) and create the knowledge for decision support.

The next section describes the functional model of the new WFE-DSS solution artefact and different UIs, demonstrating how a small business owner/manager in the competitive B2C e-commerce environment can identify its website issues and strategically select relevant ICDT-based features using the artefact.

8.4 Functional model of the new WFE-DSS

A model is a representation of a system designed for a particular purpose and also builds to address a specific aspect of a problem. A task model is a simplified representation of some human activities, but it provides answers about how representative users proceed to reach specific goals (Coutaz & Calvary, 2012). The functional model of the WFE-DSS is shown in **Figure 8.6,** which is a use case diagram.

The use case diagram is also known as a task model describing the interactions between a user, and KB and DB systems through various UIs. A use case diagram shows how a task can be performed with an application. This type of model also captures the requirements of a system. A use case diagram also shows the performance of the target system from an external point of view (Power, 2014). It also represents the user's communication with the system, who the users of the system are, and what they can do with it.

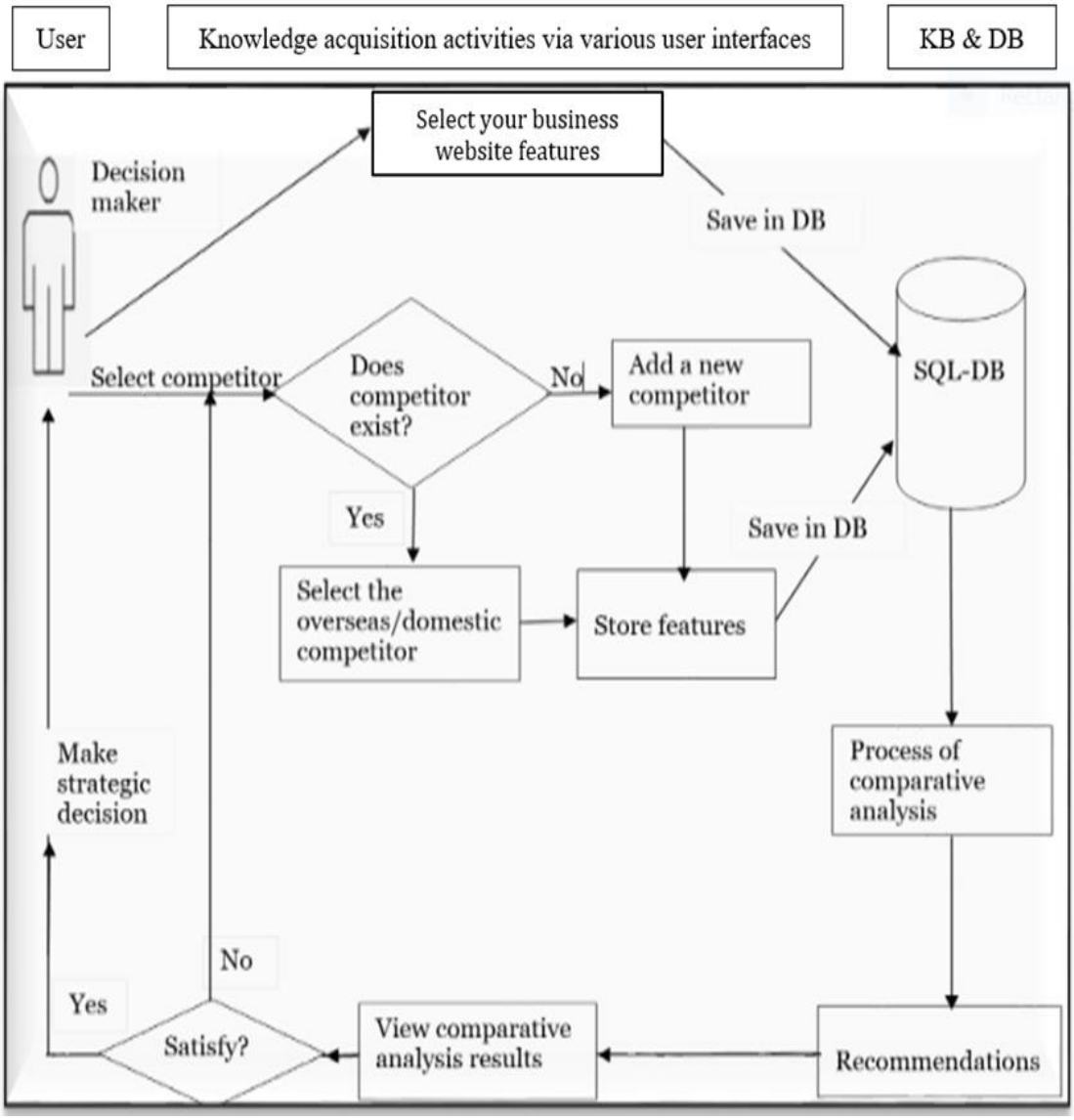


Figure 8.6: A functional model of the WFE-DSS (use case diagram) for end-user (owner/manager) interactions with system and knowledge acquisition processes

Ultimately, the functional model of the WFE-DSS correspondingly describes interactions between an owner/manager and KB and DB components through various UIs. As confirmed by Marakas (2003), the KB component of a DSS initiates tasks to identify problems and to generate solutions, along with functions to manage the process of problem-solving. Accordingly, an owner/manager can input enquiries by inserting its available website features and those of its competitors through various UIs. These are saved into the DB and represented as the KB. Next, a small business can compare its current website features with those of its many successful competitors. This is termed the acquisition of knowledge from the external environment to enable strategic decision-making. As a result, a small business can identify problems regarding the inadequacy of

its website features and be given recommendations related to the selection of more appropriate features.

How an owner/manager uses the WFE-DSS and performs tasks using various UIs, is discussed in the following sections.

8.4.1 The WFE-DSS user interface in the main window

The first WFE-DSS UI is the welcome window or main window (the two terms are used interchangeably in this study), as shown in **Figure 8.7**. This is easy to understand and contains various DSS features.

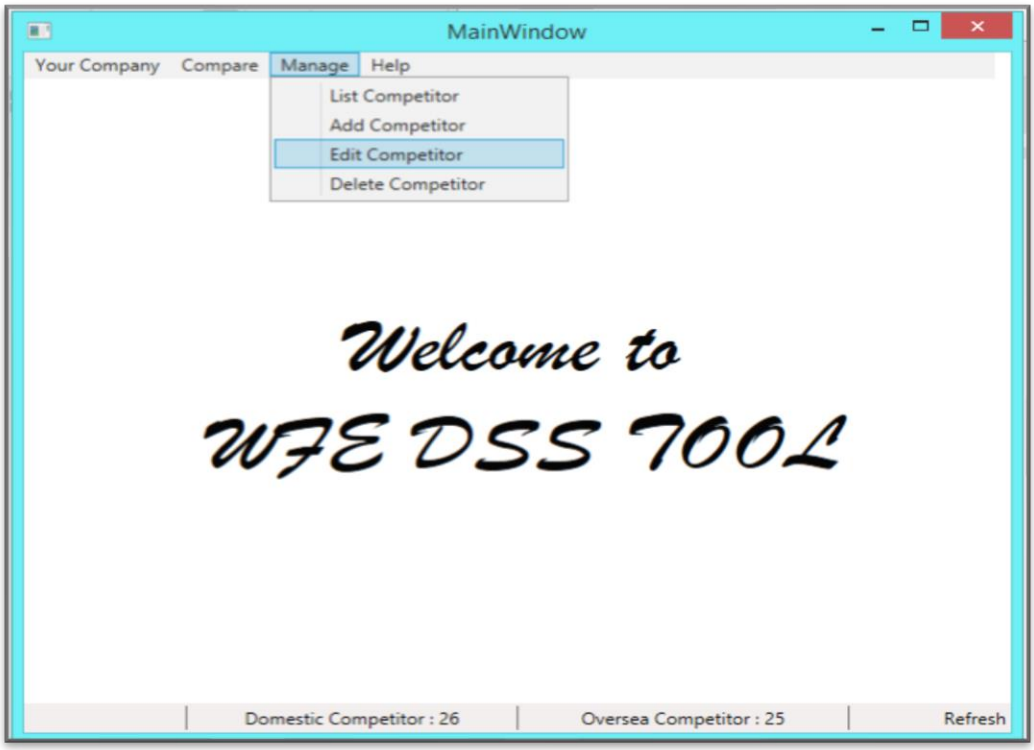


Figure 8.7: The WFE-DSS welcome window interface

8.4.2 User interface for selecting small business website features

The UI as shown in **Figure 8.8** is displayed when a small business owner/manager selects the 'Your Company' menu tab on the welcome window interface and inputs its current website features into the SQL-DB for an assessment or query.

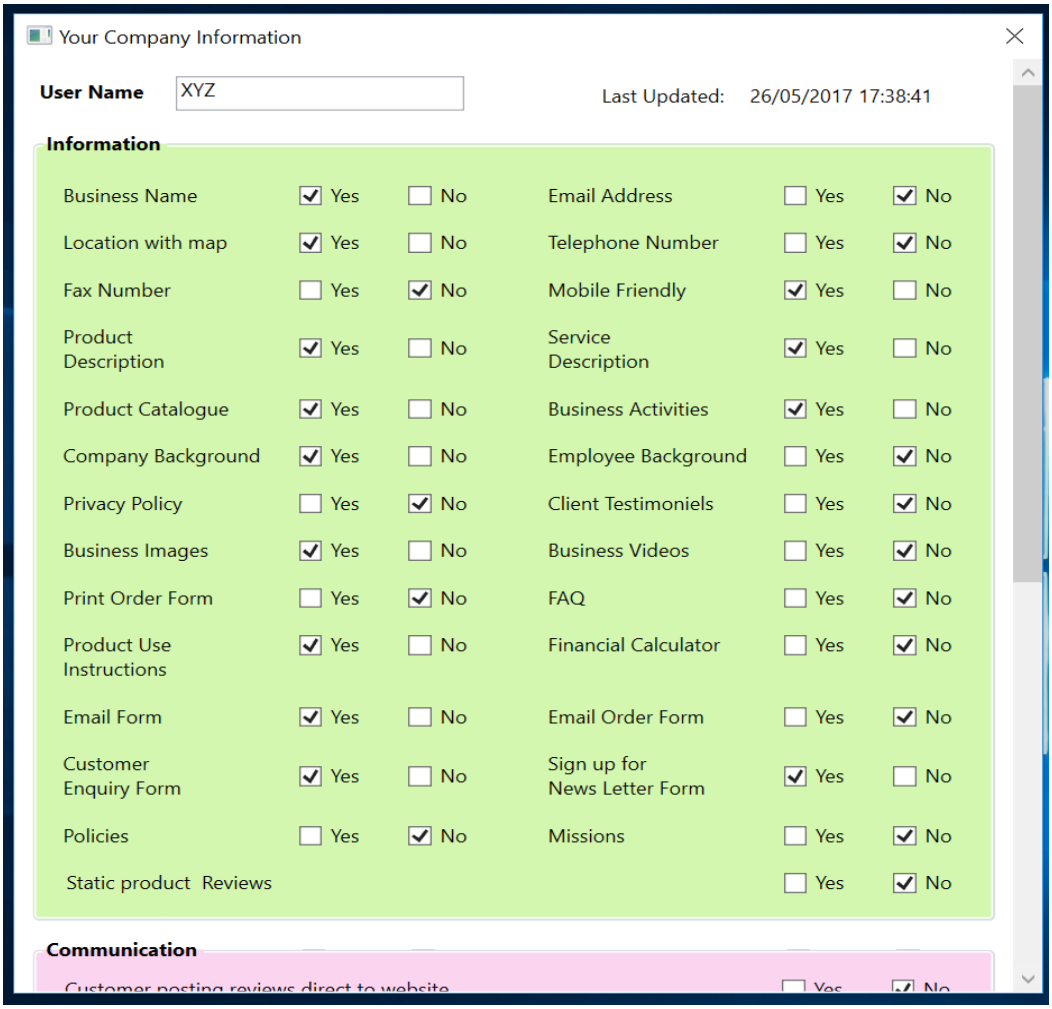


Figure 8.8: UI for selecting small business website features

This interface provides the option to select a username (e.g., company name), and to select website features using 'Yes' or 'No' menu keys. The user then needs to use the 'Submit' key to save selected features or data into the SQL-DB. These activities are shown through the middle part of the functional model (e.g., knowledge acquisition activities). These are then ready to be compared and used to create a KB. This is the secondary design activity completed by end-users to select decision support parameters (small business website features), as recommended by Miah et al. (2014) in their UCDE method.

The next section describes how an owner/manager can use the WFE-DSS interface to input competitor website features or data into the SQL-DB.

8.4.3 User interface for selecting competitor website features

A small business must know what information or data are essential for its strategic decision-making in relation to the selection of competitive features on its website. Some

researchers have called this routine strategic knowledge acquisition practice (Pietrzak et al., 2015). As discussed early, the WFE-DSS is a KB and a small-scale PDSS type of solution designed to address the strategic needs of small business decision-makers. Thus, for strategic decision needs, the data must be sourced from the external business environment to create knowledge. External data in the B2C e-commerce environment must include an examination of successful competitor website features. This section describes how a small business owner/manager can use the UI to select features (e.g., text data), which are available on its competitor websites and stored into the SQL-DB to create knowledge.

An owner/manager needs to select a successful competitor(s) by clicking the 'Manage' tab on the welcome window page. Here they can select from a set of tabs assigned as 'List Competitor', 'Add Competitor', 'Edit Competitor', and 'Delete Competitor'. If the expected competitors exist on databases, the owner/manager can select a competitor by clicking on the 'List Competitor' tab. If a potential competitor does not exist in the DB, then the user can select a potential new competitor by clicking on the 'Add Competitor' tab. This opens a new UI, as shown in **Figure 8.9.**

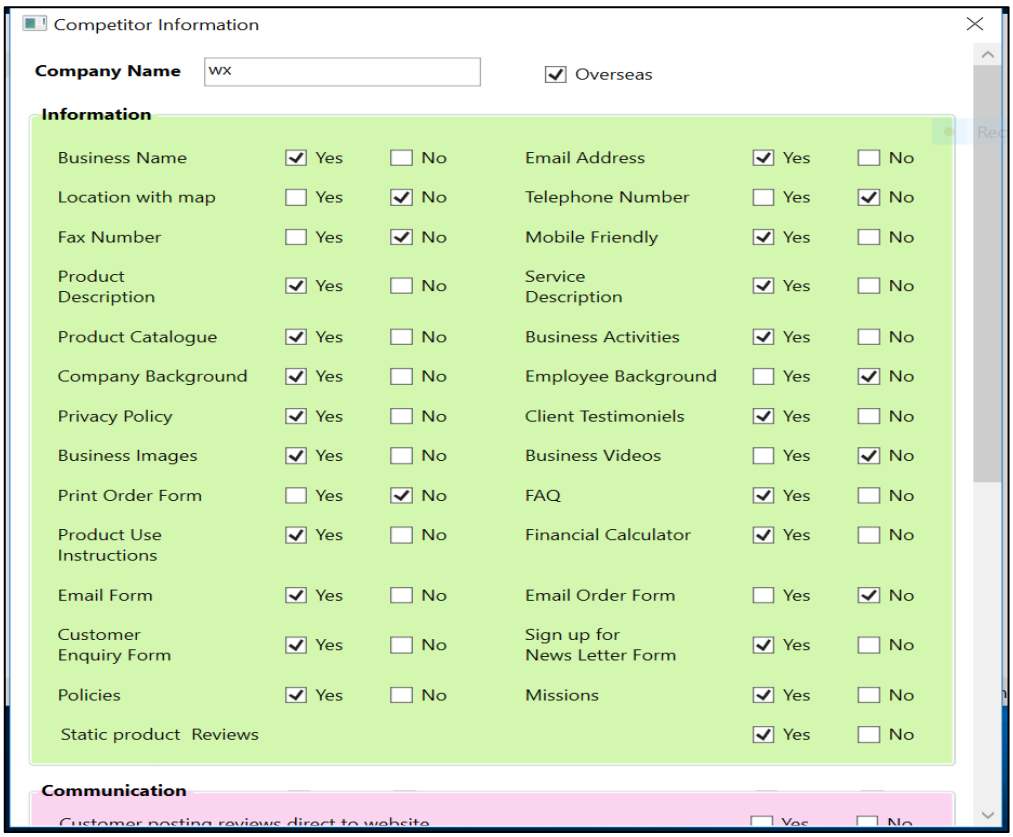


Figure 8.9: The UI for selecting competitor website features

The new UI, as displayed above, allows the user to select competitor website features from the Internet. Ultimately, the user can collect and input competitor features as data by using the 'Yes' or 'No' keys, saving or storing this into the SQL-DB by clicking the 'Submit' key. These activities are shown in the middle part of the WFE-DSS functional model, in the use case diagram. This step also represents the secondary design activity of the end-user, who selects the decision support parameters (competitor website features), as recommended by Miah et al. (2014) in their UCDE method.

8.4.4 User interface for identifying current and desired website features

An owner/manager now takes a design step to accumulate strategic knowledge sourcing from the B2C e-commerce environment. Competitor website features and small business website features have been stored into the SQL-DB for comparative analysis, as discussed in the previous sections.

After the user clicks on the 'Compare' menu key on the welcome window interface, a small UI or window **(Figure 8.10)** will be displayed with features including 'Domestic, and 'Overseas' competitor, 'Compare' and 'Close' menu keys. This UI will prompt the user to select either the 'Domestic' or 'Overseas' buttons, followed by the 'Compare' button on the UI, as shown below. these values (website features) are cross-examined with the knowledge stored in the knowledge repository (SQL-DB). Finally, the system derives recommendations from the knowledge base to support strategic decision-making.

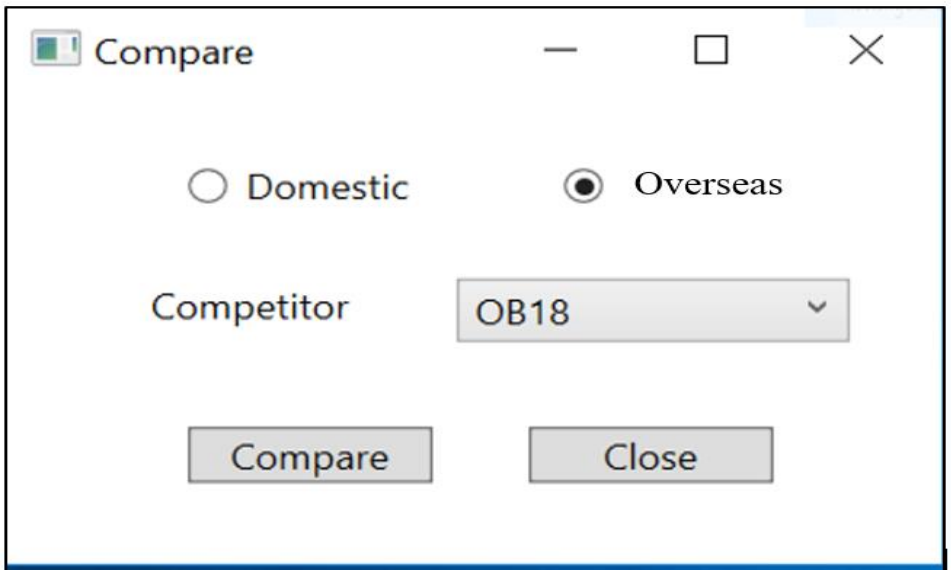


Figure 8.10: UI for analysing and identifying current and desired small business website features compared with its domestic or overseas competitors

In this design task, an owner/manager must consider competitors (domestic or overseas) as external environmental factors in the B2C e-commerce environment. Thus, an owner/manager can identify the current and desired website features through a comparative analysis and can produce strategic knowledge through this UI. These activities are presented in the right-hand part of the WFE-DSS functional model. This step is also the secondary design activity or task for end-users to compare the current and desired website features, as recommended by Miah et al. (2014) in their UCDE method.

Finally, the system displays an interface with a summary of recommendations, as illustrated in **Figures 8.11**. This is the outcome of the final design step taken by an end-user under the UCDE method. For each feature, essential facts and meta-knowledge are derived from the 'Did you know' format, so the business owner can understand the significance of any missing features.

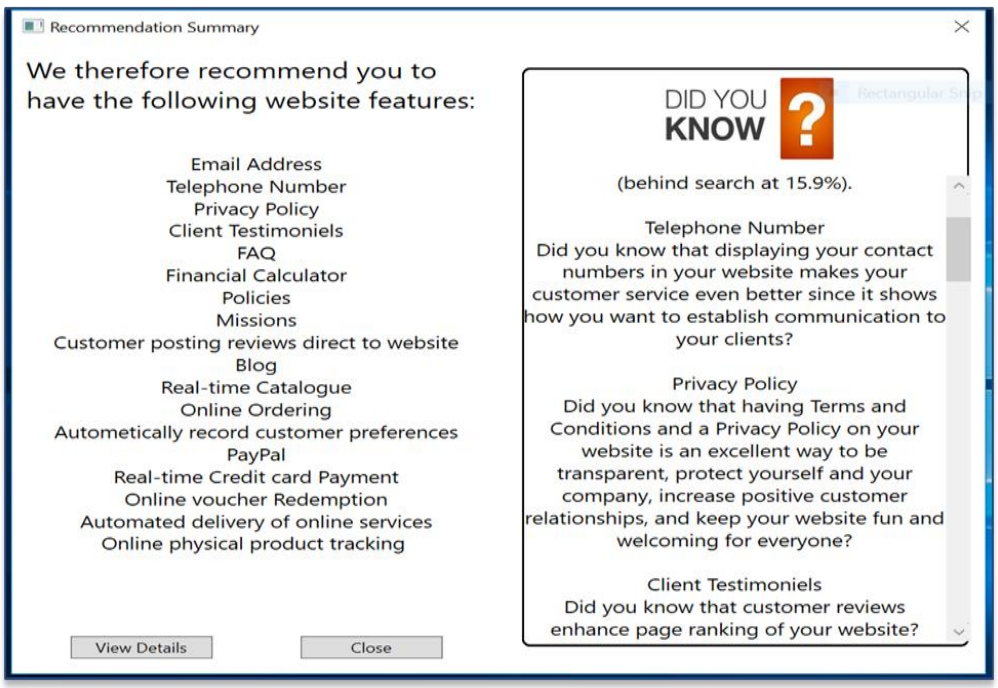


Figure 8.11: Example of a UI with a recommendation summary and metadata

There is an option for an owner/manager to view detailed recommendations, which also supports KM. The user can click on the 'View Details' button through this UI. This displays the UI with recommendation details, as shown in **Figure 8.12.**

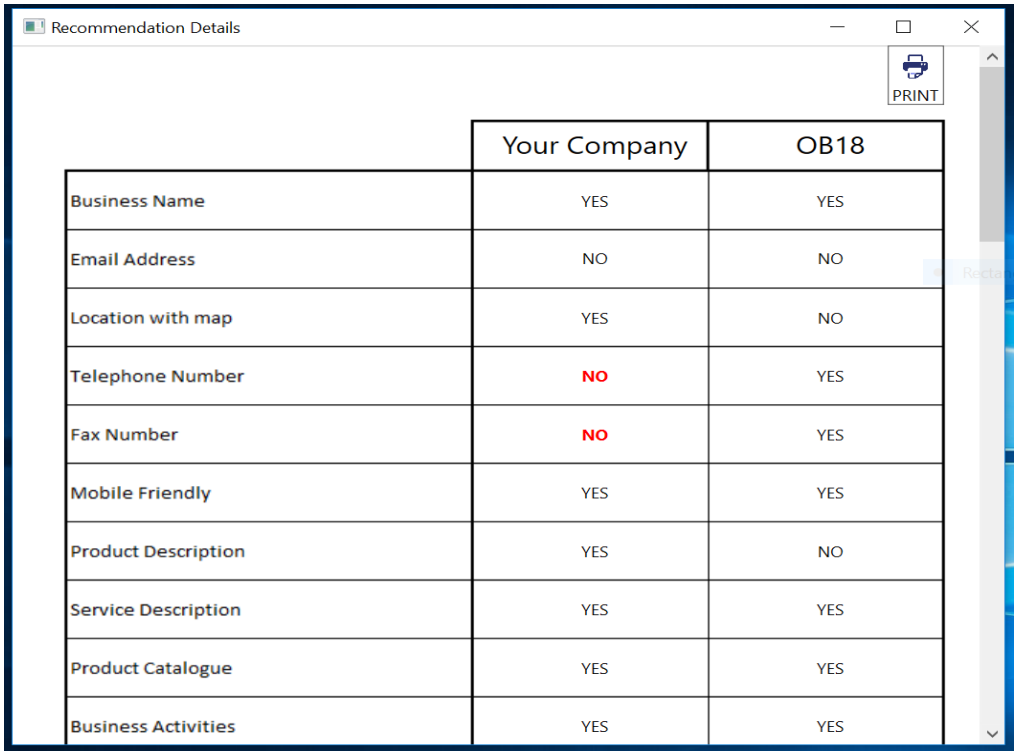


Figure 8.12: Example of a UI showing recommendation details from the comparative analysis

This recommendation as above can be printed or saved in a pdf file, helping the business decision-maker manage or store knowledge to aid strategic decision-making about how to manage competitive website features in the B2C e-commerce environment.

However, an owner/manager can use their cognition and analytical knowledge if the recommendations provided by the artefact do not satisfy their strategic needs, as the strategic decision also supports qualitative judgement (Bonczek et al., 1981). An owner/manager can then select other competitor(s) and conduct further analysis to accumulate knowledge from the external business environment and remain competitive. In cognitive psychology, cognition refers to mental processes involving the acquisition, maintenance, and use of knowledge (Niu et al., 2009).

8.5 Chapter summary

The main objective of this study was to develop a new DSS-based solution artefact to address small business owner/manager decision-making issues in the B2C e-commerce environment. This was predominantly focused on the selection of competitive features on their B2C websites. This chapter described the design and development procedures of the

solution artefact, known as the WFE-DSS. The artefact was developed following the UCDE method, which also recommended the completion of secondary design activities by end-users. The main support components of the WFE-DSS architecture comprised the user as a decision-maker using their own judgement, UIs for communication between the user and the system, a DB and KB for creating knowledge, and acquisition for small business strategic decision needs.

As a strategic decision involves an information incentive process, the DB and KB are vital components of DSS architecture. These can assist an owner/manager in making efficient decisions to select competitive features on their website by processing information into knowledge using the WFE-DSS. The artefact was developed within the .NET environment on the Windows-based platform, available in most organisations, including many small businesses. The functional model of the WFE-DSS allowed the end-user to interact with the system for the acquisition of knowledge from the external environment. This then allowed the user to select competitive features for their website. Ultimately, a small-scale KB-DSS was built as a PDSS type.

The next chapter describes the process for WFE-DSS prototype evaluation, including the approaches taken to produce the final version of the artefact.

Chapter 9: Evaluation of the New WFE-DSS Prototype

This chapter describes the evaluation details of the WFE-DSS prototype. As part of the design research, this study fully evaluated the instantiation artefact in order to confirm how well the system achieved the target user's objectives. The evaluation was conducted using a practitioner-oriented approach. Initially, the researcher and the project supervisor tested the new WFE-DSS prototype before evaluation by the real users. Next, five small business owners/managers as DSS users participated in the evaluation process of the new WFE-DSS prototype through a focus group workshop with multiple sessions. The main objective of the evaluation was to gain an understanding of the suitability of the instantiation artefact. Well-executed evaluation methods were needed in line with the HMPR guidelines in DSR, with guideline 5 recommending the use of rigorous evaluation methods. Topics covered in this chapter include system evaluation concepts, goals, methods, results and analysis of results using different approaches. The impact analysis and the improvement of the WFE-DSS prototype is also include in this chapter followed by a chapter summary.

9.1 Evaluation

Evaluation is an important part of system design and supports the design process. It assists in determining how the proposed design fits the needs of users in terms of their characteristics, the kind of activities for which the system solution will be used, the environment of use, and the technology that will support these activities (Preece et al., 1994). The evaluation is also involved in gathering data about the usability of a design or product by a specific group of users for a particular activity within an actual environment. Moreover, evaluation involves assessing the strengths and weaknesses of programs and products (Hevner et al., 2004). In this study context, the evaluation of the WFE-DSS prototype was vital to identifying how the proposed artefact worked, whether it was user-friendly, and if the proposed features met the small business decision-making needs, particularly in defining their website problems and solutions.

9.2 System evaluation goals

Some researchers in the IS domain have described the goals of system evaluation (Dix et al., 2004; Prat, Comyn-Wattiau & Akoka, 2014; Preece et al., 1994).

According to Dix et al. (2004), system evaluation has three main goals:

1. **To assess the extent and accessibility of the system's functionality**: The system functionality must satisfy the user requirements and support users to perform their anticipated tasks more efficiently.
2. **To assess the user's experience of the interaction with the system:** It is important to assess the user's experience of the interaction with the system and its impact on the user. The experience and impact include how easy the system is to learn, its usability and the user's satisfaction with the system.
3. **To identify any particular problem with the system:** A final goal of evaluation is to determine specific problems with the design. Difficulties can be related to the intended user context and unexpected results delivered by the system. These problems might be linked to the functionality and usability of the design.

These evaluation goals were achieved through the involved of small business owners/managers (end-users) in focus group sessions. Further evaluation was done through self-testing by the researcher and the project supervisor. These activities are described later in this chapter.

Preece et al. (1994) provide four goals for artefact evaluation:

1. **Understanding the real world:** This part of the assessment concerns how users use technology in the workplace and how a design may improve the work environment. These evaluation activities are essential before the application is developed to meet the user needs. This evaluation phase was completed through case studies and web content analysis, used to identify small business problems, needs, and DSS requirements. The new WFE-DSS (a small-scale application) was developed to support those needs.
2. **Comparing design:** This part of the evaluation involves comparing two or more design ideas. This assessment goal was achieved by reviewing different design methods in the IS design literature and, ultimately, adopting the evolutionary and prototyping design ideas under the UCD principles.
3. **Engineering towards a target:** This evaluation step involves usability testing of the system. To achieve this goal, the WFE-DSS prototype was evaluated by

gathering data about the usability of the instantiation prototype to meet user requirements.

4. **Checking conformance to a standard:** In this evaluation stage, standards bodies are involved in evaluating the system. This step was one of the limitations of the current DSS research project. However, three research-in-progress papers were accepted on this project and presented to technology-oriented audiences at International Conferences in Adelaide, Australia in 2015, San Francisco, the United States in 2016, and Fiji in 2017. The artefact prototype was also demonstrated in the interactive focus group sessions with small business owners/managers in Auckland, New Zealand in November 2016, to test its usefulness, efficacy, and performance.

Some criteria have been developed to characterise the goals of system evaluation. Prat et al. (2014) identified the following:

- **Efficacy:** Artefact efficacy is the evaluation scale in which the artefact produces its desired effect, or achieves its intended goal (Venable, Pries-Heje & Baskerville, 2012). Effectiveness is sometimes differentiated from efficacy (Prat et al., 2014). However, Hevner et al. (2004 as cited by Prat et al., 2014) used these two terms interchangeably, as did the researcher in this present study. System efficacy was assessed through focus group sessions, which are discussed later in this chapter.
- **Validity:** Artefact validity is the evaluation scale in which the artefact works correctly to achieve its goal (Gregor & Hevner, 2013; Prat et al., 2014). Klein and Methlie (1995) suggested testing and evaluating to validate data, knowledge, and the model, as well as to assess the quality of the system. The data (e.g., website features in word format) were verified initially by the researcher and the project supervisor. Finally, the data was validated by end-users using the given WFE-DSS prototype in the focus group sessions.
- **Reliability:** Reliability is concerned with the consistency of the measurement process (Straub et al., 2004). A reliable evaluation method is one that produces the same results on separate occasions under the same circumstances (Preece et al., 1994). For example, a reliable system will yield the same results irrespective of the sequence in which the input data is given (Klein & Methlie, 1995). The

WFE-DSS was verified using data from individual end-users to achieve similar goals through focus group sessions, as discussed later in this chapter.

9.3 Selection of evaluation methods for the WFE-DSS prototype

This study adopted the DSR methodology for the successful development of the WFE-DSS prototype. DSR focuses on two phases of the design artefact: development and evaluation. Evaluation forms part of the cycle in the refinement of a design artefact (Tremblay, Hevner & Berndt, 2010). Moreover, evaluation is more important in the DSR methodology than other research paradigms, because they do not involve the design and development of new artefacts. The primary focus of the evaluation is on the assessment of design science outputs (Venable, Pries-Heje & Baskerville, 2016). Outputs include information system design theories (Gregor & Jones, 2007) and design artefacts (March & Smith, 1995). The evaluation aims were to identify the usefulness of the WFE-DSS, its functionality in meeting user-specific needs, the user experience of the interaction with the system, and the system's ability to support a user in performing its anticipated tasks efficiently (Dix et al., 2004; Miah, 2009).

The DSR was appropriate for this study because, in this methodology, researchers not only design a useful artefact, they also provide evidence that the design artefact can solve real business problems (March & Vogus, 2010; Miah, 2009; Tremblay et al., 2010). Many researchers in DSS field have been employed DSR for the evaluation of artefacts. For instance, Féris, Zwikael and Gregor (2017) used DSR for a project management software evaluation, adopting Peffers et al.'s (2007) DSR method. Miah et al. (2014) employed the HMPR DSR guidelines for prototype testing with users and other stakeholder involved in livestock-based businesses in Queensland, Australia. Similarly, the present study adopted the HMPR DSR guidelines for evaluating the WFE-DSS prototype with small business owners/managers. HMPR guideline 3 suggested that "the utility, quality, and efficacy of a design artefact must be rigorously demonstrated via well-executed evaluation methods" (Hevner et al., 2004, p. 83). HMPR guideline 5 recommended applying rigorous methods to evaluating the artefact, and guideline 7 suggested presenting the artefact to technology and management-oriented audiences. Therefore, the purpose of this phase of the study was to demonstrate and evaluate the WFE-DSS solution prototype through well-executed evaluation methods that also showed the utility, quality, and efficacy of the design artefact.

Many KB methods have been outlined by Hevner et al. (2004) in DSR for the evaluation of an artefact. These methods include:

- **Observation:** This method focuses on case and field study within the business environment, with the field study monitoring multiple projects.
- **Analytic:** This method examines the structure and performance quality of the artefact.
- **Experimental:** This method evaluates the artefact in a controlled environment for the assessment of qualities (e.g., usability) and simulation, such as entering artificial data into the artefact.
- **Testing:** This method helps evaluate artefacts through functional and structural assessments to identify defects.
- **Descriptive:** This method assists evaluation using information from the KB (relevant research) to build a convincing argument for the artefact's utility and constructs detailed scenarios to demonstrate its utility.

Tremblay et al. (2010) recommended that an artefact need to evaluate within the technical infrastructure of the business environment. Arnott and Pervan (2010) suggested using extended methods, including simulation, scenarios, case studies, and experiments. Siegel (2012) adopted the 'naturalistic approach' to the assessment of usability with the engagement of users. Usability evaluation is a process that aims at testing the degree to which a product meets specific usability criteria, such as efficiency and learnability (Pescarin et al., 2012). Dix et al. (2004) considered two evaluation techniques including 'expert analysis' and 'user participation.'

In accordance with the HMPR guidelines in DSR, the artefact prototype in this study was presented and demonstrated to management-oriented audiences and evaluated through focus groups sessions with the participation of small business owners/managers as end-users. In addition, usability assessment was carried out to identify the end-user requirements and utility of the given artefact prototype.

Hevner et al. (2004) suggested doing evidence-based artefact evaluation and recommended using a qualitative method with a focus groups approach. Many other researchers in the DSR domain have recommended similar methods (Botes et al., 2014; Tremblay et al., 2010). Since the DSR methodology has two essential processes - problem

identification through artefact design and evaluation - this required qualitative data (Botes et al., 2014).

Many studies have used focus group assessment methods to further improve artefacts (Miah et al., 2014; Tremblay et al., 2010; Botes et al., 2014; Dhouib et al., 2016). The focus group method can deliver valuable qualitative data that reveals user needs and potential problems. This type of data is used to address functionality, usability, and environmental requirements in the design of system adaptations by users (Dhouib et al., 2016).

The most significant contributions of focus groups are observations of group interactions, individual perceptions, information processing and decision-making (Stewart & Shamdasani, 2014). Tremblay et al. (2010) identified in the DSR literature many significant reasons for using focus group evaluation. These include:

- **Flexibility:** Focus groups allow for open agreement and are flexible enough to handle a broad range of design topics and domains.
- **Direct interaction with respondents:** Focus groups allow researchers to ask respondents directly about design queries and to clarify any concerns they may have.
- **Significant amounts of rich data**: Focus groups allow researchers to gather extensive amounts of valuable data to help them understand user requirements. This type of data assists the researcher or designer not only in understanding the respondents' reactions to using the artefact, but also to identify other issues that may be present in a business environment and might impact the design.
- **Building on other respondent's comments:** The focus group setting allows researchers to identify and build on evolving ideas or opinions that might not emerge in individual interviews. Additionally, causes of disagreement can pinpoint possible problem areas in the proposed artefact.

The use of focus groups in this study also reflected the UCD principles (Dhouib et al., 2016) upon which the WFE-DSS prototype was designed and developed. The UCD principles focus on users, and their involvement in the development process (Baroni et al., 2010; Ivari & Ivari, 2011; Miah et al., 2014). Evaluation is a dominant part of user-centred system design (UCSD) (Preece et al., 1994). Various UCD methods have been

identified by researchers for interactive system evaluation, and one of these is the focus group (Dhouib et al., 2016). Mao et al. (2005, p. 105) stated that:

> UCD is a multidisciplinary design approach based on the active involvement of users to improve the understanding of user and task requirements, and the iteration of design and evaluation. It is widely considered the key to product usefulness and usability—an effective approach to overcoming the limitations of traditional system-centred design.

McLeod, MacDonell, and Doolin (2007) found more potential benefits than limitations in the literature for the participation of users in artefact development. These benefits and limitations are outlined in **Table 9.1.**

Table 9.1: Benefits and limitations of user participation

Benefits of user participation	**Limitations of user participation**
• Improves the quality of the IS development. • Avoids unnecessary system features being developed. • Provides a more accurate and complete assessment of user requirements. • Improves user understanding of the IS and its features. • Increases user acceptance of the IS. • Leads to user satisfaction with the IS. • Helps to create more realistic user expectations about IS capabilities. • Facilitates communication between participants, particularly users and developers. • Ensures the developed IS meets user needs.	• Increases project duration if there are multiple user groups. • Increases project costs due to multiple users and their needs. • Difficult to implement if there are time constraints, large groups and unwilling participants.

Source: McLeod et al., 2007

In this study, owner/manager participation provided more benefits for the WFE-DSS development and evaluation than limitations. Benefits included identifying small business problems, needs, and system requirements and confirming that the designed prototype met user needs with further improvements. Limitations related to time constraints and the users' unwillingness to participate. The present study also adopted the descriptive method for evaluating the artefact, which used information from the KB to build a convincing argument for the artefact's utility and construct knowledge (Hevner et al., 2004).

Prototyping methods indicate what should be assessed because these processes are themselves all about evaluation (Rhee & Rao, 2008). The prototyping method represents the implementation of an artefact aimed at demonstrating the utility or suitability of the artefact (Peffers, Rothenberger & Kuechler, 2012). The next section describes the initial phase of the artefact prototype evaluation.

9.3.1 The initial phase of the WFE-DSS prototype evaluation

In this phase of the evaluation, the researcher and the project supervisor tested the artefact prototype before conducting the focus group evaluation. As cited by Gregor and Hevner (2013), in practice, the prototype can be tested both personally and with others (Peffers et al., 2007). Thus, it was reasonable for the researcher and the project supervisor to test the prototype. They used small business website features and competitor site features as the input data (data from an external source), which they entered into the system and stored in the SQL-DB using the UI. The intention was to analyse the current and desired features on small business websites compared with their overseas competitors' websites to generate expert recommendations.

The UI of the artefact prototype is shown in **Figure 9.1**. This represents initially the main window interface. During the assessment processes, some errors were identified. These included welcome window with spelling error, the tool suddenly stopping when the 'Overseas' or any menu tabs were clicked a second time, the problem with the refresh and help tabs. The improved version of the main window or welcome UI is shown in the end-user manual in **Appendix H.**

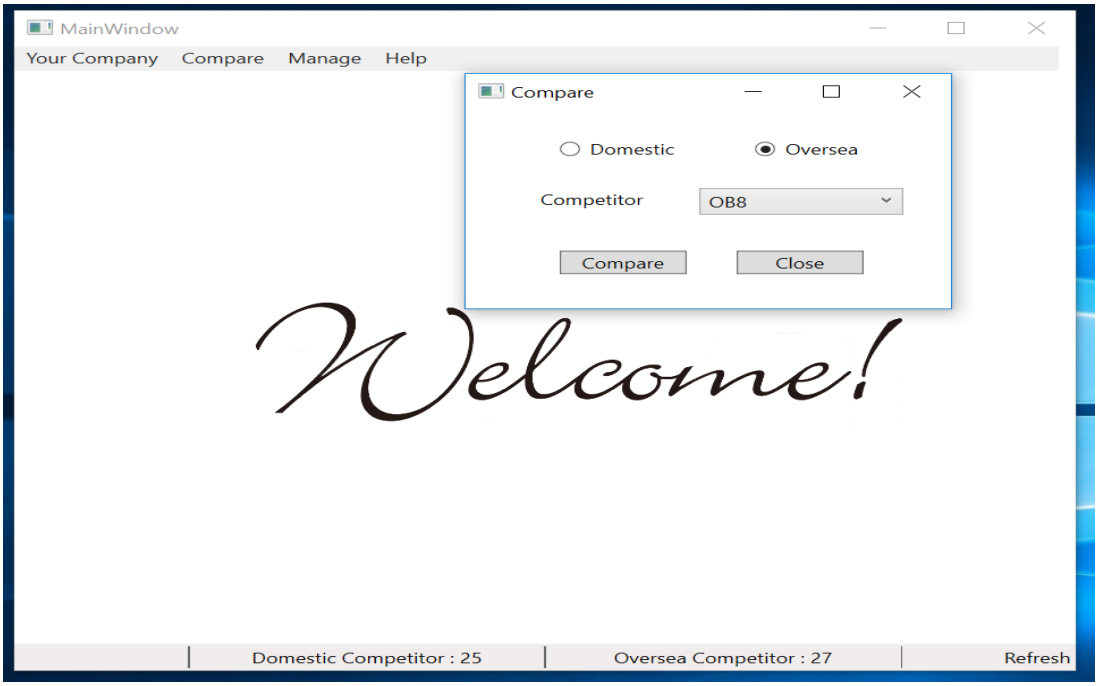
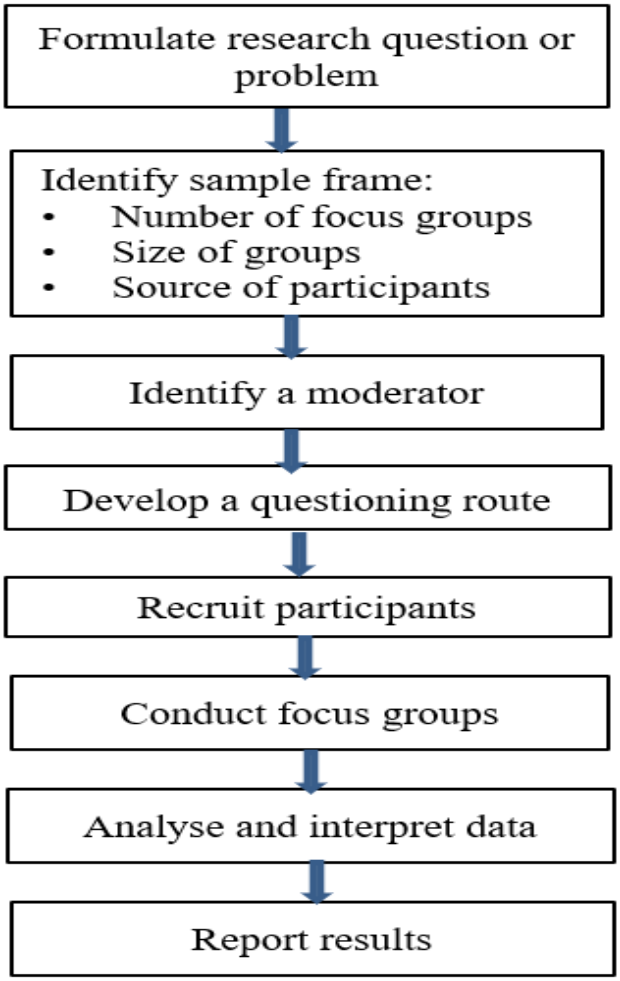


Figure 9.1: The main window of the initial WFE-DSS prototype

9.3.2 The second phase of the evaluation through focus group sessions

In this phase, the evaluation of the artefact prototype was carried out through focus group sessions. The research literature outlines several steps to carry out focus group research. Each of these steps can be used for any research-oriented focus groups and varied depending on the goal of the study (Tremblay et al., 2010). The current study adopted several DS focus group steps for the WFE-DSS prototype evaluation. These are shown in **Figure 9.2** and descriptions of each step are provided in the following sections.



Source: Tremblay et al., 2010, p. 602

Figure 9.2: Focus group steps in DSR

9.3.2.1 Formulate the research question or problem

This step of the focus group method in DSR assists the researcher in defining the research question or problem. The research question was formulated and presented in Chapter 1.

9.3.2.2 Identify the sample frame

In this step, Tremblay et al. (2010) recommended identifying:

- The number of each type of focus group to run the artefact.
- The desired number of participants in each group and how they will be sourced.

9.3.2.2.1 The number of each type of focus group to run the artefact

Tremblay et al. (2010) proposed using two types of focus groups: exploratory and confirmatory. Exploratory focus groups help to achieve incremental improvements in the artefact design. Confirmatory focus groups assist in demonstrating the utility of the design

in a field setting. However, in the WFE-DSS context, the confirmatory type of focus group was selected because the evaluation was carried out only by small business owners/managers in online retail sector. This was similar to the field testing created within the focus group workshop environment. The participants attempted the tasks using the given artefact prototype with the ultimate purpose of producing a satisfactory system (Petter, DeLone & McLean, 2012). Having participants try tasks is an essential component of any usability testing (Dumas & Fox, 2012).

9.3.2.2.2 The desired number of participants (sample size) and sources

Tremblay et al. (2010) recommended having groups of between four and 12 participants, as this makes them easier and less expensive to run than larger focus groups. Dumas and Fox (2012) suggested selecting five to eight participants from the same user population with multiple test sessions. The present study selected a small number of participants (five small business owners/managers), as recommended by Tremblay et al. (2010), but from the same user population and using multiple test sessions, as suggested by Dumas and Fox (2012).

Participants were sourced through personal communications and friends, or were visited directly in small retail businesses in Auckland. Stores were close to the location of the workshop to encourage participants in terms of convenience and saving them time.

9.3.2.3 Identify a moderator

Specific skills are needed when moderating a focus group workshop with multiple sessions. Essential skills include being able to respect participants, the ability to communicate and listen effectively, and self-discipline to express personal views in a welcoming manner with a sense of humour. For DS research, a moderator not only needs to have these skills, they also require a clear understanding of the technical aspects of the design artefact. In many cases, the moderator may be one of the artefact designers. In this situation, the moderator has to be ethical and avoid personal bias when introducing the artefact (Tremblay et al., 2010).

The researcher was the focus group moderator in the usability testing of the WFE-DSS prototype, having adequate technical knowledge about the artefact and both verbal and written communication capabilities. The moderator had already completed the PhD coursework units in these areas with High Distinction (HD), and was able to address

research participants respectfully when interacting with them. In addition, the moderator had various presentation skills and experience in academic workshops and well-recognised international conferences, engaging question and answer sessions throughout her PhD candidature.

The researcher also had the demonstration and group data collection experience with undergraduate and postgraduate students, using questionnaires at Victoria University in Melbourne, Australia. She had also carried out case studies with small business owners/managers for the WFE-DSS requirement analysis. Furthermore, ethics approval had been received from the Victoria University Ethics Committee (Ref. number HRE 15-216), with the researcher answering numerous questions about how to ensure ethics and integrity when conducting research. Finally, one of the project supervisors was present as an observer during the moderation processes.

9.3.2.4 Developing a questioning route

Tremblay et al. (2010) recommended that the questioning route outlined in the focus group sessions is aligned with research objectives. These researchers also suggested providing extensive descriptions of the design artefact, explaining how it would be utilised and finishing with a scenario and how to evaluate the artefact. They also proposed using no more than 12 questions for each two-hour session, presenting questions from the most general to the more specific, and focusing on the research agenda.

Initially, a brief introduction was given about the workshop sessions and prototype. Next, descriptions were provided of the prototype assessment, and how the prototype would be utilised and tasks finished. After that, the moderator outlined further evaluation sessions using questionnaires and quick interviews on user experiences of the prototype. Subsequently, the next level of corrections could be conducted to improve the initial WFE-DSS prototype.

Hevner and Chatterjee (2010) argued that an IT artefact evaluation requires the definition of appropriate metrics. An IT assessment also requires the gathering and analysis of relevant data about functionality, completeness, consistency, accuracy, performance, reliability, usability, and other related quality attributes. Questionnaires were designed following HMPR DSR guideline 3 and covered the system evaluation matrices of usability, efficacy, and performance. The two sets of questionnaires (semi-structured and

unstructured, and Likert scale), which used these matrices, are shown in **Appendix G**. Descriptions of some of these matrices are provided in **Appendix G1.** Therefore, the questions were designed to address the requirements of further improvements to the WFE-DSS prototype.

A questionnaire is a reliable tool for collecting user opinions and is similar to the interview method. Questionnaires can have structured, unstructured, and semi-structured questions. They can be used for usability testing and, according to Preece et al. (2002), should begin with general questions first, followed by design specific questions, which can contribute to evaluation goals. If the questionnaire is lengthy, the questions may be sub-divided into related topics to make it easier, and more consistent.

Some queries or questions apply rating scales, which can be used for judgements about something, such as how easy it to use something. Therefore, ranking or rating scales are valuable for usability studies. Two commonly used rating scales are Likert and semantic differential scales (Preece et al., 2002). Semantic differential scales were unsuitable for the usability evaluation of the WFE-DSS prototype because they explore a range of bipolar views about a particular item. Each pair of opinions is represented as a pair of adjectives, and respondents are asked to choose between two extremes, such as 'helpful' or 'unhelpful'. Likert scales are used for measuring opinions, attitudes, and beliefs, and consequently, they are more widely used for evaluating user satisfaction with products than semantic differential scales (Preece et al., 2002).

The current study designed two types of questionnaires. One was designed using a five-point Likert scale. The other was created with semi-structured and unstructured questions for the prototype usability evaluation. Some questions were developed to receive discrete responses of 'Yes' or 'No'. Questionnaires were divided into different parts using headings with varying evaluation matrices of evaluation, similar to the questionnaire design recommended by Preece et al. (2002).

Finally, instant interviews were carried out to capture the users' overall experience of the prototype. The interview data were collected through audio recording, which is a convenient alternative to note-taking and can be revisited if there is any confusion about results (Preece et al., 2002). Preece et al. (2002) found two problems with audio recording, which were the lack of a visual record and the time required to transcribe. However, in

this study, the audio recording of their overall experience of using the prototype was only one minute long for each of the five respondents.

9.3.2.5 The recruitment of participants

The recruitment of focus group participants is not statistically rigorous because, unlike survey research, participants are not selected randomly (Tremblay et al., 2010). A random sampling technique is impractical for choosing the target population in usability testing. More limitations of random sampling include issues of geography, such as participants being close enough to the workshop venue, with availability to participate during business hours and engage willingly. If the sample is 'real users' that may yield lists of problems, thus, every usability test sample should be more convenient. Moreover, real user participation is necessary for usability testing to achieve the target goal. It is not designed to test different populations (Dumas & Fox, 2012). Many researchers have suggested involving industry and decision-makers in developing the DSS (Arnott & Pervan, 2012; Arnott, 2006; Hosack et al., 2012).

For the usability testing in this study, small business owners/managers were the real users of the WFE-DSS. This was a small convenient sample. Small business addresses were collected from the 'Yellow Pages of New Zealand' and the researcher communicated with the businesses, first by phone and then via email. However, this initiation was ineffective and proved one of the limitations of the research. Therefore, the researcher started personal communications through friends and visited different small retail businesses in Auckland. An information sheet about the project and workshop particulars were given to potential participants, inviting them to the workshop and refreshments. Similarly, Tremblay et al. (2010) identified likely participants through personal contact, made phone calls and provided descriptions of the study along with invitations for participation.

9.3.2.6 Conduct the focus group

When a DSS project is based on DSR, not only does it focus on the development of the artefact, it also demonstrates that the artefact can be used efficiently to solve real problems (Hevner et al., 2004; Tremblay et al., 2010). The purpose of conducting focus group was to determine how a group of real users (small business owners/managers) could efficiently use the WFE-DSS prototype in analysing their current and desired website features within the online retail environment. Thus, they had the option to collect competitor data from the external business environment using the prototype to create

knowledge for their business needs. These activities promptly help the researcher to further improve the prototype version.

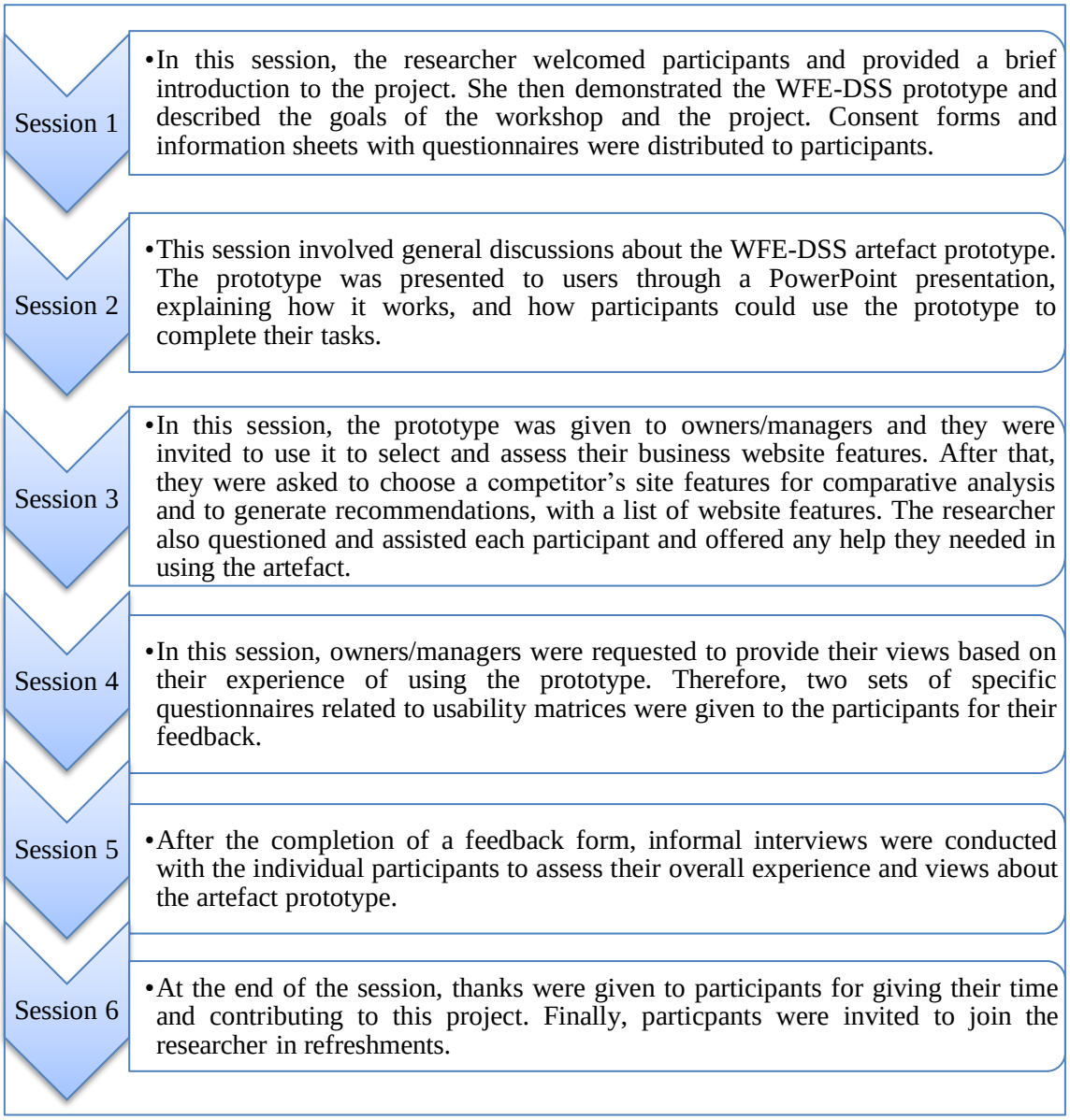
There are many different methods of usability testing, such as user tests, user interviews, questionnaires and expert reviews. User tests involve observing and measuring the performance and behaviour of a user who attempts to solve one or several tasks to evaluate the product. This produces rich descriptive data, but the process can be time-consuming to perform. Pescarin et al. (2012) recommended using usability questionnaires, which are suitable for rapid collection of large sets of data in a workshop setting.

The current study engaged a small group of real end-users, controlled by a moderator, which is the most common usability test method in a workshop environment. Albert and Tullis (2013) differentiated between a focus group and a usability test of an artefact. In a focus group, participants commonly watch someone demonstrate or describe a potential product and then react to it. In a usability test, participants are allowed to use some version of the product.

In the context of the usability evaluation of the small business WFE-DSS prototype, the focus group sessions were carried out in an institutional demonstration room. This room had suitable space with a PowerPoint presentation option allowing the researcher to demonstrate the prototype. These sessions were therefore held in an environment similar to a field or laboratory setting for the prototype usability testing by real users, as well as providing a focus group environment for the system demonstration.

The workshop environment was suitable because the WFE-DSS prototype was a small-scale PDSS type, developed only for an owner/manager of a small business. The PDSS is ideal because the technology used is a personal computer, with relatively user-friendly software applications (Arnott, 2008). The data can be captured during and after the completion of tasks (Dumas & Fox, 2012). Data were also collected using questionnaires and through quick interviews after members of the focus group completed their tasks. Focus group workshop sessions were 1.5 hours long. The overall steps and various activities across the multiple sessions are presented in **Table 9.2.**

Table 9.2: Focus group sessions for the WFE-DSS prototype evaluation



9.3.2.7 Analyse and interpret data

The primary units of analysis in this round of data collection were:

- Prototype usability assessment responses using a rating scale (five-point Likert scale) questionnaire.
- Prototype usability assessment responses using semi-structured and unstructured questionnaire.
- Focus group quick interview transcripts for the overall user experience of the prototype.

A colour coding method was applied, coding and categorising qualitative data using Microsoft Word and visualising data. Coding involved looking for distinct concepts and categories in the data which would form the core unit of analysis (Bree & Gallagher, 2016).

This study used qualitative (Miah, Ahsan & Msimangira, 2014) and descriptive analysis methods (Henver et al., 2004) for analysing and interpreting focus group data and creating concluding concepts. The concluding concept or KB was crafted from the end-user generated data after using the artefact prototype to satisfy kernel theory. Kernel theories are justificatory knowledge, which represent the underlying knowledge or theory from the natural, social or design sciences. The kernel theory provides the basis and explanation for the design (Hevner & Chatterjee, 2010). These concluding concepts help to confirm the most critical points, which will assist in further development of the prototype (Hevner & Chatterjee, 2010).

The evaluation outcomes from the focus group sessions are provided in the following sections.

9.4 Evaluation results

This section discusses the prototype evaluation results from the focus group sessions involving the owners/managers of five small businesses. Section 9.4.1 presents the results from the five-point Likert scale questionnaire. Section 9.4.2 describes the results from the semi-structured and unstructured questionnaire, and section 9.4.3 discusses results from the quick interviews about overall user experiences.

9.4.1 Evaluation results based on the Likert scale questionnaire

This section presents the WFE-DSS prototype evaluation results based on data collected from the Likert scale questionnaire. The Likert scale questionnaire was designed using the IT artefact evaluation matrices of usability, efficacy, and performance, and were given to end users to capture their opinions. Each question was rated on a one-to-five Likert scale: 1—Strongly disagree, 2—Disagree, 3—Neutral (neither agree nor disagree), 4—Agree, 5—Strongly agree. Likert scales allow respondents to indicate how strongly they agree or disagree with a statement or series of statements (Saunders et al., 2009).

Dane (2006, p.1) described a Likert scale as:

> a psychometric response scale primarily used in questionnaires to obtain participants' degree of agreement with a statement or set of statements. Likert scales are a non-comparative scaling technique and are unidimensional (only measure a single trait) in nature. Respondents are asked to indicate their level of agreement with a given statement by way of an ordinal scale.

When data cannot be precisely described with numerical values for evaluations, quality ratings are frequently classified as either nominal or ordinal scales (González-Rodríguez, Colubi & Gil, 2012; Likert, 1932). An ordinal scale is well-known as a ranked scale (Brown, 2011).

The detailed Likert scale result are presented in **Appendix G2.** The following sections discuss the prototype evaluation results using graphical representations with colour coding focused on the specific evaluation metrics of usability, efficacy, and performance. Concluding concepts or justificatory knowledge are also provided based on the analysis of results.

9.4.1.1 The WFE-DSS prototype usability results analysis

Usability is concerned with the ease of use when users interact with a given system (Albert & Tullis, 2013; Coutaz & Calvary, 2012; Tsakonas & Papatheodorou, 2006). Ease of use indicates how easy all functions are to use in a system. System usability focuses on the efficient communication process between the user and the system features and how information (input/output) is processed (Tsakonas & Papatheodorou, 2006). Therefore, assessments and interpretations are required about how users execute given tasks in effective, efficient and satisfactory ways (Albert & Tullis, 2013; Preece et al., 2002; Tsakonas & Papatheodorou, 2006, 2008).

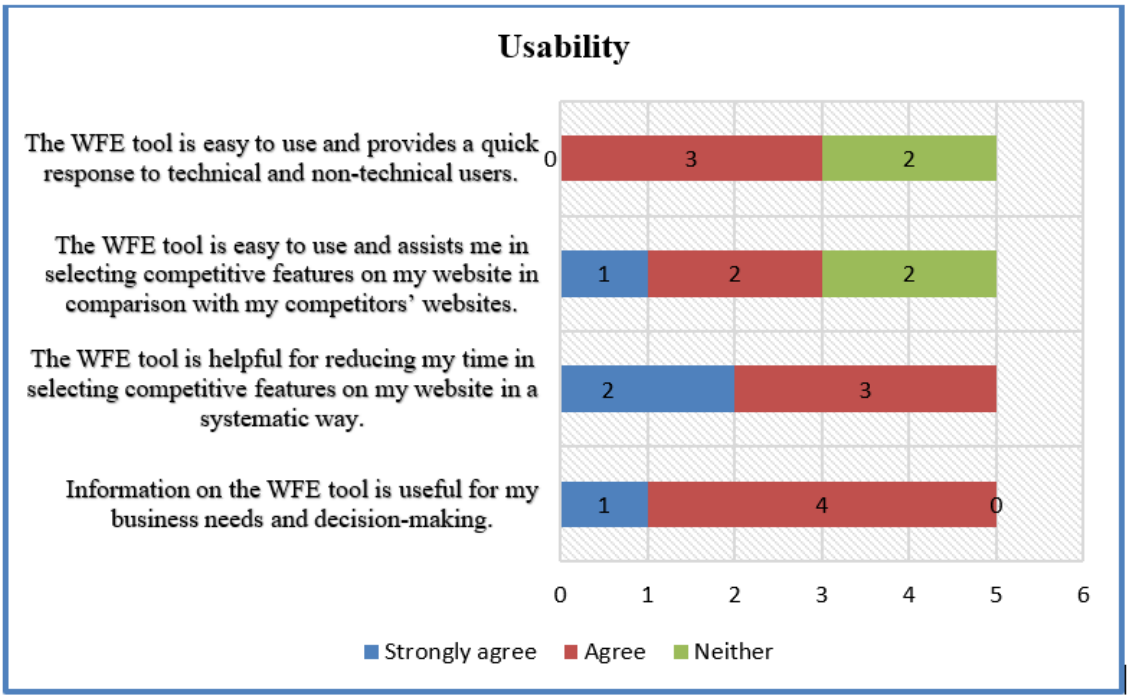


Figure 9.3. Usability evaluation results from end-users

Figure 9.3 provides a graphical representation of the prototype usability evaluation ratings from the five small business owners/managers. The results are summarised as follows:

- The majority of owners/managers agreed that the artefact was easy to use and provided quick responses in helping them select competitive features on their websites.
- All users agreed that the artefact assisted them to be systematic and quick ways in managing their website features.
- All users agreed that the tool was useful for their business needs and supported them in their decision-making.
- More than half of the respondents agreed that the tool was easy to use for both technical and non-technical users.
- Two respondents were neutral about the ease of use for technical and non-technical users.

Justificatory knowledge: *The majority of the small business owners/managers agreed that the WFE-DSS prototype was easy to use, systematic, user-friendly, provided quick responses, and was useful for their businesses in the selection of competitive features on their websites.*

9.4.1.2 The WFE-DSS prototype efficacy results analysis

The efficacy of a system enables users to perform tasks in a quick, cost-effective way in a particular environment (Coutaz & Calvary, 2012; Dix et al., 2004). Artefact efficacy is reached when the desired effect is produced, such as achieving its intended goal with users. The effectiveness of the artefact also represents the summative evaluation of the utility of the artefact (Venable et al., 2016).

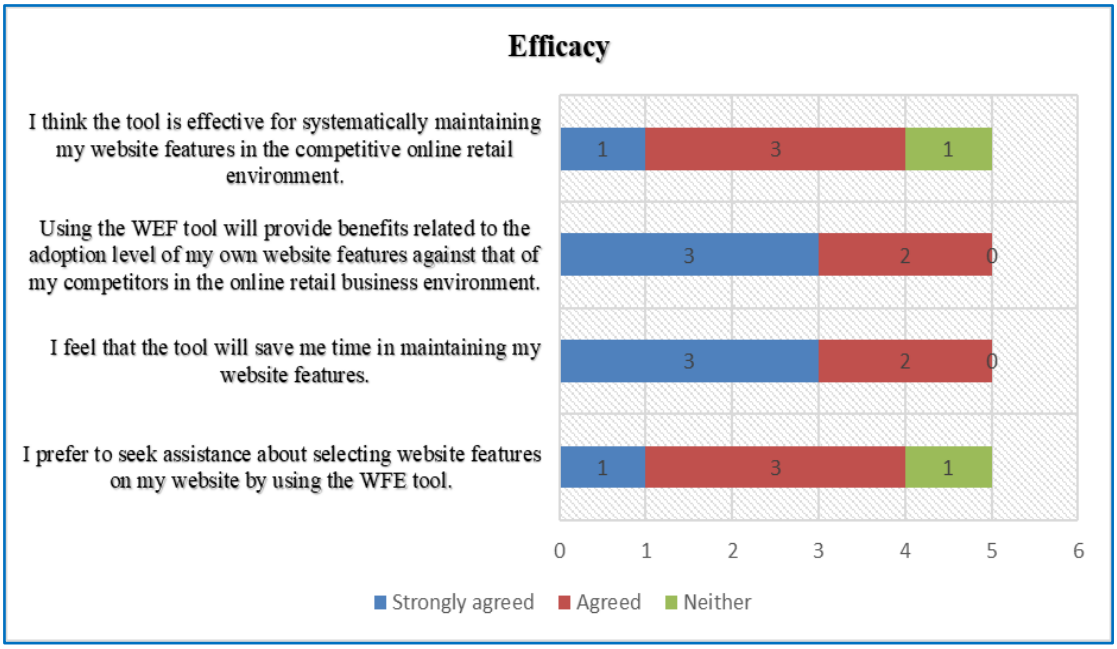


Figure 9.4: Efficacy evaluation results from end-users

Figure 9.4 provides a graphical representation of the evaluation results on the WFE-DSS prototype efficacy, as rated by owners/managers. The results are summarised as follows:

- The majority of owners/managers agreed that the tool was useful for maintaining their website features; one respondent remained neutral.
- All owners/managers agreed that using the WFE-DSS would offer benefits in terms of comparing their current website features with those of their competitors.
- All owners/managers agreed that the tool could save them time in managing their website features.
- The majority of users preferred to use the WFE-DSS to update their website features; one respondent remained neutral.

Justificatory knowledge: *The majority of users agreed that the WFE-DSS prototype was effective for maintaining their website features and to assess their current level of features against those of their competitors. Moreover, all of them agreed that the prototype could*

save time in managing their website features, and the majority preferred using the artefact.

9.4.1.3 The WFE-DSS prototype performance results analysis

Performance is a critical measure in the design of systems. The goal is to get the best outcome for a given cost (Hevner & Chatterjee, 2010). Performance is also a determining factor for user acceptance of a system (Tsakonas & Papatheodorou, 2006). Four major types of performance matrices can be considered. These areas include duration, counting, the proportion of tasks completed, and the quality of output (Preece et al., 1994). Duration metrics measures how much time is spent doing a particular activity. Counting metrics measure how many discrete actions are performed, or errors made in a given time. The proportion of tasks completed is not easy to measure. It can be achieved by carefully setting the task goals, and then expressing final results of completion as a percentage of those goals. Similarly, it is not easy to measure quality output, but it is possible to identify right or wrong output (Preece et al., 1994).

In this WFE-DSS performance and usability study, focus group users were given approximately 30 minutes to perform a task, and another 30 minutes (approximately) to express their opinions by completing questionnaires and quick informal interviews. Therefore, the performance of the prototype artefact within this limited timeframe can be considered effective.

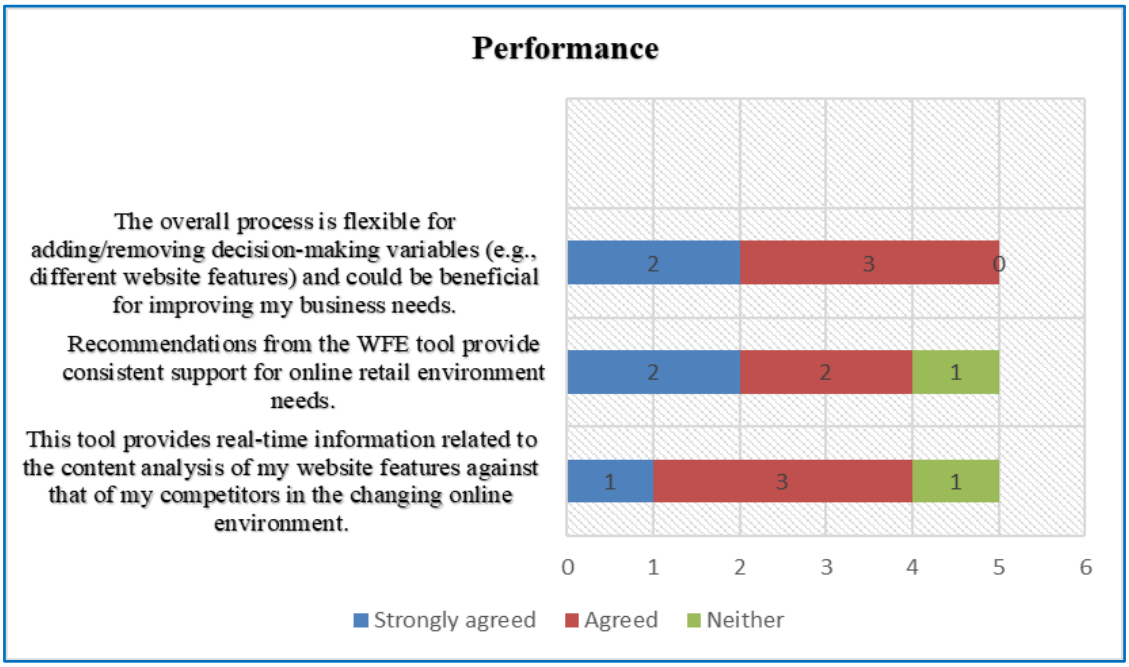


Figure 9.5: Performance evaluation results from end-users

Figure 9.5 provides a graphical representation of the WFE-DSS performance evaluation results, as rated by owners/managers. The results are summarised as follows:

- All owners/managers agreed that the tool was flexible and reliable for improving business needs in terms of adding and removing website features.
- The majority of them agreed that the artefact could provide outputs that were consistent and could support the needs of the online retail environment; one respondent remained neutral.
- The majority of users agreed that the artefact could provide real-time information about the level of adoption of their own and their competitors' website features.

Justificatory knowledge: *The majority of users agreed that the given WFE-DSS prototype was flexible, reliable, consistent and had the capability to provide real-time analysis of the level of adoption of features on their websites and those of their competitors in the online retail environment.*

9.4.1.4 A summary of WFE-DSS prototype evaluation results by score ratings

Table 9.3 presents a summary of results from the Likert scale ratings by the five small business owners/managers after using the WFE-DSS prototype. The average score ratings by the group were as follows: usability (3.98); efficacy (4.3), and performance (4.2). Therefore, user ratings were generally between 'Strongly agree' and 'Agree' on the evaluation scale. The majority of artefact users scored most assessments with 'Agree' or 'Strongly agree', but a few scored 'Neither agree nor disagree.'

Table 9.3: A summary of WFE-DSS prototype evaluation results using the Likert scale

Evaluation matrices and related questions	Average rating by small business decision-makers (N=5)	
Usability		
Information on the WFE tool is useful for my business needs and decision-making.	4.1	3.98
The WFE tool is helpful for reducing my time in selecting competitive features on my website in a systematic way.	4.4	
The WFE tool is easy to use and assists me in selecting competitive features on my website in comparison with my competitors' websites.	3.8	
The WFE tool is easy to use and provides a quick response to technical and non-technical users.	3.6	
Efficacy		
I prefer to seek assistance about selecting website features on my website by using the WFE tool.	4.0	

I feel that the tool will save me time in maintaining my website features.	4.6	4.3
Using the WEF tool will provide benefits related to the adoption level of my own website features against that of my competitors in the online retail business environment.	4.6	
I think the tool is effective for systematically maintaining my website features in the competitive online retail environment.	4.0	
Performance		
This tool provides real-time information related to the content analysis of my website features against that of my competitors in the changing online environment.	4.0	4.2
Recommendations from the WFE tool provide consistent support for online retail environment needs.	4.2	
The overall process is flexible for adding/removing decision-making variables (e.g., different website features) and could be beneficial for improving my business needs.	4.4	

Summary of justificatory knowledge: *This assessment recommended the WFE-DSS. It showed the potential for small business decision-makers to meet their contextual business needs, such as comparing their website features with those of their successful competitors. Ultimately, users could update their website features in the B2C e-commerce environment to remain competitive.*

9.4.2 The WFE-DSS prototype evaluation results from the semi-structured and unstructured questionnaire

This questionnaire had two parts. Part I asked structured questions regarding owner/manager ICT skills. Part II comprised a further two parts, with Part IIA asking semi-structured questions about system usability and Part IIB asking unstructured questions about system effectiveness.

9.4.2.1 Part I: Owner/manager ICT skills

Small business owner/manager responses regarding their ICT skills are presented in **Table 9.4.**

Table 9.4: Small business owner/manager ICT skills

Question	Business names	Business responses
What do you consider to be your level of ICT literacy (e.g., computer literacy)?	Business 1	Very strong
	Business 2	Very Strong
	Business 3	Average (use for non-IT job)
	Business 4	Average
	Business 5	Very strong

A graphical representation of these responses is provided in **Figure 9.6.** The results indicate that the majority of owners/managers believed they had strong ICT skills.

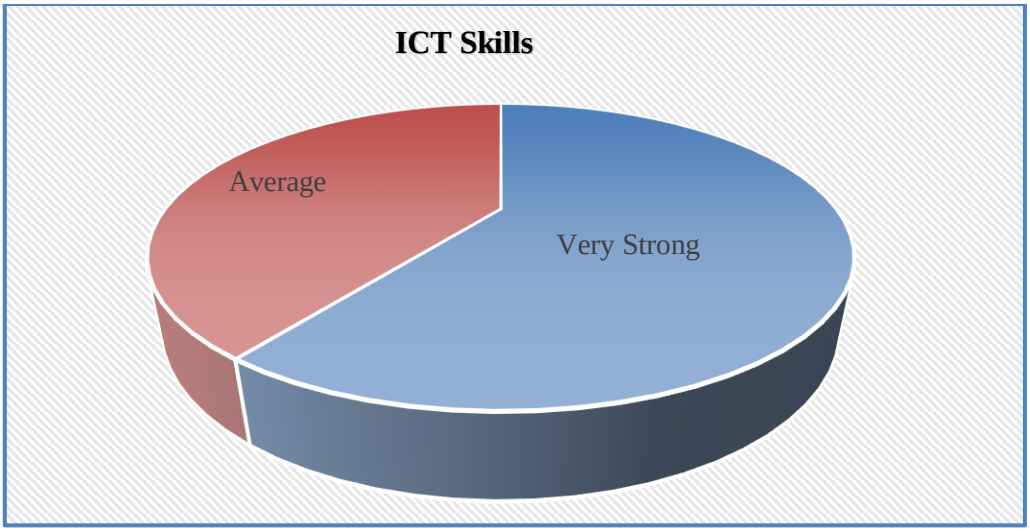


Figure 9.6: Owner/manager ICT skills

Justificatory knowledge*: Their ICT skills might provide a significant reason for owner/manager participation and contributions to the WEF-DSS prototype evaluation.*

9.4.2.2 Part IIA: WFE-DSS usability assessments from the semi-structured questions

In the semi-structured questions, the five owner/managers had the option of a quick 'Yes' or 'No' response, plus the opportunity to offer suggestions for further improvement of the prototype. The owner/manager responses are presented in **Table 9.5.**

Table 9.5: Usability assessment results from the semi-structured questions

Part IIA: Questions on usability	**Businesses names**	**Owner/manager responses**
1. Is the tool capable of providing useful information about the website features that are important for interacting with online consumers? If yes, please move to question 2, if no, please provide your reasons.	Business 1	*Yes, it does. However, it need to be more business specific as current tool is generic. For example, I have a clothes retail website, some features do not relate to me.*
	Business 2	*Yes*
	Business 3	*Yes*
	Business 4	*Yes*
	Business 5	*Yes*
2. Is the information produced by the tool useful for your own decision-making in the online retail environment? If yes, please go to question 3. If no, please provide your comments.	Business 1	*Yes*
	Business 2	*Yes, to certain degree*
	Business 3	*Yes*
	Business 4	*Yes*
	Business 5	*Yes*
	Business 1	*Yes*

3. Is the tool assisted you in selecting competitive features for your company's website? If yes, please go the question 4. If no, please provide your comments.	Business 2	*No, the features do not work well with a restaurant, as required financial calculator.*
	Business 3	*Yes*
	Business 4	*Yes*
	Business 5	*Yes*
4. Does the tool provide an easy way to find information about the adoption level of features on your website against those of your competitors and a quick response as you expected? If yes, please go to question 5. If no, please provide your suggestion.	Business 1	*No, the manage competitors' features again would be elaborated further as right now it is more elaborated.*
	Business 2	*Blank*
	Business 3	*Yes*
	Business 4	*Yes*
	Business 5	*Yes*
5. Does the tool save you time in making quick decisions to select competitive features on your website without consulting with the web designer? If yes, please go to question 6. If no, please provide your suggestions.	Business 1	*Yes*
	Business 2	*Yes*
	Business 3	*Yes*
	Business 4	*Yes*
	Business 5	*Yes*
6. Do you think this tool could, to some extent, replace the advice received from an e-business consultant? If yes, please go to question 7. If no, please provide your suggestions.	Business 1	*Yes*
	Business 2	*Yes*
	Business 3	*Yes, it is helpful if a business does not have many features using selecting menu that is looking simple.*
	Business 4	*Yes*
	Business 5	*Yes*
7. Does the tool allow you to professionally and systematically select your website features for the changing online retail environment? If yes, please go to question 8. If no, please provide your suggestions.	Business 1	*Yes*
	Business 2	*Yes, but the tool need frequent update to keep up with evaluation.*
	Business 3	*Yes*
	Business 4	*Yes*
	Business 5	*Yes*

9.4.2.2.1 WFE-DSS usability results analysis from the semi-structured questions

The summary of WFE-DSS usability evaluation results from the semi-structured questions are provided in **Figure 9.7.**

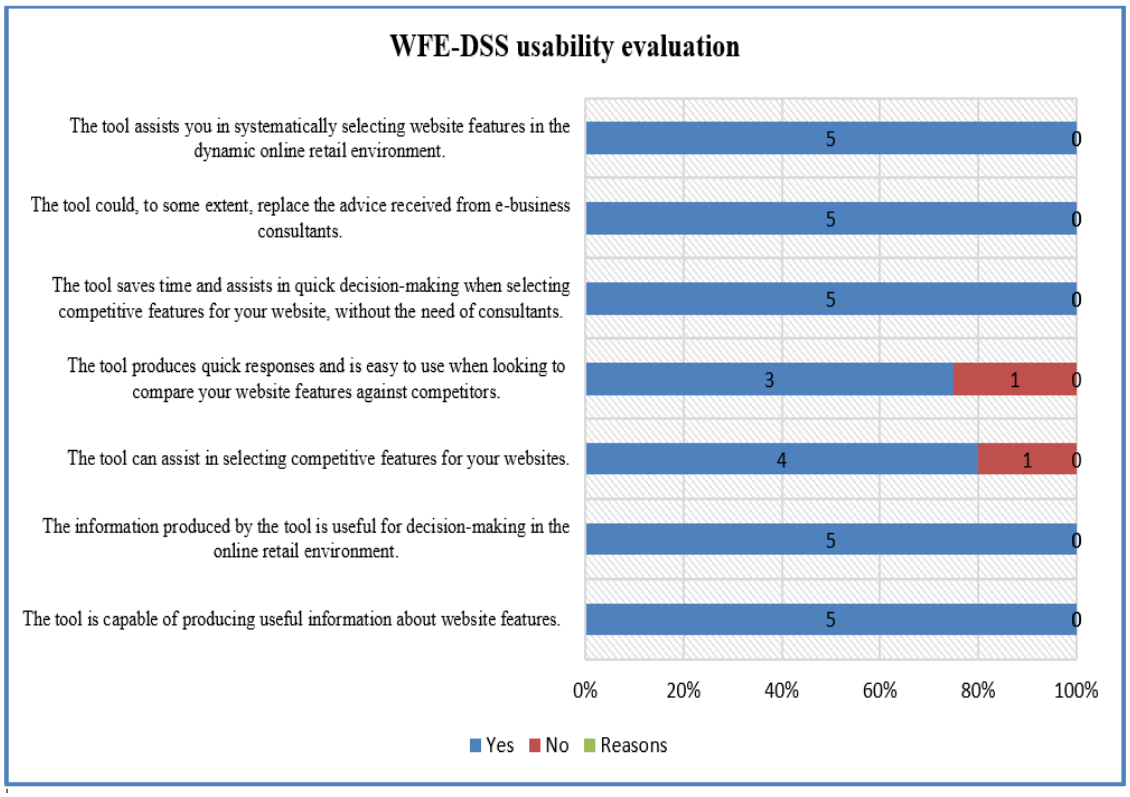


Figure 9.7: WFE-DSS prototype usability evaluation results from the semi-structured questions

The following concluding concepts or justificatory knowledge were drawn from the WFE-DSS usability evaluation results:

Justificatory knowledge: *Most of the owners/managers had similar opinions about the WFE-DSS prototype usability, which were the systematic management of website features, a replacement, to some extent, for e-business consultant advice, and quick responses in producing information for decision support in the online retail environment.*

9.4.2.3 Part IIB: Efficacy assessment results from the unstructured questions

This section describes owner/manager actual written responses to unstructured questions about the effectiveness of the WFE-DSS prototype as shown in **Table 9.6.**

Table 9.6: Effectiveness assessment results from the unstructured questions

Part II B: Questionnaires about the artefact prototype effectiveness	**Business names**	**Owner/manager responses (original)**
8. Without using this tool, what method(s) do you use for decision-making related to	Business 1	*Decision-making is mostly based on research and current trends of the industry.*
	Business 2	*Marketing team and webdesigners*

selecting your website features within the online environment?	Business 3	*I would use the help of IT department to analyses the features that are need for the groth of the company.*
	Business 4	*Missing the question*
	Business 5	*Check other websites, ask professionals.*
9. What changes in your everyday business practice will be made if you use this tool for selecting your website features and maintaining that website? Do you believe there will be a change or improvement (e.g., save time, quick support, etc.,)?	Business 1	*It can be useful if you allow facebook page assessment along with website assessment as it is another integral part of e-business.*
	Business 2	*A quick support on handling complaint, may be.*
	Business 3	*If you are a small business owner and have less budget, yes it does improve decision making faster and cheaper*
	Business 4	*It will help to make better decisions.*
	Business 5	*Decision making is tough, so if this tool help me do that, it make me release from that tough job.*
10. What are the possible benefits provided by the tool for your business purposes?	Business 1	*It lists the short comings of my website. So, I can work on them to make it better.*
	Business 2	*Having a website which can compete with other business no matter the size.*
	Business 3	*For Noel Leeming, I did not get much help. However, if I use for a small business, the benefit will be cheap, fast.*
	Business 4	*It helps to determine and fill the gaps of the business features.*
	Business 5	*This tool gives me objective advice rather than subjective one. It is very helpful.*
11. Do you think the tool creates any disadvantages for you? If yes, please provide your reasons. If no, please answer the next question.	Business 1	*No*
	Business 2	*Yes (without reasons).*
	Business 3	*No*
	Business 4	*No*
	Business 5	*The design of the tool is simple too*
12. What other aspects of this tool could be improved? If any, please provide your suggestion.	Business 1	*Just a little more detail in the assessment criteria and a business centric assessment would be much better.*
	Business 2	*The tool is to given. Something more specific, such as selection of industry. Ex: hospitality, retail…*

	Business 3	*In selection mean, have more features that are not very obvious for business owners to know them. "unknown features" that bring maximum profit.*
	Business 4	*Its already good.*
	Business 5	*From the present design, I do not want to answer the questions.*
13. What do you think about the effectiveness of the tool?	Business 1	*It is an o/s tool not something great if it was more focused on certain businesses I would have been more happy with it!!*
	Business 2	*It can gives useful information to keep the website up to expected standard from customers.*
	Business 3	*This tool would be effective if I use it as a tool to my small new set up business. However, when I compete it to Noel Leeming I could not see great effectiveness.*
	Business 4	*To improve my business in various aspects.*
	Business 5	*As I said in question 10, objective information is very useful for me.*

The following sections provide a qualitative and descriptive analysis of the data shown in this table, generated through the assessments of owners/managers on the effectiveness of the WFE-DSS prototype. Concluding concepts or justificatory knowledge have also been constructed.

9.4.2.3.1 Results analysis based on how small businesses decide what website features to select without this tool

This study sought to identify what methods small businesses used to manage their website features in the online environment, as stated in **Question 8** in **Table 9.6.** The four responses (one was missing) were:

- Research into current trends in the industry
- Through a web designer and marketing team
- Through the IT department
- Checking other sites and seeking professional help

Justificatory knowledge: *None of the owners/managers used any methods for making decisions by themselves to manage their website features, although one respondent*

checked other sites. Consequently, the WFE-DSS could provide a cost-effective and systematic way of maintaining features on their websites.

9.4.2.3.2 Results analysis based on how everyday business practice might change if small businesses used the artefact for managing website features

Figure 9.10 provides a graphical representation of the impact of the WFE-DSS if it were used by small businesses in their everyday business practice, as associated with **Question 9** in **Table 9.6.**

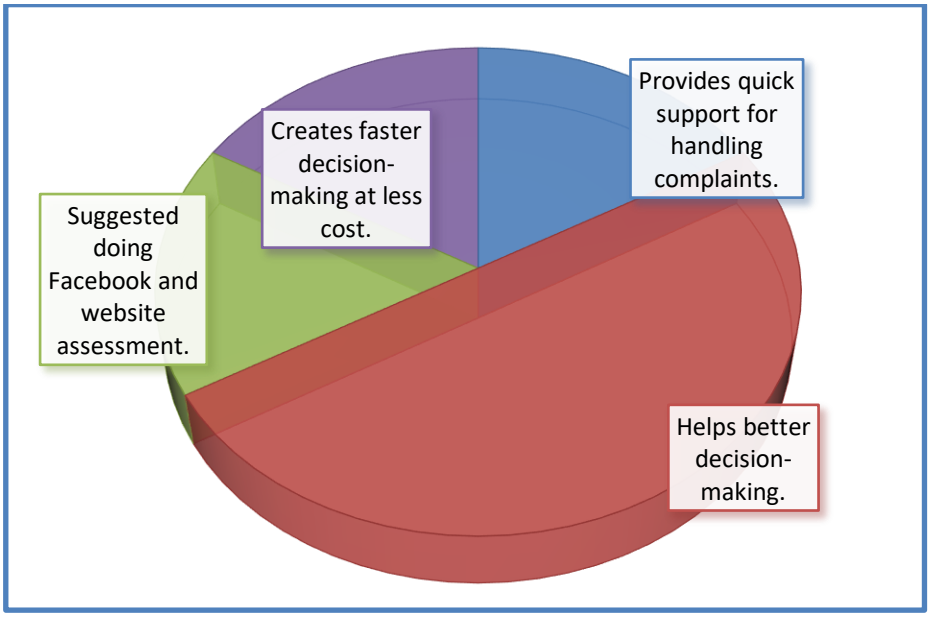


Figure 9.8: Efficacy evaluation results based on how the WFE-DSS might change everyday business practice

The WFE-DSS impacts on business practice, as shown in the **Figure 9.8,** include:

- Improving decision-making in relation to the selection of website features, as indicated by the majority of owners/managers.
- Providing immediate support for handling customer complaints. As confirmed by one user, that is one of the significant features any retail website needs to include. Thus, after completing an analysis of website features, if this feature is not available on small business websites, the WFE-DSS will inform the decision-maker of its importance for their business.
- Another owner/manager stated that the tool could assist in faster decision-making in a cost-effective way, particularly for small businesses with limited finance.
- One respondent suggested the efficient use of the artefact along with the Facebook assessment. While the WFE-DSS was not developed to assess

Facebook pages, it can provide recommendations about adopting different social website links as features on small business websites.

Justificatory knowledge: *The WFE-DSS could have a substantial impact on the everyday practice of small business within the online retail environment. Impacts include quick support for dealing with customer complaints, improving decision-making with less cost and making better decisions related to effective small business online presence.*

9.4.2.3.3 Evaluation results analysis based on the possible benefits and disadvantages of using the tool

The purpose of this study was to recognise the possible benefits to small businesses provided by the prototype, as stated in **Question 10** in **Table 9.6.** The benefits of the WFE-DSS identified by the five owners/managers were:

- It helped determine the list of shortcomings of small business website features, which in turn helped them improve their websites.
- It provided quick responses that would help reduce business costs.
- It offered fact-based advice rather than biased opinions.
- It was very useful for the business.
- It helped improve business websites, so they could compete with any size company.

This study also sought data about the potential disadvantages of the WFE-DSS for small businesses, as stated in **Question 11** in **Table 9.6**. Evaluation outcomes included:

- The design of the artefact is simple.
- Although one respondent said that the tool had disadvantages, the respondent did not provide any reasons for this belief. The majority of respondents stated that the WFE-DSS prototype had no disadvantages.

A graphical representation of responses if any potential disadvantages of the prototype they perceive are presented in **Figure 9.9.**

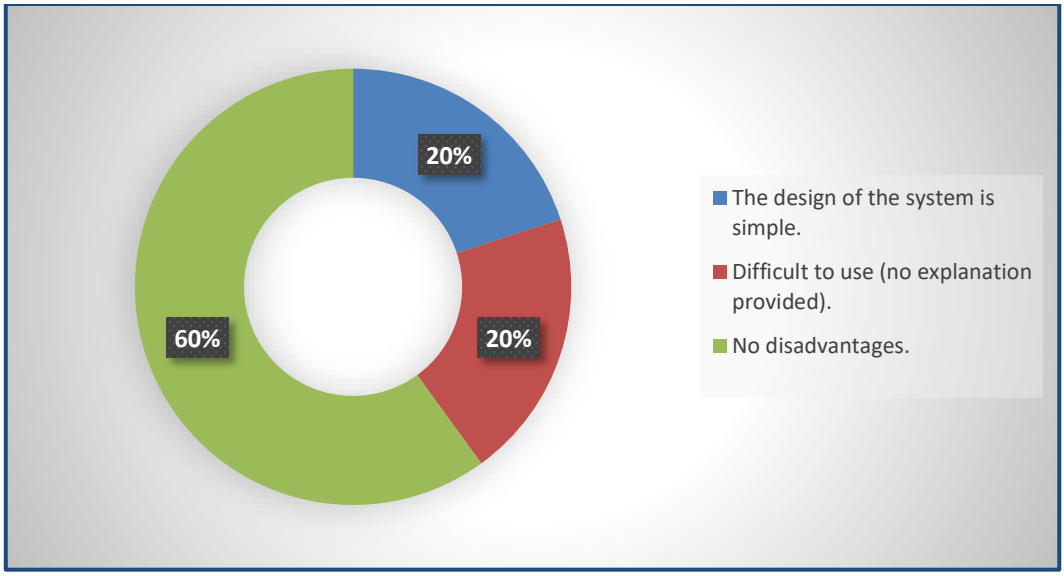


Figure 9.9: WFE-DSS prototype evaluation results relating to possible disadvantages if any user perceived

Justificatory knowledge: *Based on the evaluations and descriptive analysis of results, it can be concluded that the WFE-DSS has the potential to provide small businesses with substantial benefits and few disadvantages in developing an effective online presence.*

9.4.2.3.4: Suggestions from users for improvements to the WFE-DSS

Suggestions were sought from owners/managers about any improvements in the WFE-DSS prototype are required, as stated in **Question 12** in **Table 9.6**. Improvements are probably the most common kind of DSR contribution, and they can be challenging because a researcher needs to show that a proposed solution will improve the artefact. Improvements may relate to efficiency, usability, safety, maintainability and/or other qualities of the artefact (Johannesson & Perjons, 2014). However, the majority of the small business owners/managers in this study provided irrelevant suggestions regarding improvements to the WFE-DSS prototype. Responses were as follows:

- One respondent suggested focussing on a specific industry (e.g., retail, hospitality) although this artefact was designed mainly for small companies in the online retail sector. There may have been a lack of understanding of the purpose of the prototype or a misinterpretation of the question.
- One respondent said “just little more detail in the assessment criteria” and suggested a “business-centric assessment”. This suggestion was not clearly understood.

- The advice provided by 'Business 3' was not clear in terms of addressing the question. It seems likely that the respondent was suggesting that the artefact could help business owners in selecting unknown features to bring maximum benefits. Might be their inability in addressing open-ended questions.
- One respondent simply stated that the system was already good.
- Another stated that “I do not want to answers the questions based on current design.”

The researcher also requested advice on the overall effectiveness of the prototype, as seen in **Question 13** in **Table 9.6**. Owners/managers stated the following:

- It is an awesome tool.
- Useful for my small business but not useful when competing with Noel Leeming. It seems likely that the tool may be unable to produce effective outcome when competing with big retail businesses as Noel Leeming.
- The tool is helpful for various business aspects.
- The tool is very helpful.
- It can give valuable information to keep websites updated as expected by customers.

Justificatory knowledge: *Although the majority of owner/manager suggestions about improving the prototype were not very clear, one stated that it was already functional. The overall effectiveness of the prototype was captured in the language used by the small business owners/managers, including “helpful”, “excellent”, “useful”, “efficient” and “keeps website updated”. However, the tool would not be appropriate for large companies stated by one user.*

9.4.3 Captured comments from the focus groups interviews

Five owners/managers provided comments about their overall experience of using the WFE-DSS prototype. These comments are transcribed and presented in **Table 9.7.**

Table 9.7: Owner/manager comments on their overall experience of using the WFE-DSS prototype

Small business names	End-user experience
Business 1	*The tool was helpful in evaluating my website. I could easily see where my website has many shortcomings and other problems. The tool has helped me to understand what other shortcomings of my websites, so I can obviously improve them further, but again I would like to say that the tool was more business centric that would help me better considering I have a clothes retail business website. This was more like a generic sort of tool in which we could use for any sort of business or retail businesses.*
Business 2	*I am not using the tool for my own company, because I do not have company but what I have noticed that the tool very helpful for small company, which they do not have time and finance. The tool is quite simple and very easy to use. The tool is very generic but for the big company, the tool needs to add more features.*
Business 3	*The tool is very useful to find out what are the information missing on website compare to competitors. Then can determine how to improve your business even better if you want to compete with the current market position. I think it is very useful tool. It gives proper descriptions and helps owners of the business.*
Business 4	*The tool is very useful. The tool is too generic and also good for restaurant as I am working in restaurant. Therefore, it can give company information on the website. The customer feedback feature is very good for attracting more customers. The small business can compete with big businesses to update their website features. It is very good tool for small businesses.*
Business 5	*It is difficult to select the features. I do not want to use email address on my websites. Yes, tool is easy to use.*

The next section describes the analytical results and concluding concepts.

9.4.3.1 User experience results analysis

Qualitative Content Analysis is a commonly used method for analysing qualitative data (Myers, 2013). This method (Miah et al., 2014; Myers, 2013) was adopted for interpreting the interview data related to the overall user experience of using the WFE-DSS prototype. This part of the data analysis also recognised the streamlined codes-to-theory model developed by Saldaña (2015) for qualitative data reduction and analysis in systematic ways that applied in case study data analysis in Chapter 6. Therefore, user experience results are described first from Table 9.7, then carried out analysis and drew concluding concepts or justiciary knowledge.

The user experience provides a broad view across individual interactions with the system, as well as thoughts, feelings, and perceptions resulting from those interactions (Albert & Tullis, 2013). Users articulated the following:

- The WEF-DSS prototype is simple and easy to use.
- The tool is beneficial for small companies, saving time and money.
- The tool is generic and useful for other types of businesses (e.g., restaurant), but should have additional features for larger companies.
- Most importantly, the tool is very useful for determining what information is missing on small business websites compared with those of their competitors, allowing owners/managers to improve their sites.

Justificatory knowledge: *The overall user experience of the WFE-DSS prototype was positive. It was easy to use, useful for identifying missing website information and keeping websites up-to-date, saved time and money, and was worthwhile for other businesses (e.g., restaurant). However, the tool would not be appropriate for large enterprises without additional features.*

9.5 The strengths and limitations of the WFE-DSS

At the end of the overall evaluation of the WFE-DSS prototype by small business owners/managers, the advantages and limitations of the artefact were analysed using a SWOT tool. Hernández, Lyons, and Stamatopoulos (2016) used a SWOT tool for analysing a collaborative web-based DSS for SMEs precision engineering design to enhance their decision-making capabilities. The SWOT assessments for this study are summarised in **Table 9.8** and represent an impact analysis of the WFE-DSS. The purpose of this analysis was to establish the potential of the WFE-DSS and how it might be improved.

Table 9.8: Summary of a SWOT analysis of the WFE-DSS prototype

Strengths	**Opportunities**
Usability: - Ease of use. - Systematic management of website features. - Provides quick response for producing information. - User-friendly. Generic: Useful for other businesses **(**e.g., restaurant).	Usability: - Supports a small business owner/manager in the selection of website features through a comparative analysis with successful competitors in the online retail environment. - It can, to some extent, replace e-business consultant advice (most of the respondents used external consultants).
Effectiveness: - Systematic management of website features that save time. - Helps to make better decisions.	Effectiveness: - Helps assess a small business' current adoption levels of website features compared with their competitors.

- Cost-effective.	
Performance: Flexible, reliable, and consistent.	Performance: - Assists in providing real-time analysis of website contents relating to the features available on small business websites compared with those of their competitors.
Weakness/limitations	**Threats**
- Not suitable for large companies. - Need to add more features on DB in the perspective of integration. - The limitations of the WFE-DSS include: the end-user would not be able to add new features without the help of a domain expert at this stage.	- Small business owners/managers identified no threats. In this study, threats are likely that any disadvantages perceived by users using the tool.

9.6 Improvements in the WFE-DSS prototype after the evaluation

The usability evaluations by small business owners/managers suggested that the WFE-DSS prototype had the capacity to process and produce relevant information related to the selection of features on their websites. Almost all users agreed that the artefact prototype was easy to use and useful for comparative analysis of their website features against those of their competitors. Moreover, all owners/managers stated that the artefact could save them time, helping them to make quick decisions when selecting competitive website features without seeking the advice of an external consultant. The WFE-DSS was considered user-friendly and easy to understand. For a more professional look, the welcome window was improved, with the inclusion of the actual name of the artefact, as shown in **Figure 7** in **Appendix H** (the end-user manual). The previous version of the welcome window is shown in **Figure 9.1.**

9.7 Chapter summary

This chapter described the evaluation of the WFE-DSS prototype in line with HMPR DSR guideline 3, which recommended evaluating the utility, quality, and efficacy of the artefact. The focus group method was employed to assess the prototype usability with the involvement of small business owners/managers following UCD principles. Rigorous methods were used in conducting the multiple focus group sessions, including formulating objectives, framing the sample, identifying a moderator, developing questionnaires using the system usability matrices, and recruiting participants. After

conducting the focus groups, data were analysed and interpreted using the qualitative and descriptive methods, with the results reported in order to further improvement the WFE-DSS prototype.

Five small business owners/managers evaluated the WFE-DSS prototype. Every participant agreed that the artefact prototype could provide valuable information about important website features in the online retail environment. All users also agreed that the recommendations generated by the artefact were useful for their business decision-making in the B2C e-commerce environment.

Conclusions and further research directions are discussed in the next chapter.

Chapter 10: Conclusions and Further Research Directions

The aim of this chapter is to provide a concluding summary of the research and suggestions for further research directions. This chapter comprises four sections. Section 10.1 outlines the main research problem and outcomes of the study incorporated with research questions. This section also describes the implementation steps that have been taken to achieve the study objectives. Section 10.2 summarises the key findings and Section 10.3 outlines the contributions of the research. Section 10.4 describes the research strengths, limitations and suggestions for further research.

10.1 Main research problem and outcomes with implementation steps

While the e-commerce platform provides significant benefits to businesses, including small businesses, many retail sector companies in the B2C e-commerce environment in Australia have failed to attract local consumers (Irvine et al., 2011). Consequently, many Australian consumers purchase from overseas websites instead of from local retail websites (Deloitte, 2013; Frost & Sullivan, 2012; Irvine et al. 2011; Khatun, 2011; Oster & Thorn, 2012; PwC, 2012; Sensis, 2013; Sivasailam, 2012; Todd, 2012). This significant problem results in the potential loss of online retail sales to small businesses in Australia who represent 95.6 percent of all businesses (DIISRTE, 2012). The objective of this study was to investigate the issues or factors and recommend a potential solution that other Australian studies have lacked.

The DSR was adopted for designing the overall research because the primary purpose of the DSR is to design a system for the solution of a problem (Dresch et al., 2015). In order to define the small business problems, needs and a solution, this method is significant for this study because it assists in addressing the real-world application environment in which the research problem or opportunity is illustrated (Hevner et al., 2004). Three research questions (RQs) were formulated to investigate the significant issues or factors that may influence many Australian consumers to purchase from overseas websites rather than local small business retail websites, and a potential solution.

Accordingly, the RQ 1 was formulated to examine the factors or issues initially by reviewing relevant kinds of literature, which were available in the problem domain. They

specifically focused on studies that were carried out in Australia in the B2C e-commerce field. All studies in this domain in Australia were concentrated on consumers' buying factors or behaviours instead of owners'/manager's strategic decision requirements in the B2C e-commerce environment. More specifically, competitive features can be selected on business websites to make them accessible for the online customers. Before developing the DSS prototype, an extensive literature review was conducted, focussed on the discipline of B2C e-commerce, the strategic decision field, and DSS development in the small business domain. Key findings from the literature were used to develop descriptive justificatory knowledge, as part of kernel theory. This knowledge then helped in developing the theoretical framework, which was used to identify real small business problems, needs and inform the design of a DSS-based solution.

The RQ 1 also was formulated for empirical investigations to identify the real issues through web content analysis and multiple case studies with Australian small businesses in the online retail sector. The purpose was to determine the small business real problems, needs, and DSS-based solution and design requirements. An analysis of small business website features, such as contents, identified that the majority of small business websites had a significant lack of competitive features when compared with their overseas competitors. This finding can be considered significant issues exist concerning the inadequacy of competitive features on small business websites.

Multiple case studies confirmed that many small business owners lacked competence when it came to using advanced technology. Their required knowledge of internal and external business environments and associated factors was sadly lacking. Knowledge of business environments and analysis are essential components of the strategic planning process. This type of knowledge helps decision-makers to identify new opportunities and risks before making important decisions (Khan & Khalique, 2014). Although many small businesses have strategies, most are ill-suited for addressing their problems and meeting their needs, particularly when it comes to selecting competitive features for their websites in the B2C e-commerce environment. These issues were recommendations for a DSS-based solution, design requirements, and components of the DSS architecture. The RQ 2 was formulated to focus on the solution of the main research problem and real problems arising from web content analysis and case studies. In the solution concept, relevant and available studies in the literature have been reviewed in the area of the DSS research

domain to construct a conceptual DSS solution framework on a theoretical basis. This produced a KB practical solution known as the website features evaluation DSS (WFE-DSS). The RQ 3 was formulated to rigorously design and develop the DSS-based solution within the B2C e-commerce environment.

The study adopted the DSR approach for the overall research design as discussed early. Notably, HMPR guidelines in DSR were adopted, with guideline 2 recommending the development of a technology-based solution to address critical business problems, and guideline 1 suggesting the design of an artefact in the form of a construct, model, method or instantiation.

The user-friendly WFE-DSS was developed and evaluated specifically for the purpose of addressing existing small business problems and to provide solutions. The innovative WFE-DSS was designed to assist a small business owner/manager in their strategic decision-making when selecting competitive website features in the dynamic B2C e-commerce environment. The selection of features on small business websites mainly centred on accumulating knowledge sourced from the external business environment, particularly from overseas competitor websites.

This study employed evolutionary and prototype system development approaches under the UCDE method (Miah et al., 2014). The UCDE recommends evaluating an organisation and understanding its needs by analysing the organisational environment. This method also supports secondary design activities with the contribution of end-users. Therefore, case studies were conducted with small businesses, as well as web content analysis to identify business problems, needs, and DSS requirements before designing the initial WFE-DSS prototype.

A focus group with multiple sessions evaluated the initial WFE-DSS prototype using the IS evaluation matrices of usability, efficacy, and performance to help improve the system. This development process was also the secondary design activities using the prototype approach, a small-scale system development, direct contributions of end-users. In this secondary design activities, an owner/manager could select decision support parameters (e.g., website features), store them into the knowledge repository, and then compare their current and desired website features, generating expert analysis and reports.

The major components of the WFE-DSS architecture incorporated the user as a small business decision-maker, taking into account their judgement, the UI, the DB and KB. Various UIs were designed using MS Visual Studio programming language C#. This programming language enabled the design and implementation of Windows Form applications with text format, to capture small business website features. Moreover, the MS Visual Studio is a part of the Microsoft .NET framework and is available in most companies. A small database was developed using ICDT categories of website features and the data was structured as text formats with the query tool. The query tool SQL was used for the small DB development. The KB component of the WFE-DSS architecture was crucial for small business strategic decision-making, since such decisions are based on information accumulated from the external business environment.

The WFE-DSS was a small-scale KB-DSS and PDSS type, built only for a small business owner/manager to meet their strategic decision needs. A PDSS type was appropriate since it only required simple technology - a personal computer, and relatively user-friendly database software applications (Arnott, 2008).

10.2 Key findings

This section reiterates the critical findings gathered through the empirical investigations. The first part outlines the significant findings related to the small business problem domain. These findings were crucial for the DSS design requirements, because the main motivation of this study was to develop a DSS-based solution to address the small business problems and meet their needs. The DSS can assist small business owners/managers in strategically selecting competitive features on their website in the B2C e-commerce environment. Ultimately, a small business can assess its website issues related to current and desired states of website features against its successful competitors and can adopt changes.

The second part of this section describes the essential findings from the initial WFE-DSS prototype evaluation, including suggestions for further improvement of the artefact prototype. These findings were produced to answer the three RQs to investigate the small business problems and provide a DSS-based solution. The key findings and their importance for this study are outlined in the following sections in answer to the RQs.

10.2.1 Key findings from the empirical investigations

Findings from an analysis of small business website features revealed that significant issues exist in terms of the inadequacy of features on the majority of small business websites when compared with their overseas competitors.

The multiple case studies revealed that the majority of owners/managers lacked competencies in using advanced technology. They also developed strategies that were inappropriate for addressing their problems and meeting their needs, particularly in the selection of competitive features on their websites in the dynamic B2C e-commerce environment. The majority of the owners/managers also lacked understanding about and knowledge of internal and external business environments. Moreover, most of them knew little about the features available on their websites and on those of their overseas competitors. This type of knowledge is critical for making strategic decisions in a competitive environment, particularly in making their websites interactive and visible to their users. Thus, knowledge is vital for improving business performance. Finally, most small business owners/managers are time poor due to their focus on everyday business operations.

The findings described above relating to small business issues and needs were produced to answer the RQ 1, which was formulated to identify the small business real problems and needs in the dynamic B2C e-commerce environment. A series of justificatory knowledge or theories were constructed based on these investigations, which established the small business issues, needs, and DSS design requirements, including functional features and components of the DSS architecture. From these, an innovative decision-support solution (WFE-DSS) was built. The RQ 2 was formulated to produce a solution. The solution was the innovative WFE-DSS that has design features with information-processing and knowledge-generating functions, including various UIs with functional features. The DSS can assist a small business owner/manager in assessing its current and desired states of website features against its successful competitors. Therefore, a small business can adopt the changes and select competitive features on its B2C websites.

10.2.2 Key findings from the initial WFE-DSS prototype evaluation

This section reiterates the critical findings from the WFE-DSS prototype evaluation through focus group with multiple sessions. The evaluation results were delivered with a

series of justificatory knowledge crafted from the end-user generated data to comply with kernel theory. Kernel theory is justificatory knowledge, which is the underlying knowledge or theory from the natural, social or design sciences that informs design (Hevner & Chatterjee, 2010). These concepts help to confirm the most critical points to assist in further development. The RQ 3 was formulated to produce a DSS-based solution using rigorous methods. The next sections reiterate the significant evaluation findings with direct contributions of small baseness owners/managers as DSS users from the various questionnaires and interviews using the focus group method with multiple sessions.

10.2.2.1 Key findings from the Likert scale questionnaire

Three type of questionnaires were designed to collect DSS prototype evaluation data from users (small business owners/managers). One type was created using the Likert scale. Likert scales allow respondents to indicate how strongly they agree or disagree with a statement or series of statements about entities or things (Saunders et al., 2009). Likert scale questionnaire was given to end-users to capture their opinions about the usability, efficacy, and performance of the WFE-DSS prototype. The detailed Likert scale results are presented in **Appendix G2.** However, the critical findings can be summarised as follows:

- **WFE-DSS prototype usability:** Usability means the ease of use when interacting with a system (Albert & Tullis, 2013). The majority of the small business owner/manager (end-users) agreed that the WFE-DSS prototype was easy to use, systematic, user-friendly, useful for the selection of competitive features on their websites and provided quick responses.
- **WFE-DSS prototype efficacy:** Efficacy is achieved when a system produces the desired effect in relation to its intended goal (Venable et al., 2012). The majority of owners/managers agreed that the prototype was useful for dealing with their website features. The prototype could evaluate their current level of website feature adoption when compared to those of their competitors and saved the owners/managers time when updating website features. The majority said they would prefer to work with the artefact rather than use other methods.
- **WFE-DSS prototype performance:** Four performance evaluation matrices were considered: duration, counting, the proportion of task completed, and the quality

of output (Preece et al., 1994). Users were given approximately 30 minutes to perform tasks using the prototype, and another 30 minutes to give their opinions through questionnaires and interviews. The majority of users agreed that the WFE-DSS prototype was flexible, reliable, and consistent, providing real-time analysis of website features in the online retail environment.

- **Average ratings using the Likert scales:** Out of a possible score of 5, the average score rating by a group of end-users on WFE-DSS prototype usability was 3.98, on efficacy it was 4.3 and performance 4.2. The majority of owners/managers scored most assessments with 'Agree' and/or 'Strongly agree', but a few scored 'Neither agree nor disagree'.

These evaluation results indicated that the prototype has the potential to help small businesses to achieve their strategic business needs.

10.2.2.2 Key findings from the semi-structured questions

Almost all owners/managers agreed that the WFE-DSS prototype have capabilities for the systematic management of website features, to some extent replacing the need to seek advice from e-business consultants. They also agreed that it provided the quick processing of information on the selection of website features in the online retail environment.

10.2.2.3 Key findings from the unstructured questions

The qualitative and descriptive analysis methods were used for dealing with the unstructured qualitative data generated by end-users after using the prototype. Key findings about the artefact effectiveness included:

- The tool assists better decision-making in the management of website features.
- It provides immediate supports for handling customer complaints.
- It supports more rapid decision-making in a cost-effective way.

User comments about the overall effectiveness of the prototype were positive and included words such as helpful, excellent, useful and efficient.

10.2.2.4 Key findings from interviews about the user experience

The user experience relates to the user's interaction with a system, including their thoughts, feelings, and perceptions resulting from those interactions (Albert & Tullis, 2013). Again, the overall user experience of the prototype was positive, highlighting its

ease of use, usefulness in identifying missing information on websites when compared with competitor websites, ability to keeping websites updated and to save time and money, and its flexibility to use with other businesses (e.g., restaurants). However, the tool would not be appropriate for large companies unless additional features are included.

10.3 Research contributions

This study followed the HMPR guidelines in DSR, with guideline 4 recommending verifiable contributions in the area of design artefact, design foundations, and/or design methodologies. This section reiterates the research contributions from theoretical, methodological and practical perspectives.

10.3.1 Theoretical research contributions

When a study predominantly aims at using DSR in the information systems discipline, the development of theory or knowledge is the contribution of the DSR (Gregor & Hevner, 2013), such as how knowledge is acquired and tested (Hevner et al., 2004). Justificatory knowledge (kernel theory) can be seen broadly as any knowledge that informs design research, that is, knowledge building activities, including informal knowledge from the field and the experience of practitioners (Gregor & Jones, 2007). The present study adopted the DSR to identify the small business problems, needs and DSS-based solution in the B2C e-commerce environment. One of the significant academic contributions of this study was built kernel theory or justificatory knowledge to address the research problems and objectives. These pieces of knowledge also formed the design research into various stages, which involved knowledge building activities through web content analysis, case studies, and DSS prototype evaluation by users to achieve the research objectives. Justificatory knowledge is one of the components of design theories. It provides the justificatory and explanatory knowledge that links objectives, nature, procedures, and resources (Gregor & Jones, 2007).

DSS theories comprise propositions, principles, and system classifications that explain empirical phenomena. An acknowledged theory of DSS may help to build an improved DSS (Power, 2005). The important theoretical contribution of this study was to create a KB-DSS instantiation using rule-based systems. Rules were stored in a database as a set of known facts or data concerning the problem being solved. The rules for the WFE-DSS artefact was built by populating the KB (SQL-DB) with suitable rules, which were hand-

crafted using approximately 41 website features. An example of a rule in pseudocode for the algorithm involved in the method, which is principle for designing the instantiation, is shown in **Figure 8.5** in Chapter 8.

The academic contributions of this study are the development of descriptive theories to address the research questions and achieve the research objectives. These types of new descriptive theories are called justificatory knowledge or kernel theories, which informed the construction of a new artefact (Gregor & Hevner, 2013).

Theoretical concepts or justificatory knowledge were initially constructed through an extensive review of the relevant literature for the identification of small business problems, as documented in Chapter 2. This initial series of justificatory knowledge informed the design of a DSS-based solution. The conceptual DSS framework was designed to analyse small business internal issues, needs, and the requirements of the WFE-DSS design. The conceptual DSS created a theoretical focus for the managerial strategic decision-making process.

In addition, a series of justificatory knowledge was built from the web content analysis and multiple case studies, further helping to identify small business issues, needs, and WFE-DSS requirements. These activities are documented in Chapter 5 and Chapter 6. Further, a series of justificatory knowledge was constructed from the evaluation of the initial WFE-DSS prototype, to identify usability, efficacy, performance and the end-users' overall experience of the WFE-DSS prototype. These activities are documented in Chapter 9. Therefore, these justificatory pieces of knowledge informed the improvement of the initial prototype to produce final version.

These pieces of justificatory knowledge also show that the WFE-DSS is easy to use, useful for identifying missing website information and ensuring websites incorporate the latest developments and trends, save time and money, and are worthwhile for other businesses (e.g., restaurants). Conclusively, the WFE-DSS could provide a cost-effective and systematic way of maintaining features on small business websites in the B2C e-commerce environment. However, the tool may not be appropriate for large enterprises without additional features.

10.3.2 Methodological research contributions

This study followed the HMPR guidelines in DSR for the overall research design. For small business problem identification, needs and the WFE-DSS design requirements, web content analysis and multiple case studies were conducted in line with HMPR guideline 5. This guideline suggested using rigorous methods both in the construction and the evaluation of the artefact. Thus, this study developed a conceptual DSS framework on a theoretical basis. The results from the case studies and web content analysis were further analysed using the MRT model in the conceptual DSS framework, which is documented in Chapter 7.

This study also used evolutionary and prototyping approaches under the UCD principles for developing the WFE-DSS. A wide variety of methods were reviewed for small business DSS design, development, and evaluation. However, evolutionary and prototyping approaches were considered the most appropriate. These arguments are presented in Chapter 7. The main advantage of the evolutionary system development approach is that it quickly produces prototype systems that are fully functional (Kroenke et al., 2014). A small-scale, KB PDSS type was built with end-user involvement using the prototype approach. The prototype was an appropriate method as PDSS is a small-scale system developed for one manager, or a limited number of independent executives, to support one decision task (Arnott & Pervan, 2005, 2008).

Before designing the initial DSS prototype, this study chose the evolutionary approach through comparative content analysis of small business website features against their overseas competitors. This study also examined cognatic causal factors by employing multiple case studies to determine the level of awareness and knowledge about the business environment among small business owners/managers. It also sought to determine how they made strategic decision in the selection of competitive features on their websites in the B2C e-commerce environment.

The WFE-DSS prototype was evaluated by multiple focus group sessions with owners/managers providing direct inputs. Evaluations were conducted to identify the usability, efficacy, performance and overall user experience of the prototype. Rigorous DSR methods were used in conducting the multiple focus groups sessions, including formulating objectives, framing samples, identifying a moderator and developing

questionnaires using the WFE-DSS usability matrices. Finally, data were interpreted and documented in reports to be used for the further improvement of the WFE-DSS prototype.

10.3.3 Practical research contributions

The practical contribution of this study is a new DSS (WFE-DSS) artefact as an instantiation. The artefact is user-friendly, useful and effective for a small business decision-maker to update their website features within the dynamic online retail environment. The functional model of the WFE-DSS demonstrates the various interfaces through which a small business decision-maker can derive information from the external business environment and process this information into knowledge. That knowledge can then be used strategically to help small businesses remain competitive. The WFE-DSS offers substantial contributions, with following capabilities:

- **User-friendly:** The WFE-DSS is a user-friendly small-scale system, appropriately designed for an owner/manager of a small business. The artefact is easy to use, even for non-technical users, and assists in decision-making tasks.
- **Platform:** The artefact is a PDSS type, designed for one manager and built on a Windows-based platform for use on a personal computer. In the current business environment, many small business owners/managers are familiar with the Windows platform.
- **User interface:** Most importantly, the artefact was designed as a text-only UI for the Windows platform, which is easy for the user to understand.
- **Produces expert recommendations:** The WFE-DSS can produce comparative analyses of small business website features with one or more overseas/local competitor and generate a report recommending which features would be useful for its website. The artefact can produce a recommendation, containing a list of website features. Therefore, a small business decision-maker can adopt and/or adapt the recommended list features to suit its business website needs. The recommendations generated, along with metadata that describes the utility of supported features, reinforce small business decisions to select competitive features on their websites. This will help them achieve a competitive advantage within the dynamic online retail environment. However, the decision to implement those recommendations still lies with the business owner/manager.

Most importantly, the WFE-DSS will assist a small business in evaluating its website features by comparing its own website with that of its successful competitor(s), with less time and cost than other methods. Many small companies have limited resources, including skills and finance, and less sophisticated management structures. But by using the WFE-DSS, a small business may not need to hire a consultant or designer to maintain their website features.

10.4 Research strengths, limitations and further research directions

Important research strengths, such as major contributions to knowledge, limitations and further research topics and directions, are described in this section. Some research strengths have already been highlighted in this chapter in the discussion on contributions from theoretical, methodological and practical perspectives. The study contributions are also highly significant because three RQs were formulated to identify and define the small business problems in rapidly changing online retail or B2C e-commerce environment. The purpose was to develop a DSS-based solution to the problem. The RQ1 was formulated to investigate and define the small business problems and needs through early and empirical studies (case studies and web content analysis with Australian small businesses in retail sector). The RQ 2 was formulated to focus on the solution of the main research problem and problems identified through small business studies. The RQ 3 was formulated for to rigorously design and develop the DSS-based solution within the B2C e-commerce environment.

Therefore, the contributions made throughout this study were diverse, creating the bridge between theoretical and practical knowledge. The other major contributions to knowledge or one of the important strengths of this research, are the use of DSR that applied to small business DSS development using design theories or IS design theories, which have had limited focus in small business studies in the DSS domain. Design theories can be about designing artefacts, such as products (e.g., database) or methods, for example, the prototyping method (Gregor & Jones, 2007).

The small business DSS (WFE-DSS) has four components. One of the essential components is a small-scale database. The DSS was designed and developed using the prototyping method, a small-scale system development approach in the IS research domain. Moreover, DSR itself represents a significant approach to problem

identifications and technology-based solutions for small businesses with the analysis of the internal and external environments of an organisation.

This study developed a KB-PDSS type solution for a small business owner/manager for their strategic decision needs in the dynamic B2C e-commerce environment. The WFE-DSS was developed using appropriate methods from the design to the evaluation of the DSS prototype with the direct participations of small business owners/managers as end users by adopting the evolutionary prototyping approach under the UCD principles. The evolutionary approach allows for the creation of iterations while working with users who also evaluate the design solution before finalising it (Seffah et al., 2005). Ultimately, a series of justificatory knowledge or kernel theories have been constructed that describe the small business problems, needs and DSS design requirements and further improvements of the DSS prototype. The research adds value to the research and practice-based communities, as it is focused on design, innovation, and business environment, including the dynamic B2C e-commerce environment with associated factors.

This DSS was considered suitable for small businesses because of their inadequate expertise in website technologies and knowledge about the business environment and associated factors (e.g., competitors). This innovative DSS has the design features, including its information-processing functions and features of its various UIs. Small business owners/managers were assessing their current state of website features with their successful competitor (s) using the DSS prototype quicker than with other methods. This evaluation method of prototype assists them to identify their website issues, and they can address these issues to make their websites accessible and user-friendly to their customers, and to remain competitive in the B2C e-commerce environment

However, the research had several limitations and challenges. Further research directions were then considered for improving the development of theories and methods and proposed future research topic and directions in practical context. These are discussed in the following sections.

10.4.1 The improvement of theory development

The first steps in the process of developing more inclusive forms of knowledge or design theories involved building the artefact and describing it in terms of design principles and rules. This study proposed a set of design artefacts as an initial step in the development

of a process theory. For further research development in the theoretical context, the theory can be constructed with a focus on the analysis of the business environment with the sociotechnical aspect, such as human behaviour related to use of technology. For example, a retail manager can evaluate its websites not only comparing with competitors, but their website performance (accessibility) can be assessed by online consumers. Therefore, the current KB DSS can be integrated into meta artefact design.

The system could be designed based on that analysis to meet the decision-maker's practical needs in the business environment and environmental factors can be consumers and their technology use. This can help to create a bridge between theory and practice efficiently in the dynamic online retail business environment.

10.4.2 The improvement of the method

This study encountered some impediments during data collection because most small business owners/managers were busy, had little time and were not interested in participating in a research and development project. Therefore, data were collected through emails using online questionnaire instead of face-to-face interviews. However, it was often difficult to obtain the necessary information from participants using un-structured online questions because many small business owners/managers were unable to express themselves in writing. The response rate was low and often responses were not relevant to the question asked.

This could be improved by using multiple approaches to data collection, such as face-to-face interviews, using online questionnaire and survey methods or more flexible approaches as required and to suit participants. Each method may have its own advantages in assessing user needs and DSS design requirements.

One of the challenges of this study was to transform participant responses into visual formats, as users perceived the meaning of each question differently and expressed their own specific needs. Therefore, a structured question approach might help in this regard in future.

Moreover, while this study has sought to fill a research gap, DSR has not been fully developed in the small business domain, particularly from a strategic decision-making perspective. However, some researchers have acknowledged that a DSS could be useful

for small businesses (Burgess & Schauder, 2003; Duan & Xu, 2005; Magee, 2007; Power, 2010).

This study did not act upon the results of the evaluation to further refine the UCDE method, but a number of design considerations emerged from the evaluations and there is an opportunity here for future research. Such research should build on the iterative design process to observe the impact of *build-evaluate* cycles on the usability of the WFE-DSS using the UCDE approach. This process must be focused on non-technological concepts, such as business concepts and designing new business processes, where users are vital in the artefact design process. In addition, future research should explore feedback cycles across several iterations for artefact evaluation. In the present study, the scope of the DSR research was principally to evaluate the short-term outcomes through the focus group sessions. However, more in-depth analysis of evaluation findings and further evaluation rounds may show the transitional and long-term impacts of the WFE-DSS that will have flexible implications for research and practice.

10.4.3 Future research topics

Further research should be considered the design of a small business DSS for mobile-friendly applications. Alternatively, the current version could be improved by changing the DSS features to suit large companies, not just small business. The WFE-DSS is limited to recommending only 41 website features, using ICDT categories. Moreover, it can only compare a total of fifty websites, whether domestic or overseas. Therefore, a future WFE-DSS might have more flexible architecture, with user-friendly components to accommodate additional requirements based on individual needs. At this stage, the end-user would not be able to add new features without the help of a domain expert, which is one of the limitations of the current WFE-DSS.

In view of this, a meta-design approach should be considered, as not all problems can be anticipated at the design stage (Fischer, 2012) due to dynamic competition and the influence of multiple channels on customer buying. Channels include the business' own website and blog, Facebook, Instagram, Twitter, Snapchat, YouTube and review sites. In a meta-design approach, designers would keep platforms open, rather than designing complete solutions, so users can modify the system based on their future needs and new problems that arise. The small business DSS needs to improve by providing a KB integrated solution within the rapidly changing B2C e-commerce environment. End-users

should be provided options to add more features without the assistance of a domain expert.

10.4.4 Future research directions

Since kernel theories advise design solutions (Nunamaker, et al., 1991; Simon, 1996; Walls, et al., 2004) and offer the possibility of enhancement or development (Nunamaker, et al., 1991; Simon, 1996), a small business DSS can be improved by providing a KB integrated solution, particularly in a rapidly changing online retail or B2C e-commerce environment. This study also adopted DSR where almost all DSR in IS projects use kernel theories inevitably to refine and extend those theories (Kuechler & Vaishnavi, 2008).

In this study, a series of justificatory knowledge or kernel theories in DSR were generated based on the reviewing of related literature and empirical studies. These series of kernel theories conceptualised the small business problems and needs, and suggested the technology-based solution. Similarly, kernel theory can be formulated and tested by adopting the DSR methodology for the identification of problems and opportunities of carrying out research in other business contexts. This is because DSR is fundamentally involved in problem-solving activities through the creation of new IS artefacts (Hevner & Chatterjee, 2010; Hevner et al., 2004; March & Smith, 1995). Artefacts can be a construct, model, method, and instantiation. A construct-type artefact constitutes concepts used to describe problems within the domain and specify their solutions (March & Smith, 1995). Therefore, a construct-type artefact can be kernel theory that can craft concepts regarding other business problems of conducting research. A method-type of artefact can also be kernel theory that can constitute a set of steps used to perform a research-related methodological task innovatively.

Most importantly, research in the IS domain examines more than the technological system. Therefore, the theory or conceptual knowledge, also known as kernel theory, can be produced to show the structural components of a system (DSS) that are needed to communicate a design theory (Gregor & Jones, 2007). In this study, the small DSS architecture comprised four components, comprising a user and its judgements (analytical knowledge about the business environment), user interface, database, and knowledge base. The future DSS design needs to include one more significant component, such as "the business environment with associated factors" that is significant and needs to

consider the exploration of new possibilities and identify risk before making a strategic decision.

Environmental knowledge and analysis are essential parts of the strategy formulation. This type of knowledge helps decision-makers to explore new opportunities and identify risks before making significant decisions (Khan & Khalique, 2014). Therefore, the future DSS architecture should be comprised of five components, namely, a user and its judgements, user interface, database, knowledge base, and the business environment with associated factors. In the DSS structural or functional architectural context, both the descriptive and prescriptive knowledge or theories (kernel theories) can be constructed to complete the user-tasks (Gregor & Jones, 2007), because abstraction and generalisation about phenomena, interactions, and causations are acknowledged as the core of every theory (Gregor, 2006). Users can be, in this context, domain experts, and organisational managers or decision-makers. Therefore, descriptive design theories need to be classified as a general statement of the problem being addressed. Design theories also can give prescriptions (a type of knowledge) for the architecture of specific applications (Gregor & Jones, 2007), such as a DSS-based solution in the particular context of decision-making within the business environment.

Ultimately, prescription-driven research knowledge can provide solutions for managerial problems. In addition, description-driven research knowledge enables researchers to understand the nature of the problems. The description-driven research knowledge leaves incomplete task options for developing integrated systems (Gregor & Jones, 2007). However, Gregor (2006) recommended that a prescriptive theory can also integrate explanatory and predictive theory as well as descriptive statements for artefact construction.

Prescriptive, descriptive, explanatory and predictive types of knowledge (kernel theories) can produce significant contributions in designing the integrated DSS-based solution innovatively. These types of theories can be constructed to design artefacts as well as testing or evaluating for large businesses, including SMEs, for a particular research domain in the rapidly changing e-commerce environment of Web-based business technologies and their disruptive innovation.

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Appendices

Appendix A: Email interview questionnaire for multiple case studies

Introduction

Many Australian consumers buy products from overseas websites, resulting in loss of potential domestic sales for the Australian small businesses in the business to consumer (B2C) sector. The purposes of this research are to determine the significant factors that influence consumers to purchase products from overseas websites and provide a possible solution in this regard.

For a possible solution, this study will develop a decision support system (DSS) tool based on collected data from businesses. This DSS tool can assist owners/managers in making the strategic decision to select competitive features on their websites in the online environment, both to attract and interact with potential consumers.

Instructions

Please read the following questions and provide information about your business relevant to this research. Please note that some questions request extra information. Background information will guide you to answers the interview questionnaire.

PART I: Company profile

1. **Company profile**:

   Company name: ……....

   Your address: ……

   Mission statement: ……

   Company website: ……

   Company status and geographic coverage: ……

   Number of employees: ……

PART II: Demographic questions (owner/manager profiles)

2. What is your role within your business organisation? Please select one/both.
   - Owner

- Manager

3. What is your Gender? Please select one.
   - Male
   - Female
4. What is your highest level of education? Please select one.
   - Primary School
   - Secondary school
   - Higher Secondary School
   - Certificate/ Diploma
   - Bachelor's degree
   - Master's degree
   - Others……
5. ICT skills

   Note: Information & Communication Technology (ICT) skills are basic knowledge of computers; proficiency in using software; electronic communication; Internet skills; moving files and security settings for protecting your documents and networks. Do you have any ICT skills? Please provide details if you have.

   .....

   .....
6. Approximately how long has your business been in operation? .....Months/Years.

PART III: Business model and the concept of online shopping problems in Australia.

7. A business model is a set of planned activities designed to make profits.

   For example:
   - Content providers that sell information, digital products and services via websites.
   - Companies sell goods direct to consumers via websites.

   Please describe your business model.

   ……

   ……
8. Many Australian consumers buy products from overseas websites due to many factors, resulting in declining potential domestic sales in the small business B2C e-

commerce sector in Australia. Do you know this problem? Please tell us about your experiences in this regard.

……

……

PART IV: The questions in this section have been designed by employing a SWOT tool to strategic business decision-making. One of the significant components of the strategic management process is analysing the organisation's external and internal business environment.

Note: SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis involves describing and analysing firms' internal capabilities, such as their strengths and weaknesses relative to external opportunities and threats.

9. Do you have any understanding and knowledge about the external and internal business environment and related factors? Please provide details if you have any.

……

……

Note: Business internal strengths (S) examples:

- Existing brands with huge ranges;
- Reaching from national to international markets over the website;
- Selling products directly to consumers via websites;
- Powerful marketing tools by using ICT (Internet, email, social media etc.);
- Having human resources with ICT skills;
- Keeping the cost below competitors by using ICT.

10a. What are your internal strengths? Please provide details.

.....

.....

10b. What are your strategies to leverage strengths to maximise opportunities? Please provide details.

.....

.....

Note: Internal weaknesses (W) examples:

- The lack of strategic planning when using appropriate systems and technology in strategic business decision-making in the online retail environment;
- Lack of skills or expertise necessary to deal with the web presence and setting up websites;
- Lack of knowledge about where to source relevant skills when recognising a shortfall of expertise;
- Poor planning when using advance technology such as the Internet;
- Lack of operating costs for such things as space and technology, including ready-to-use decision support system (DSS) software.

11a. What are your weaknesses (Internal)? Please provide your own experiences.

.....

.....

11b. What are your strategies to counter weaknesses through exploiting opportunities? Please provide your strategies.

.....

.....

Note: External opportunities (O) examples:

- Selling products via websites to distance geographical location;
- Connecting more customers through websites;
- Reaching new markets at any time via websites;
- Keeping costs low for exchanging information, conducting transactions and distributing goods and services via websites;
- Could compete with large businesses with the option of using advanced technology.

12a. What are your external opportunities? Please provide your pieces of knowledge.

.....

.....

12b. What are your strategies to use external opportunities? Please provide your strategy.

……

……

Note: External threats (T) examples:

- Consumers have different choices in the online environment;

- Overseas competitors are using sophisticated websites with relevant features to reach consumers (e.g., electronic catalogues, payment and distribution of products and services);
- New substitute products increase due to the benefits of e-commerce websites with relevant features;
- Easy product and price comparisons due to sophisticated technology (e.g., Internet);
- Government policy.

13a. What are your external threats? Please discuss your own experiences.

.....

.....

13b. If you find any threats, what would be your strategy for minimising them?

.....

.....

Note: Many overseas online retailers (your competitors) sell products to Australia.

14a. Who are your overseas competitors who sell products to Australia? Please list their names if you know them.

……

……

14b. Please provide lists of substitute products and services offered by your overseas competitors who sell products to Australia.

.....

.....

14c. To what extent are your overseas competitors using relevant features on their websites? For example, are they using features on their B2C webpage related to information, communication, transactions and product distribution provision? Please provide your experiences of competitor website features if you are aware of them.

.....

.....

15. Do you have a strategy to maintain your website features relevant to information, communication, transactions and product distribution provision?

.....

.....

16. To what extent have you adopted features on your website about "*information*" to reach your potential customers?

.....

.....

17. To what extent have you adopted features on your website about "*communication*" to reach your potential customers?

.....

.....

18. To what extent have you adopted features on your website about "*transactions*" to reach your potential customers?

.....

.....

19. To what extent have you adopted features on your website about "*distribution*" products to reach your potential customers?

.....

.....

20. As a small business owner/manager, how do you make decisions about relevant website features that should be available on your websites to reach your potential buyers/customers?

……

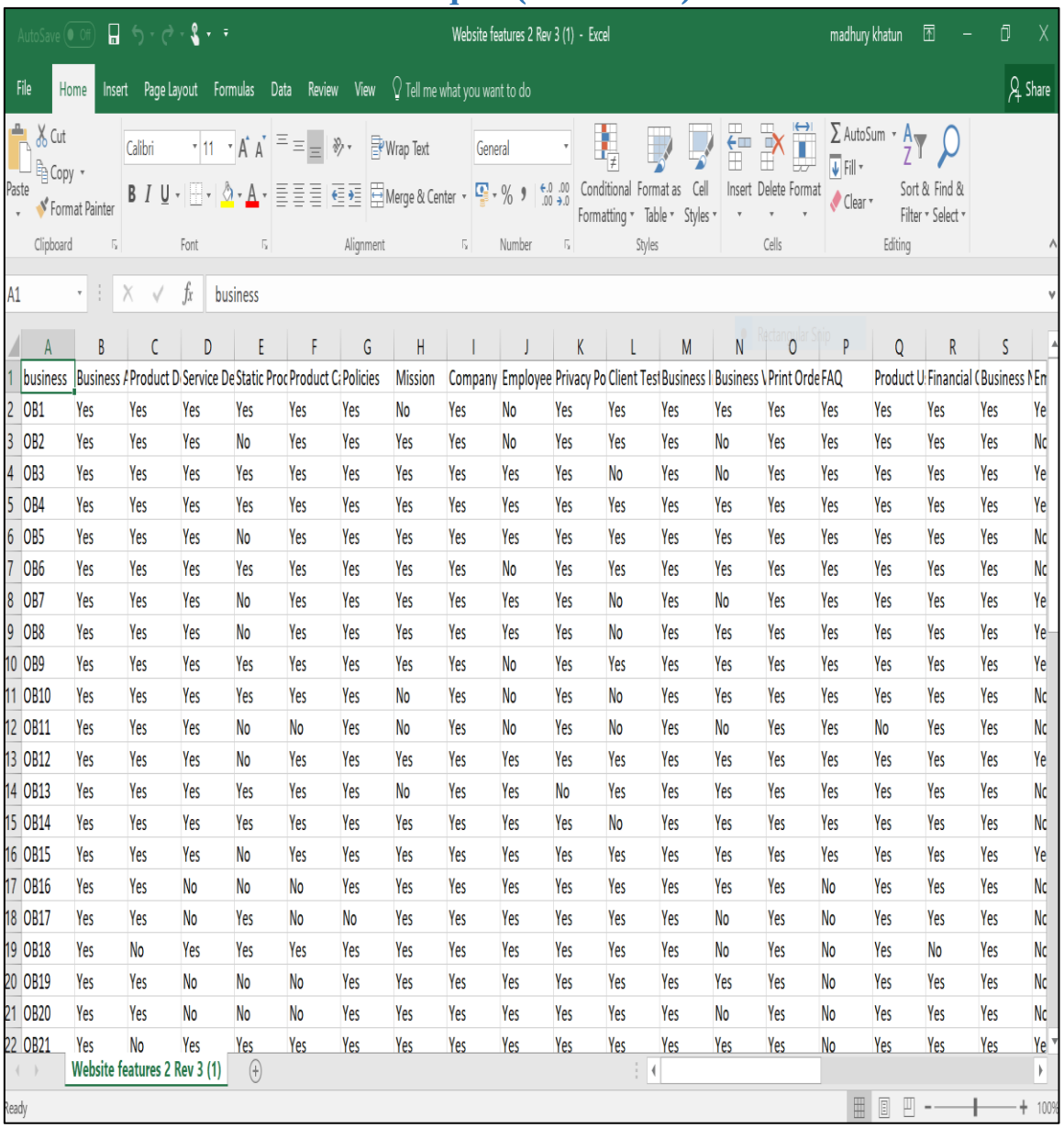
……

Thank you for your time and contribution to my PhD research project. It is much appreciated.

Appendix B: ICDT categories of website features

ICDT categories of website features for small businesses in the B2C e-commerce environment	
Information (I) based main categories of website features	**Information-based subcategories of website features**
Contact details	Business name, email address, location with map, telephone and fax numbers
Business information	Product/service descriptions, static product reviews, product catalogue, policies/mission, company and employee background, privacy policy, customer testimonials, business images/videos, print order form
Added value	FAQ, product use instructions, financial calculator
Communication (C) based main categories of website features	**Communication-based sub-categories of website features**
Contact the business	Email form, email order form, customer enquiry form, and sign up for newsletter form
Customer reviews	Customer posting reviews direct to website
Social networking	Facebook, MySpace, Bebo, Bulletin board, blogs, etc.
Distribution (D) based main categories of website features	**Distribution-based sub-categories of website features**
Web-based distributions	Online download of digital goods or contents, software
E-services	Online digital product delivery information, online physical product tracking information
Transaction (T) based main categories of website features	**Transaction-based sub-categories of website features**
Online database	Real-time catalogue, online ordering, automatically record customer preferences
Payment	Real-time credit card payment, Internet banking, online voucher redemption, PayPal

Appendix C: A model of traditional data coding and collection techniques (screenshot)



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	business	Business A	Product D	Service De	Static Proc	Product C	Policies	Mission	Company	Employee	Privacy Po	Client Test	Business I	Business \	Print Orde	FAQ	Product U	Financial C	Business M
2	OB1	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	OB2	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
4	OB3	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes
5	OB4	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	OB5	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7	OB6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8	OB7	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes
9	OB8	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10	OB9	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11	OB10	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12	OB11	Yes	Yes	Yes	No	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes
13	OB12	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
14	OB13	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
15	OB14	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
16	OB15	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
17	OB16	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
18	OB17	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes
19	OB18	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes
20	OB19	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
21	OB20	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes
22	OB21	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes

Note: OB1, OB2, ……., = Overseas competitors; B1, B2, …., = Small businesses

Appendix D: Website features - descriptions and usefulness

Website features	Descriptions and usefulness
Business activities	Business activities describe related features on websites, including products/service descriptions, policies and mission statements, company and employee backgrounds, privacy policy and so forth (Burgess, 2016).
Static product reviews	This is when products are advertised in a static catalogue that is not linked to a product database. Therefore, the business needs to update its product database and websites separately when product details change (Association of IRM, 2013).
Product catalogue	This is a method of presenting a catalogue to a user, through which a user may obtain product information and order a product online (Mihalcheon, 2003).
Policies	Policies are fundamental principles and associated guidelines formulated and enforced by the governing body of an organisation to provide direction and limitation with its actions in pursuit of long-term goals (Business Dictionary, 2016).
Mission statements	This is a document or statement that describes the company for its stakeholders and briefly states the company's overall purpose, products, services and values (Rosenblatt, 2014).
Privacy Policy	When organisations collect data via their websites, it is an expected part of an enterprise agreement to include a privacy policy. This is a statement or legal document (in privacy law) that discloses some or all of the ways parties gather, use, disclose, and manage a customer or client's data (Burgess et al., 2009). This policy should be easily identifiable and accessible from the organisation's homepage. Consumers tend to value their privacy and divulge minimal personal information in the online environment. The privacy policy is usually positioned in a prominent part of the website and it is imperative that the policy informs current and potential customers of the manner in which the company will protect the information that the customers share with the company (Burgess, 2009).
Client testimonials	This is a written recommendation from a satisfied customer affirming the performance, quality, and value of a product or service.
Print order form	Some conservative small businesses provide forms online that can be printed by customers. Customers can use this form to order products and services, as well as add their credit card details. These forms can be faxed to the business. Firms that are still concerned about online security or do not want to set up online credit card payment systems may wish to do this (Burgess et al., 2009).
Added Value	Added value comes from features that provide additional information to assist users (Hashim, Murphy & Law, 2007) including FAQs, product user instructions, financial calculators and so forth (Burgess, 2016).
FAQs	FAQs are listed as questions and answers relating to a particular subject, especially one giving necessary information for users of a website (Stevenson, 2010).
Product use instructions	Features allow companies to provide product use instructions for users or consumers.
Financial calculator	The financial calculator is one of the value-added features on the website that allows website users to convert currency.
Contact the business	This feature allows companies to contact their potential customers (and vice versa) through email forms, email order forms, customer enquiry forms, and sign-up newsletter forms (Burgess, 2016).
Email form	A website produces a series of electronic forms that are related to completing different customer service tasks (Wolff & Brunner, 1998).
Email order form	As more business is transacted on the Web, an email form can be used to order items (Light & Garney, 2001).

Customer enquiry form	Online forms are becoming more prolific as more companies are doing their business via websites. One such form is the customer enquiry form, used to request further information (Light & Garney, 2001).
Sign up for newsletter form	E-mail advertising presents a valuable opportunity for many small businesses to promote their company and web presence. Unsolicited e-mail is often referred to as spam. Of more use is a well-designed subscription e-mail newsletter. By providing visitors with helpful and pertinent content, a business can create a long-lasting relationship with customers by using sign-up newsletter forms (Burgess, 2009).
Customer posting reviews direct to websites	This is one of the website features that allows online customers to review products and services on business websites. Online customer review systems are one of the most influential channels to generate online word-of-mouth. Online user reviews can influence product sales through either awareness effects or persuasive effects. Awareness effects indicate that reviews convey the reality of the product and thereby put it in the choice set of consumers. Persuasive effects, in contrast, are to shape consumers' attitudes and evaluation towards the product and ultimately influence their purchase decision (Duan, Gu & Whinston, 2008).
Social networking	Social networking sites such as Facebook, MySpace, and Bebo operate by building communities of people. These online communities share interests and activities. They offer various ways for users to interact through e-mail and file sharing, including discussions. They are a potentially rich source of promotion through an online social space and word-of-mouth, particularly as more and more Internet users sign up to social networking sites (Burgess, 2009).
Bulletin board	This is a website noticeboard where users can post comments about a particular issue or topic and reply to other user postings.
Blog	A blog is usually a website where a particular person or business can store and share thoughts, comments, product descriptions and so forth through text and images on virtually any topic (Burgess, 2009; Gonçalves Curty & Zhang, 2013). Readers of the blog may also leave comments. Blogs have increased in popularity in recent years because they are an efficient way of expressing personal and business viewpoints. Blogs are influential and have allowed smaller companies to compete against larger competitors (Burgess et al., 2009). A blog can provide valuable information for a system analyst (Rosenblatt, 2014).
Online database	A database is a collection of tables, relationships and metadata (e.g., describes the data) (Rosenblatt, 2014). Therefore, an online database provides a real-time catalogue, online ordering, and records customer preferences automatically (Burgess, 2016).
Real-time catalogue	Many companies sell their products or services to consumers through online catalogues utilising shopping cart software (WTO, 2013). The shopping cart software generates webpages, or online real-time catalogues shows lists of items that shoppers can select for purchase (Himmel et al., 2002; Saarinen et al., 2012). The real-time catalogue also integrates with promotions, payments, shipping and customer account information (O'Brien & Marakas 2009; Marakas & O'Brien, 2014).
Online ordering	This occurs when a company takes and completes customer orders, providing track order status online and a secure payment method. This supports more effective user engagement (Huang & Benyoucef, 2013).
Automatically record customer preferences	This website feature records a customer's history of past searches and viewed items (Gonçalves Curty & Zhang, 2013). Therefore, web personalisation actively involves creating user profiles, such as customer files and personal webpages, by using website tools that help businesses develop a relationship with discrete customers (O'Brien & Marakas, 2009; Marakas & O'Brien, 2014).

Payment	This feature provides information about payment (Stair & Reynolds, 2010), including real-time credit card payment, Internet banking, online voucher redemption, PayPal and so forth (Burgess, 2016).
Distribution	Distribution refers to the total time spent in shipping and handling, including reliable and timely product delivery to achieve consumer satisfaction. Online shopping websites also provide parcel tracking mechanisms to reduce consumer anxiety (Chen, Hsu & Lin, 2010).
E-Services	E-services include automatic delivery of online services (Burgess, 2016), such as parcel tracking mechanisms (Chen, Hsu & Lin, 2010) and digital product delivery (e.g., software and digital books) (Burgess, 2016).

Appendix E: A small-scale database shown on the external user interface created by the ICDT categories of website features

Figure E1: External UI of a small DB for selecting available ICDT categories of features on small business websites with Yes or No keys.

Descriptions: The WFE-DSS has a small-scale DB component with an external UI. Figure E1 shows the small DB with external UI related to the ICDT categories of features for selecting and analysing small business website features. Figure E2 shows the small DB with the external UI of the ICDT categories of features for selecting and examining overseas competitor website features.

Figure E2: External UI for a small DB for selecting available ICDT categories of features on small business overseas competitor websites with Yes or No keys.

Appendix F: A summary of hardware and software requirements

Table F1: Database software comparisons

Category	MS Excel	MS Access	SQL Server Management Studio	SQL Server Compact 4.0
Used for	Data analysis	RDBMS	RDBMS	RDBMS
Backup	Easy to backup, however requires user initiation.	Easy to backup, however requires user initiation.	Backups can run anytime, even if users are active.	Easy to back however requires user initiation.
Transaction logs and rollbacks	Limited, as it only shows when file is edited, such as date and time of edit.	Requires programming to track changes done by the user.	Shows who modified what data, and user can undo changes. Has built-in features and triggers to support this.	Transaction logging is not possible without some manual change tracking.
Scalability	Limited to its worksheet size, which is 1,048,576 rows by 16,384 columns	Limited to two gigabytes (GB). Therefore, a solution cannot be entirely solved if a database exceeds that limit.	Can be designed for 524,272 terabytes for heavy usage and be optimised for web solutions.	Supports database files up to four GB.
Limitations		Only for one user.	Supports more users and has the ability to improve performance.	
Cost	AU$229 with MS Office.	AU$139 with part of MS Office 365 (4-year subscription).	Free version of MS SQL Server Express.	Free

Note: RDBMS stands for relational database management system

Descriptions: Lists of software are illustrated in Table F1, with the small DB component of WFE-DSS created using the SQL Server Compact 4.0. Although SQL Server Management Studio has many features, this study chose SQL Server Compact 4.0 because it runs successfully on Visual Studio 2012 and is free. Other software and hardware requirements are shown in Table F2.

Table F2: Other hardware and software requirements.

1. **Computer hardware**: Computer with processor such as Intel® Core™ i5-6200U CPU @ 2.30GHz 2.40 GHz and 8 GB RAM
2. **Operating system:** Windows 8.1 Pro
3. **Data management and storage**: MS Visual Studio 2012
4. **Software applications**: MS Office, MS Visio, MS Visual Studio 2012

Appendix G: WFE-DSS prototype evaluation questionnaires

How competitive is your business website?

A website features evaluation DSS tool for small business

About the project

Although e-commerce has been providing significant benefits to businesses, many small businesses in the online retail sector have not yet received benefits from their e-commerce presence. Many online consumers purchase products from overseas competitor websites, resulting in the substantial loss of online sales for Australian small businesses. Therefore, a website feature evaluation DSS (WFE-DSS) tool has been developed to assist small businesses in selecting competitive features for their websites in order to interact with online consumers. Your participation will help build and optimise the WFE-DSS tool.

What am I supposed to do?

You are going to use the WFE tool provided in the session to evaluate your company's website features. Then you will be asked to select a competitor from the list, so a comparison and recommendation can be derived. Finally, you will be asked to complete the questionnaire and quick interviews based on your experience using the WFE tool.

Data privacy and security

The data collected about your business will only relate to the website features of your company. You do not need to disclose the company name or your name. The data will only be used to derive a recommendation that you may deem as fit or not through your feedback. No data will be stored for future use since the WFE-DSS is in the prototype stage. We will dispose of the data after you have closed the tool.

The Ethical approval committee has approved the research project **(Ref. HRE 15-216),** and the data collected as a part of this exercise will be securely stored and used for the purpose of this research only, as per the guidelines of the Victoria University Ethics Committee data security and privacy policy.

For successful implementation, it is necessary to test the WFE-DSS tool. The intention is then to deliver a final version. Your feedback is highly valuable in the development of the tool.

Workshop sessions and work plans

Duration of discussions	: 1-1.5 hours
Participants	: 4-5 small business owners/managers
Introductory session	: 10 min
General discussion on the tool	: 10-15 min
Usability session	: 20-30 min
Efficacy session	: 20-30 min
Tea/snack session	: 15 min
Thanks	: 5 min

Thank you for your kind assistance in giving your valuable time to complete the questionnaire.

Yours sincerely,

Madhury Khatun
PhD Student Researcher, College of Business
Victoria University
Melbourne, VIC 8001, Australia
Email: madhury.khatun@live.vu.edu.au

1. WFE-DSS prototype tool evaluation questionnaire using a Likert scale

Instructions: Please select the number below that best represents how you feel about your experience with the WFE-DSS tool used in this session.

Usability	**Strongly agree**	**Agree**	**Neither agree nor disagree**	**Disagree**	**Strongly disagree**
Information on the WFE tool is useful for my business needs and decision-making.	5	4	3	2	1
The WFE tool is helpful for reducing my time in selecting competitive features on my website in a systematic way.	5	4	3	2	1
The WFE tool is easy to use and assists me in selecting competitive features on my website in comparison with my competitors' websites.	5	4	3	2	1
The WFE tool is easy to use and provides a quick response to technical and non-technical users.	5	4	3	2	1
Efficacy					
I prefer to seek assistance about selecting website features on my website by using the WFE tool.	5	4	3	2	1
I feel that the tool will save me time in maintaining my website features.	5	4	3	2	1
Using the WEF tool will provide benefits related to the adoption level of my own website features against that of my competitors in the online retail business environment.	5	4	3	2	1
I think the tool is effective for systematically maintaining my website features in the competitive online retail environment.	5	4	3	2	1
Performance					
This tool provides real-time information related to the content analysis of my website features against that of my competitors in the changing online environment.	5	4	3	2	1
Recommendations from the WFE tool provide consistent support for online retail environment needs.	5	4	3	2	1
The overall process is flexible for adding/removing decision-making variables (e.g., different website features) and could be beneficial for improving my business needs.	5	4	3	2	1

2. WFE-DSS prototype evaluation using a semi-structured and unstructured questionnaire

PART I: Information and communication technology (ICT) skills

What do you consider to be your level of ICT literacy (e.g., computer literacy)? Please chose one.

- Very strong.
- Average (I use the computer as part of my non-IT job).
- Basic literacy (I check emails and other basic tasks).
- I am not computer literate.

Part II: Evaluating the system usability and effectiveness by focus groups

A. Usability

1. Does the tool presented provide meaningful information related to particular website features that are significant for interacting with online consumers? If yes, please go to question 2. If no, please provide your recommendations below.

   …….....

   .....
2. Is the information produced from the tool useful for your own decision-making in the online retail (B2C e-commerce) environment? If yes, please go to question 3. If no, please provide your recommendation below.

   ……

   ……
3. Did the tool assist you in selecting competitive features for your company's website? If yes, please go to question 4. If no, please give your reasons below.

   ……

   ……
4. Does the tool allow an easy way to find information related to your website features adoption level compared with that of your competitors and as quick a response as you might expect? If yes, please go to question 5. If no, please provide your suggestions below.

……

……

5. Does the tool save you time in making quick decisions to select competitive features on your website without consulting with the web designer? If yes, please go to question 6. If no, please provide your suggestions below.

……

……

6. Do you think this tool could substitute, to some extent, the advice received from an e-business consultant? If yes, please go to question 7. If no, please provide your suggestions below.

……

……

7. Does this tool allow you to professionally and systematically select your own website features for the frequently changing online competitive environment? If yes, please go to question 8. If no, please provide your suggestions below.

……

……

B. Efficacy

8. Without using this tool, what method(s) do you use for decision-making and selecting your website features in your online environment? Please provide your answer below.

……

……

9. What changes in your everyday business practice will be made if you use the tool for selecting your website features and maintaining the website? Do you believe that there will be a change or improvement (e.g., save time, quick support)? Please provide your answers below.

……

……

10. What are the possible benefits provided by the tool for your own business purposes? Please submit your answer below.

……

……

11. Do you think the tool brings any possible disadvantages to you? If yes, please explain. If no, please answer the next question.

    ……

    ……

12. What other aspects of this tool could be improved? If any, please provide your suggestions, otherwise go to question 13.

    ……

    ……

13. Why do you think this tool will be effective for you?

    ……

    ……

Thank you for your time!

Appendix G1: Descriptions of some WFE-DSS evaluation matrices

Information systems evaluation matrices	Descriptions
Usability	• Usability denotes ease of use and utility, while ignoring learning (Coutaz & Calvary, 2012). • Usability is usually considered the ability of the user to use the thing to carry out a task successfully (Albert & Tullis, 2013). • Usability describes the product that can be easy to use, efficient and is easy to engage (Albert & Tullis, 2013). • Usability is a set of goals comprising efficiency, effectiveness, utility, learnability, safety, and memorability (Preece, Rogers & Sharp, 2002). • Usability focuses on the effective, efficient and satisfactory task accomplishment and aims to support a constant interaction between the user and the system (Tsakonas & Papatheodorou, 2008).
Efficacy	• The term efficacy represents the user considering that the software is enabling the task to be performed in a quick, cost-effective way (Coutaz & Calvary, 2012; Preece et al., 1994).
Performance	• Performance is a key criterion in the design of software systems or artefacts. The goal of designers, scientists, analysts, and users is to get the highest performance for a given cost (Hevner & Chatterjee, 2010). • System performance is a determining factor for user acceptance of a system (Tsakonas & Papatheodorou, 2006).
Usefulness	• The concept of usefulness defines whether a product assists user to complete the task (s) (Tsakonas & Papatheodorou, 2008).
Utility	• The term utility is common to people and organisations, it measures the quality (e.g., usability) of the artefact in practical use (Prat et al., 2014). • The utility also describes the functionality of a system (Preece et al., 1994).

Appendix G2: Detail of results based on Likert scale approach

Evaluation matrices and related questions	Business 1	Business 2	Business 3	Business 4	Business 5	Strongly agreed	Agreed	Neither agree	N=5	Strongly agreed score in %	Agreed score in %	Neither agree nor disagree score in %	Agree in %
Usability													
Information on the WFE tool is useful for my business needs and decision-making.	4	4	4	5	4	1	4	0	5	20	80	0	100
The WFE tool is helpful for reducing my time in selecting competitive features on my website in a systematic way.	4	5	4	5	4	2	3	0	5	40	60	0	100
The WFE tool is easy to use and assists me in selecting competitive features on my website in comparison with my competitors' websites.	4	3	3	5	4	1	2	2	5	20	40	40	60
The WFE tool is easy to use and provides a quick response to technical and non-technical users.	4	3	4	4	3	0	3	2	5	0	60	40	60
Efficacy													
I prefer to seek assistance about selecting website features on my website by using the WFE tool.	5	4	3	4	4	1	3	1	5	20	60	20	80
I feel that the tool will save me time in maintaining my website features.	4	5	4	5	5	3	2	0	5	60	40	0	100
Using the WEF tool will provide benefits related to the adoption level of my own website features against that of my competitors in the online retail business environment.	5	4	4	5	5	3	2	0	5	60	40	0	100
I think the tool is effective for systematically maintaining my website features in the competitive online retail environment.	4	3	4	5	4	1	3	1	5	20	60	20	80
Performance													
This tool provides real-time information related to the content analysis of my website features against that of my competitors in the changing online environment.	4	3	4	5	4	1	3	1	5	20	60	20	80
Recommendations from the WFE tool provide consistent support for online retail environment needs.	4	4	3	5	5	2	2	1	5	40	40	20	80
The overall process is flexible for adding/removing decision-making variables (e.g., different website features) and could be beneficial for improving my business needs.	4	5	4	5	4	2	3	0	5	40	60	0	100

Note: Linkert scales (score 5 = strongly agree; score 4 = agree; score 3 = neither agree nor disagree by Business 1, Business 2, Business 3, Business 4 and Business 5). All five owners/managers of small businesses have attempted to evaluate the WFE-DSS using these three scores (e.g., 5, 4 and 3).

Appendix H: End-user manual

Contents **page**

Introduction

The WFE-DSS is a small business decision support system designed for the dynamic B2C e-commerce environment. Therefore, an owner/manager of a small business in the online retail sector can develop a knowledge base and build its decision support using the WFE-DSS. Accordingly, end-users will be able to compare their website features against their successful competitor (s) using this tool. The user will also be able to generate a recommendation report regarding its current and desired state of website features. Ultimately, a small business can make improvements to its website features based on this expert recommendation. The WFE-DSS is a user-friendly decision support system that has already been evaluated by end-users who found the tool easy to navigate through various user interfaces.

System requirements for WFE-DSS

A. Hardware requirements

The minimum hardware requirements essential to run the WFE-DSS are:

- Processor: Intel® Core ™ i3
- RAM: 2 GB

B. Software requirements

- MS Windows 8 is required for operating the WFE-DSS tool.

WFE-DSS functionalities

- The WFE-DSS is user-friendly.
- Easy to create knowledge through the processing of information sourced from the external business environment, and can build decision support.
- The tool was built on the Windows-based platform.
- The tool can produce a comparative analysis of small business website features against one or more successful competitor.
- It has the ability to generate a report recommending which features would be useful for the small business website.
- The recommendations produced, along with metadata, describe the utility of supported features.

Installation plan and building decision support

The end-user manual provides help and advice to users on how to install the WFE-DSS tool and interact with various interfaces. The WFE-DSS is an executable file that can be uploaded to a shared folder or over a file hosting service or cloud storage services, such as Google Drive or Dropbox. Since the WFE-DSS tool is approximately 7MB in size, it can be shared and downloaded quickly. After downloading, the user will unzip the file and execute the set-up to install the WFE tool.

A. Installation processes of the WFE-DSS

1. Download the WFE tool and open it with WinZip or 7z.

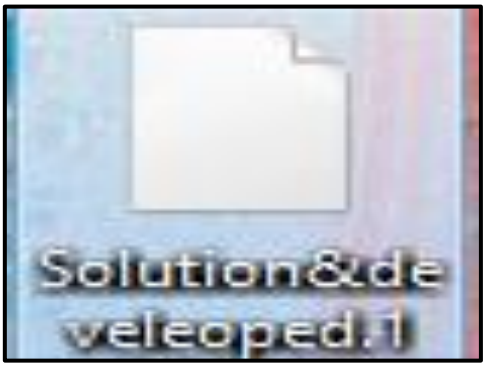


Figure 1: WinZip

2. Extract the two folders inside the file in your desktop.

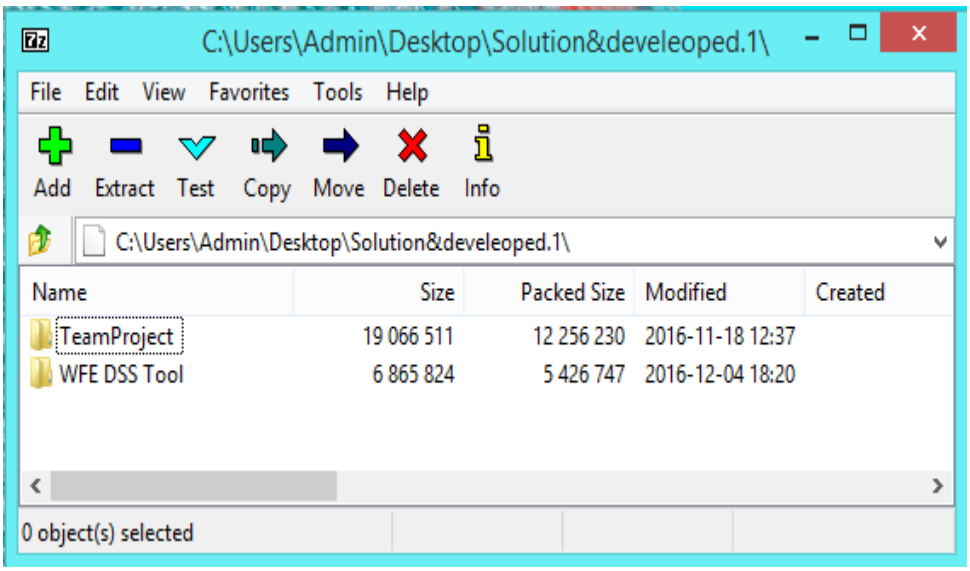


Figure 2: WFE-DSS folder

3. Select and click the WFE-DSS folder in **Figure 2** and open the tool.

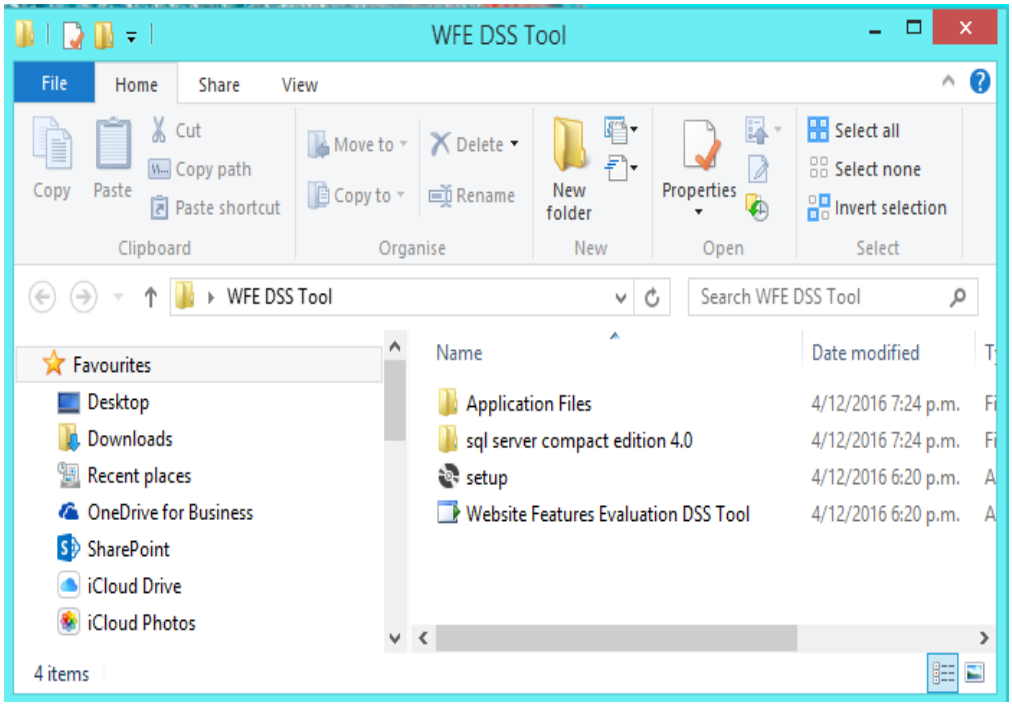


Figure 3: Setup file window

4. Prompt double click to execute the setup file, as shown in **Figure 3**, which displays the following window, as shown in **Figure 4.**

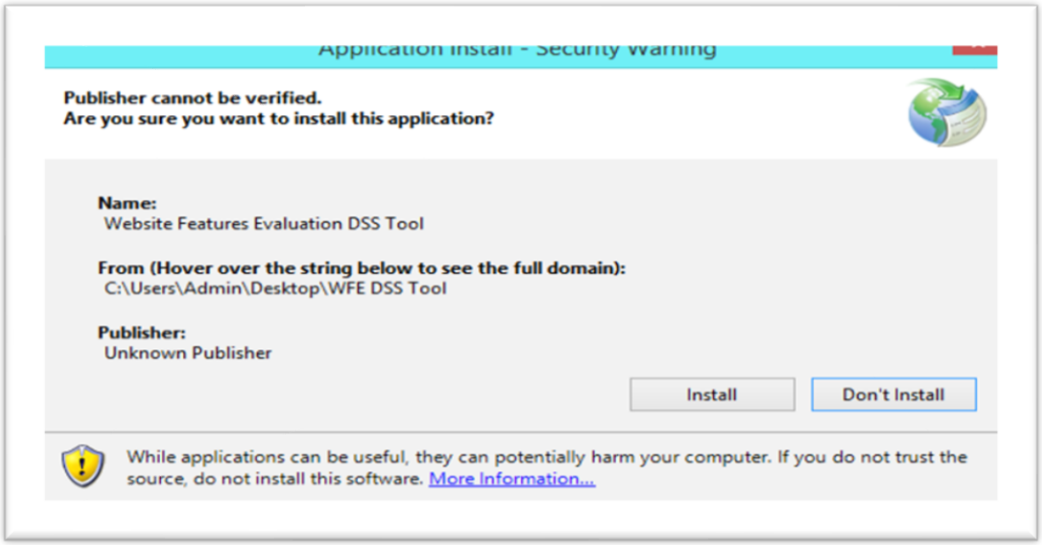


Figure 4: Installing window

5. Click the “Install” button as shown in **Figure 4** and wait for the installation of the WFE-DSS tool to finish, as shown in **Figure 5.**

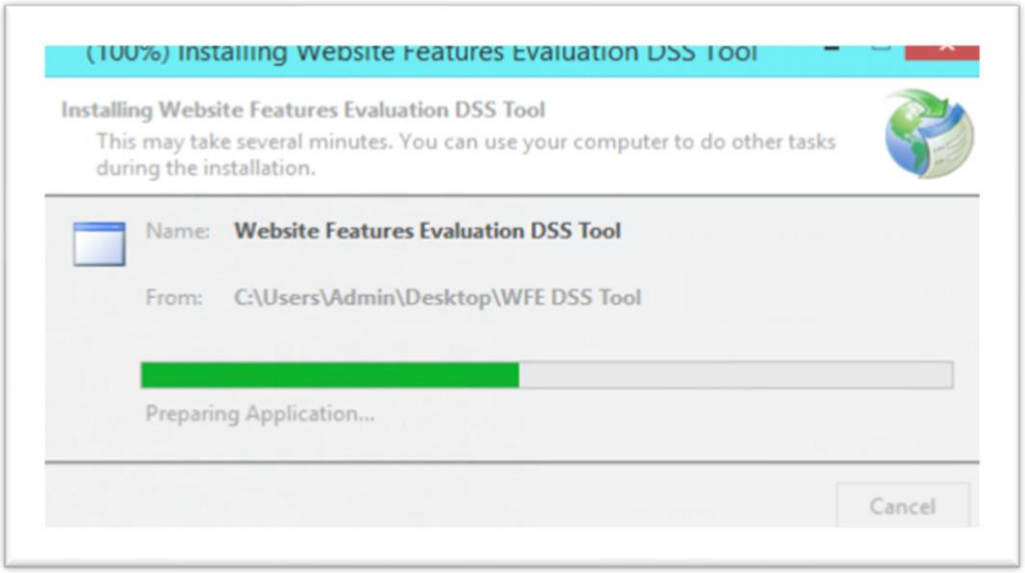


Figure 5: Installation is continuing

6. The application will start by itself after finishing the installation. The user can find this window for getting started by double-clicking the "Website Features Evaluation DSS Tool" as shown in **Figure 6.**

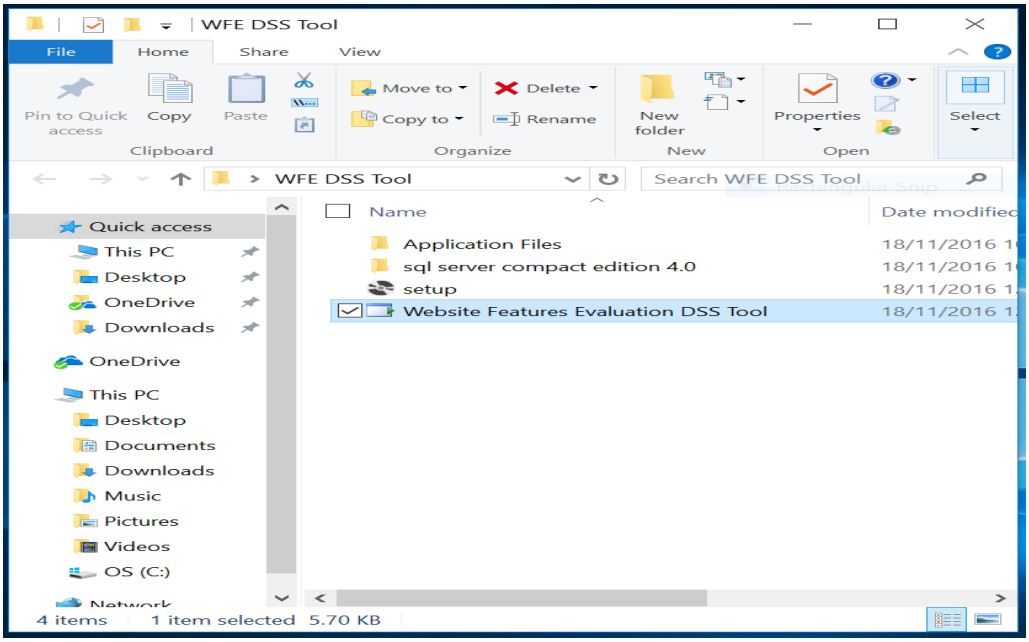


Figure 6: The WFE-DSS is ready to use

B. Building decision support with the WFE-DSS

1. **UI with main window:** When double-clicking on "Website Features Evaluation DSS Tool" as shown in **Figure 6**, the end-user will be welcomed with a UI, as shown in **Figure 7**.

Figure 7: The UI with welcome window

The user will then be required to click on “Your Company” for business name input and website feature analysis.

2. **UI for small business data input:** The user will be required to navigate the “Your Company” menu on the menu bar via the welcome window. A new window will pop up after clicking on “Your Company”, asking the user to enter either its name or its company’s name as shown in **Figure 8.** This UI comprises 41 website features.

Figure 8: UI for inputting data

3. **UI with selection and missing input data:** Users are required to click on either "Yes" or "No" when selecting the data, such as website features. If a user misses one feature or variable, the user will be notified by a message box of the feature they missed and asked to complete the task clicking on either "Yes" or "No". This UI is shown in **Figure 9.**

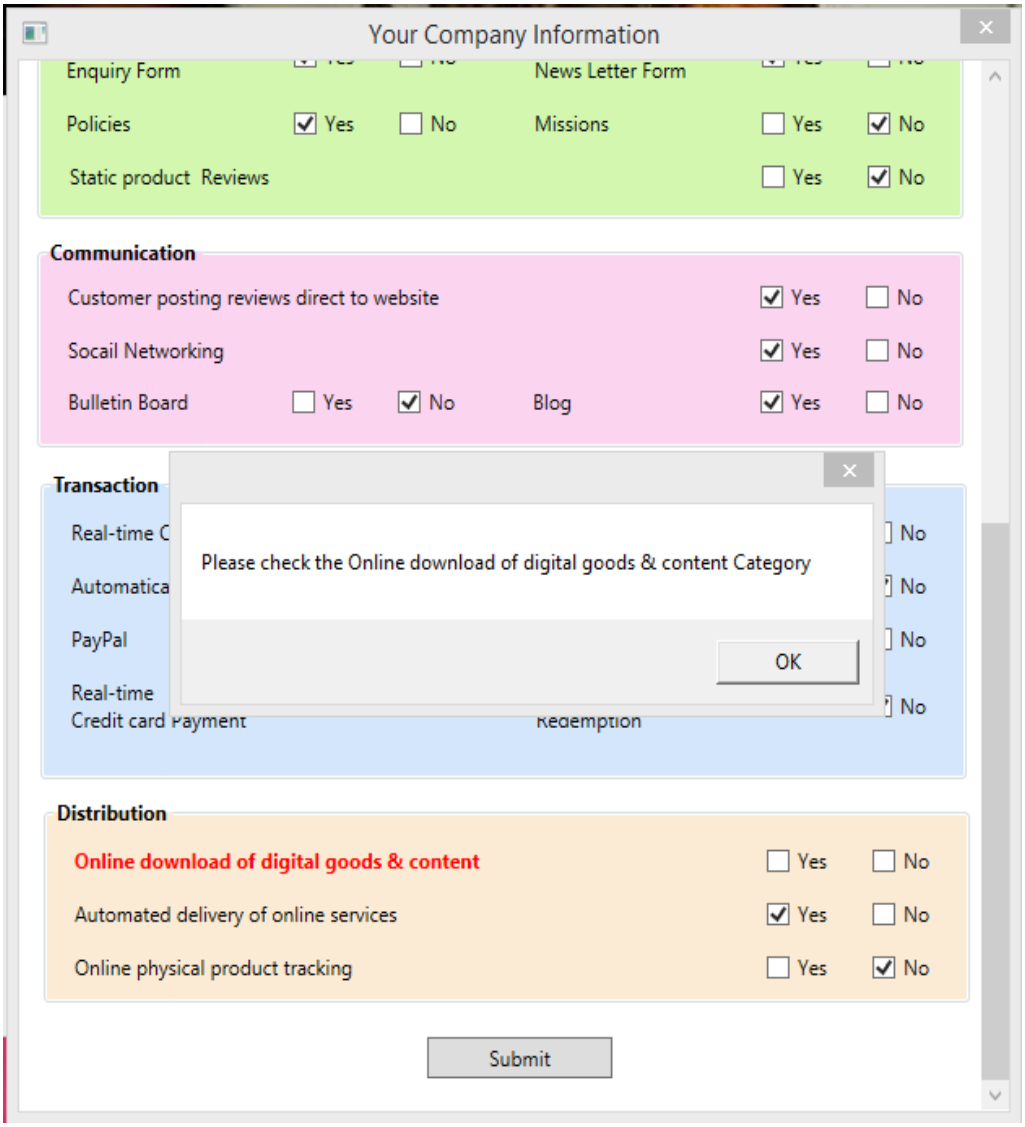


Figure 9: UI with prompt for missing data input

4. **UI for a small business data submission into the DB:** After each of the features is clicked, the “Submit” button at the bottom of the window must be clicked. A message box with the words "Data Added" tells the user that the data has been saved into the DB for analysis. This UI is shown in **Figure 10.**

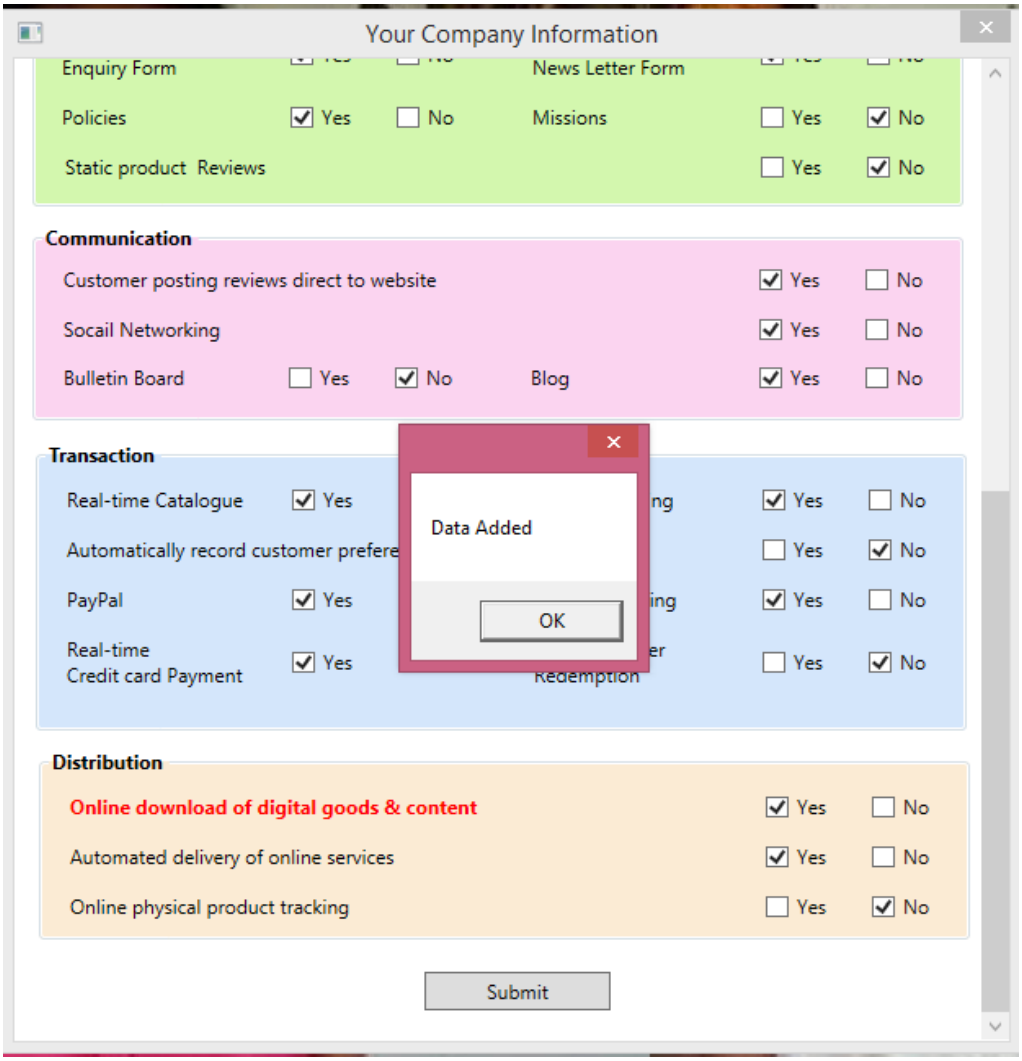


Figure 10: UI for saving small business data into the DB

5. **UI for opening and adding competitor data:** To add a competitor, the user needs to go back to the main window. The user will be required to navigate to the "Manage" menu tab on the menu bar to input competitor data (website features) into the DB system. Clicking on this menu tab, a list of buttons appears, as shown in **Figure 11.** The user needs to click on "add competitor", which prompts the opening of a new UI, as shown in **Figure 12,** for inputting competitor data into the system. The user will have the option to enter a competitor's name through this UI.

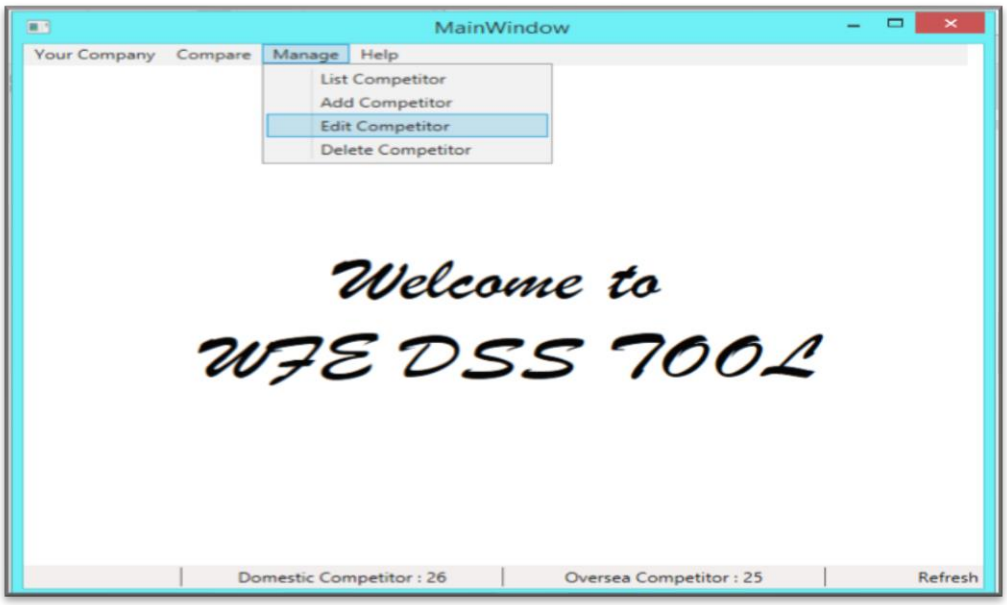


Figure 11: UI for list of menu keys to access a competitor's data

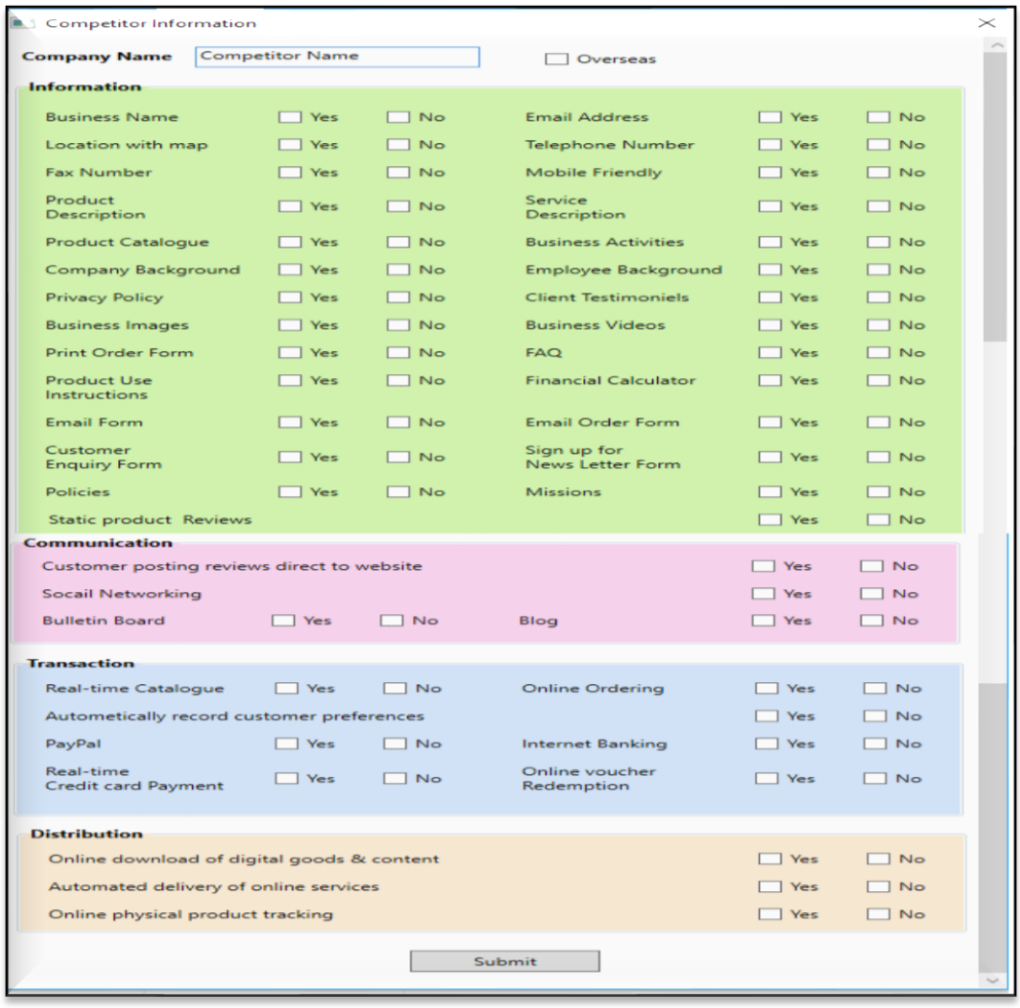


Figure 12: UI for adding competitor data (website features)

6. **UI for selecting and submitting competitor data into the DB:** After each of the features are clicked, the "Submit" button at the bottom of the window must be clicked and a message box will tell the user that their "Data" has been saved into the system for analysis. This UI is shown in **Figure 13.**

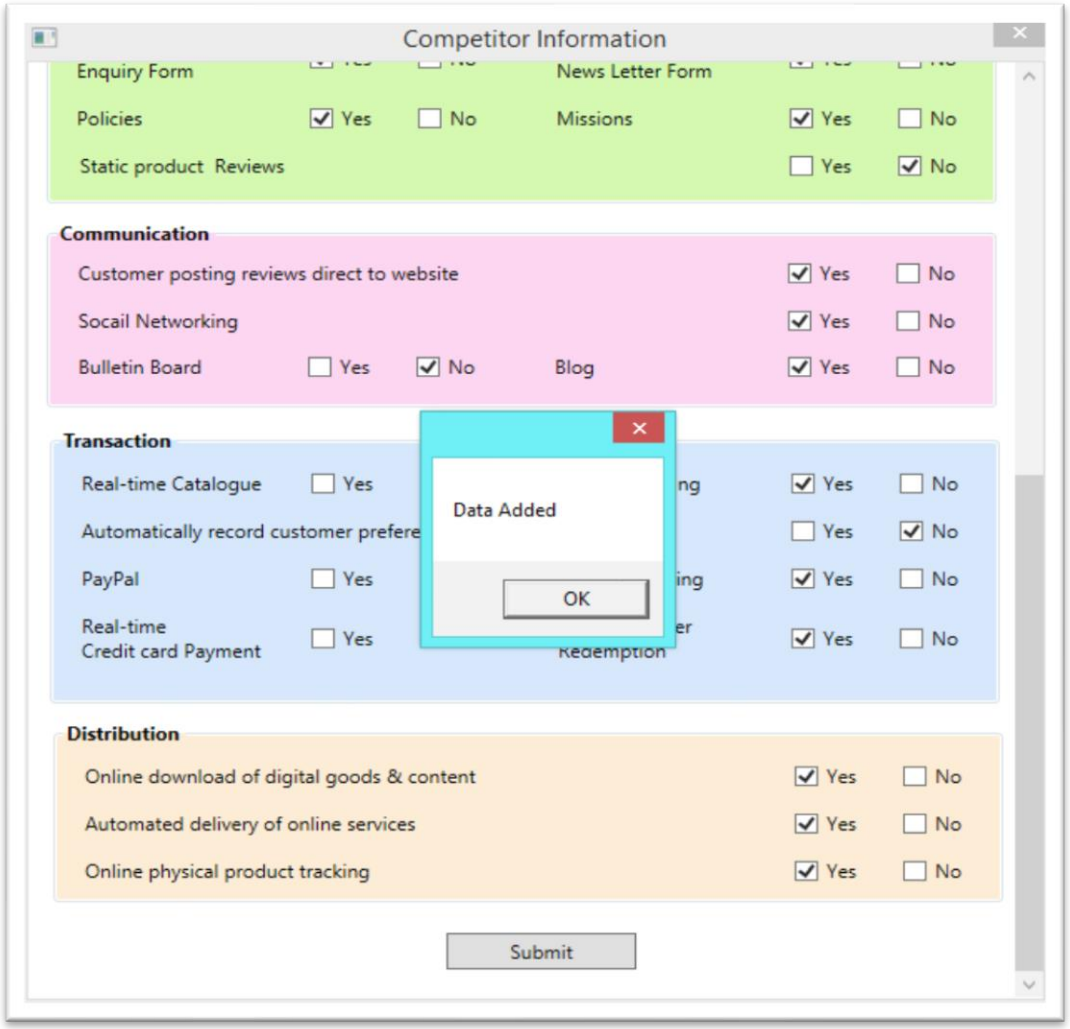


Figure 13: UI for saving competitor's data into the DB for expert analysis

7. **A UI for analysing current and desired states of small business website features:** A user can now go back to the "welcome window" and proceed to the "Compare" key on the menu. A small window will pop up with the features "Overseas" and "Domestic" meaning local and overseas competitors. This UI is shown in **Figure 14.** An end-user can now analyse and identify its current and desired state of website features against a domestic or overseas successful competitor using this interface.

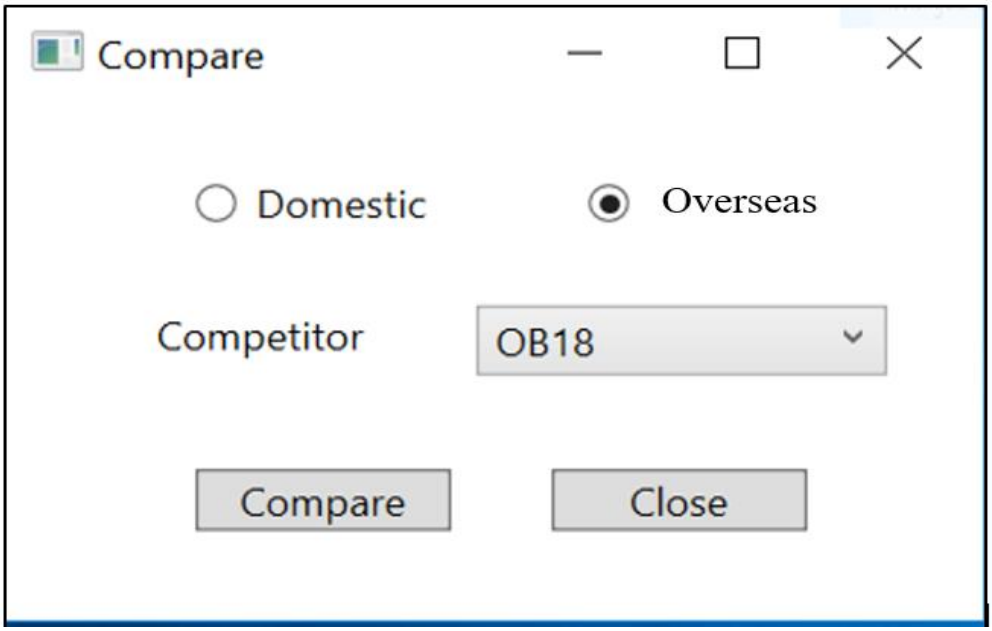


Figure 14: UI for analysing and identifying user current and desired state of website features against its competitors

8. **Expert recommendations:** After clicking on the "Compare" button, the tool will finally display an interface with a summary of recommendations, as illustrated in **Figures 15.**

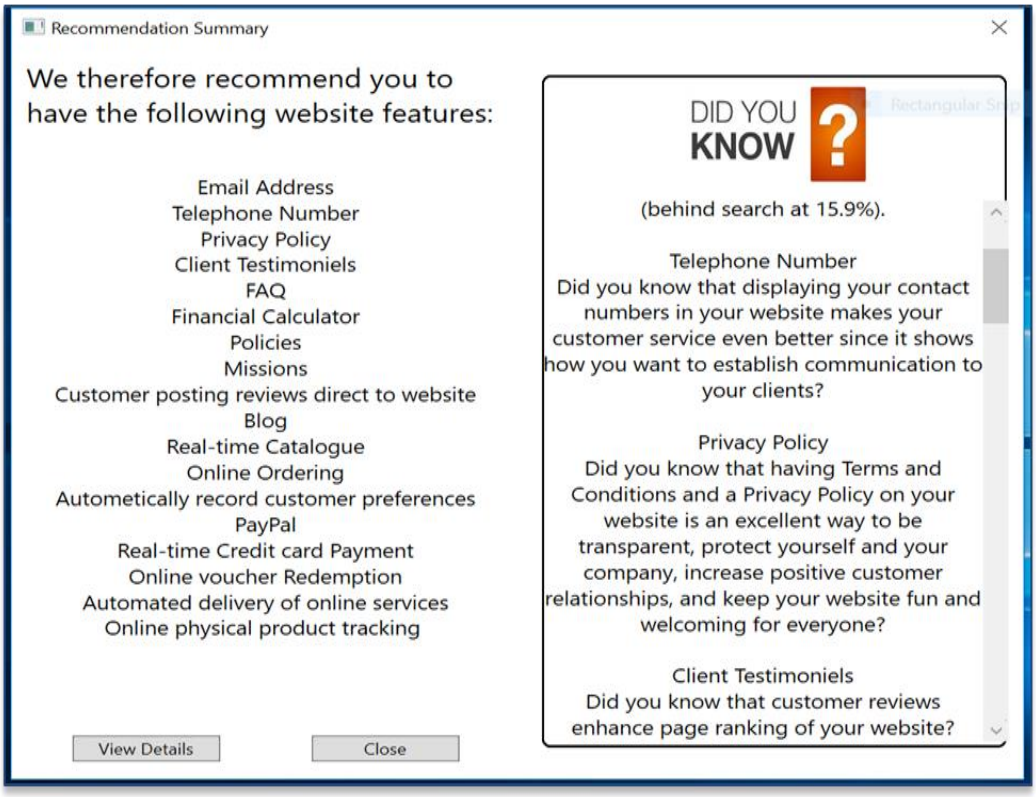
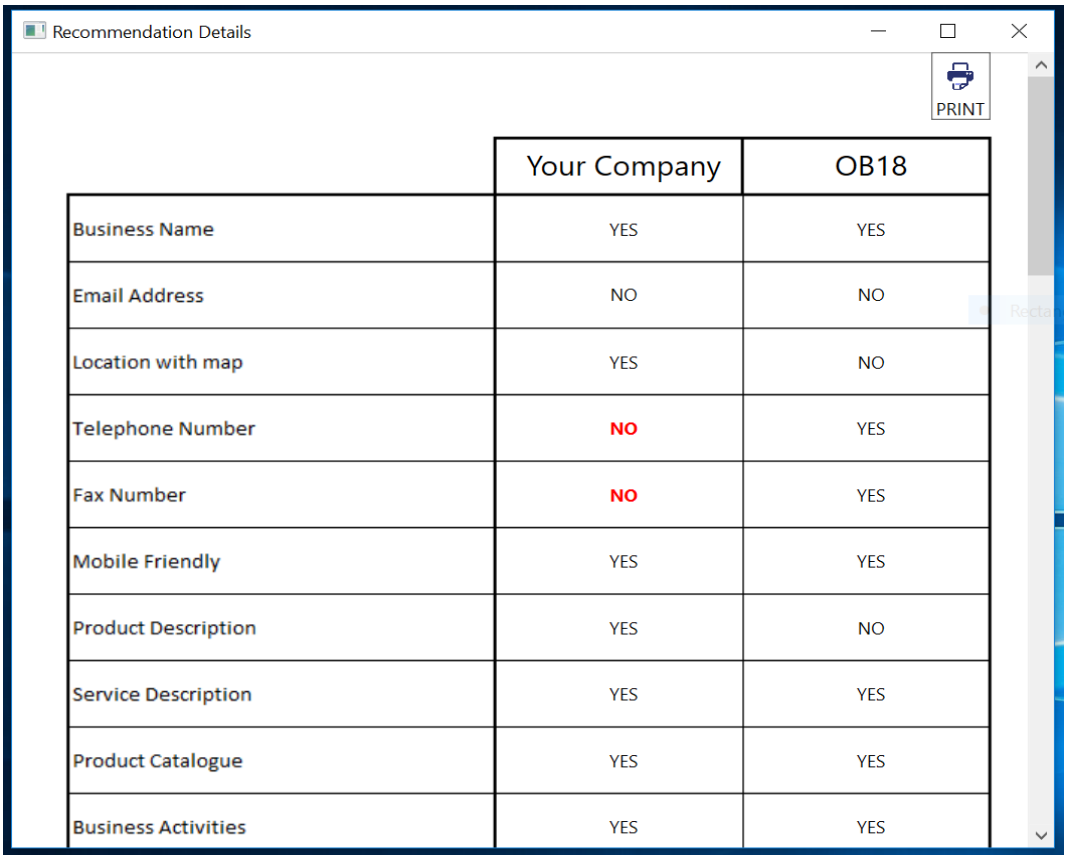


Figure 15: An expert recommendation summary

The left-hand side of this interface provides an expert recommendation for the user to implement the list of features on its website. This could represent the user's desired state of website features, such as those features not available on its websites but on its successful competitor's website. The right-hand side of this interface shows the utility or importance of these missing features.

9. **Recommendation details:** If the user wants to analyse the website features they have just entered in comparison with the competitor they have chosen, they can click on the "View Details" button, and a window will open, as shown in **Figure 16**. If they wish, users can print or save these comparative analysis details to a pdf file.



	Your Company	OB18
Business Name	YES	YES
Email Address	NO	NO
Location with map	YES	NO
Telephone Number	NO	YES
Fax Number	NO	YES
Mobile Friendly	YES	YES
Product Description	YES	NO
Service Description	YES	YES
Product Catalogue	YES	YES
Business Activities	YES	YES

Figure 16: Recommendation details

Help features

The help manual lists the basic steps users need to know about how to use the DSS tool, as shown in **Figure 17**.

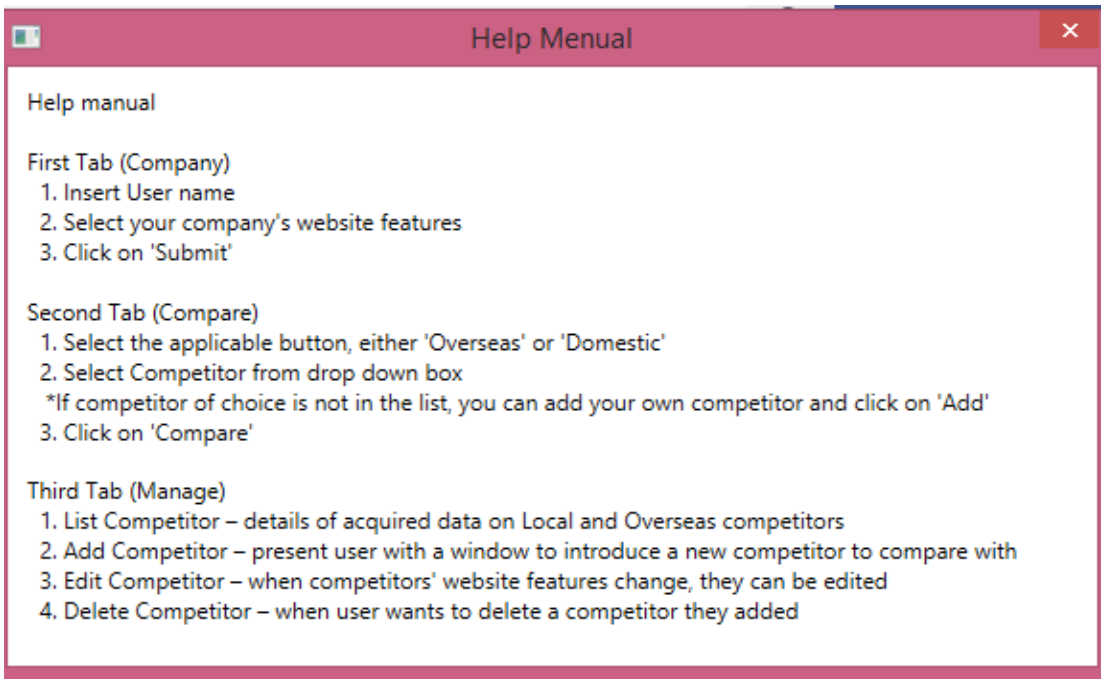


Figure 17: Help manual

Disclaimer

Through this system, an owner/manager is able to access information from the external business environment on its own and its competitor's website features. The owner/manager cannot add additional features for analysis. Only the lists of features on the UI are available for information processing. The recommendations generated by the DSS for decisions are a guide. The final strategic decisions about whether or not to implement the expert advice provided by the DSS still lie with the business owner or manager. The author of this study cannot give a guarantee as to the reliability and accuracy of the data used in the system. The information in the system is used at your own risk and how it is used is your responsibility.