

# **Development of a change framework to study SME web site evolution**

**A thesis submitted for the Degree of Doctor of Philosophy**

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## ABSTRACT

It has been suggested that the adoption of e-commerce by Small and Medium-sized Enterprises (SMEs) follows a sequence of stages with each representing increasing complexity and benefits. These models imply a development of their web sites in successive iterations or redesigns from basic use of the Internet (as a marketing tool) to the most advanced level of sophistication and integration. The EU and the UK government appear to believe such models and have used them in their e-commerce adoption encouragement policies for SMEs. However, recent research in Europe reveals that e-commerce initiatives in SMEs in most cases are still in their initial stages, which do not exceed the use of email and simple information-based web pages. This failure of SMEs to engage in the more advanced stages of adoption suggest that our understanding of the implementation and management of SME web sites over time is too limited.

Thus, the main aim of this research is to establish an enhanced understanding of the dynamics of SME web site transformations over time to better support SME e-commerce progression. The specific objectives of this research are to (1) examine the literature that explain or guide the evolution of web sites and internet strategies, particularly in the context of SMEs, (2) develop a multidimensional framework that combines three dimensions of organisational change (extent, content and drivers) to characterise and model the evolution of the web presence of SMEs and (3) undertake a study of the types and characteristics of actual changes on a sample of SME web sites over time to demonstrate the relevance and applicability of the dimensions of the framework.

This study employs both quantitative and qualitative techniques. The quantitative part of the study includes the collection and observation of the sample of SME web sites to study the extent of the changes and the content of the changes incorporated. The qualitative part of the study involves telephone interviews to seek additional information about the drivers for web site redesigns and complement the previous observations.

It is argued that a research framework that combines three different dimensions of organisational change offers an alternative approach to e-commerce Stage Models in understanding the evolution of SME web sites over time. The developed framework is useful to academics by providing multiple perspectives that enable more insightful study of SME web site evolution, and avoid over-simple, a priori theory, e.g. staged approach. The framework is also argued to be useful for SME managers seeking to make the most of their limited resources in this context.

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**LIST OF ABBREVIATIONS**

<b>ACC</b>	<b>Accessibility</b>
<b>ASP</b>	<b>Microsoft Active Server Pages</b>
<b>BERR</b>	<b>Department for Business, Enterprise and Regulatory Reform (UK)</b>
<b>CCS</b>	<b>Cascading Style Sheets</b>
<b>CGI</b>	<b>Common Gateway Interface</b>
<b>CII</b>	<b>Content for Identification &amp; Image</b>
<b>CMS</b>	<b>Content Management System</b>
<b>CPC</b>	<b>Content for Promotion &amp; Contract</b>
<b>CRE</b>	<b>Content for Relationship Enhancement</b>
<b>CRM</b>	<b>Customer Relationship Management</b>
<b>CSV</b>	<b>Comma Separated Values</b>
<b>DDA</b>	<b>Disability Discrimination Act (UK)</b>
<b>DTI</b>	<b>Department of Trade and Industry (UK)</b>
<b>EDI</b>	<b>Electronic Data Interchange</b>
<b>ERP</b>	<b>Enterprise Resource Planning</b>
<b><math>F_0</math></b>	<b>Number of coding decisions upon which the coders agree</b>
<b>FAQs</b>	<b>Frequently Asked Questions</b>
<b>HTML</b>	<b>HyperText Markup Language</b>
<b>ICTs</b>	<b>Information and Communications Technologies</b>
<b><math>I_r</math></b>	<b>Perreault and Leigh Index of Reliability</b>
<b>IS</b>	<b>Information Systems</b>
<b>IT</b>	<b>Information Technology</b>

JPEG	Joint Photographic Experts Group
JSP	Java Server Pages
$k$	Number of coding categories
$N$	Sample size or total number of coding decisions made by each coder
NAV	Navigability
NOEI	National Office of the Information Economy (Australia)
$p$	Statistical significance level
PHP	HyperText Pre-Processor
RI	Relational Interactivity
RSS	Rich Site Summary
SC	Security & Confidentiality
SCM	Supply Chain Management
SME	Small and Medium-Sized Enterprise
SMM	Site Management & Maintenance
SMMA	Sequential Mixed-Methodological Analysis
TI	Transactional Interactivity
URL	Uniform Resource Locator
XML	Extensible Markup Language
$z_c$	Critical value for the $c$ percent confidence interval



## DECLARATION

Some of the material contained in this dissertation has been presented before in the form of the following publications:

### *Journal papers*

Alonso Mendo, F., Fitzgerald, G. and Frias-Martinez, E. (Accepted for publication).

Understanding web site redesigns in Small and Medium-sized Enterprises (SMEs): an UK based study on the applicability of e-commerce Stage Models. *European Journal of Information Systems*.

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Alonso Mendo, F. and Fitzgerald, G. (2005). A multidimensional framework to study SMEs e-business progression. *Journal of Enterprise Information Management*, 18 (6), 678-696.

### *Contributions in edited volumes*

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### *Papers in conference proceedings*

Alonso Mendo, F. and Fitzgerald, G. (2005). An organisational change perspective of SMEs web presence evolving strategies. *Proceedings of the 13th European Conference on Information Systems (ECIS)*, 26-28 May, Regensburg, Germany.

Alonso Mendo, F. and Fitzgerald, G. (2005). A preliminary study of the evolution of SMEs Web sites in the UK. *Proceedings of the 9th IEEE European Conference on Software Maintenance and Reengineering (CSMR)*, 21-23 March, Manchester, United Kingdom.

Alonso Mendo, F. and Fitzgerald, G. (2004). A multi-theoretical framework to study SMEs E-business progression. *Proceedings of the 1st European & Mediterranean Conference on Information Systems (EMCIS)*, 25-27 July, Tunis, Tunisia.

Alonso Mendo, F. and Fitzgerald, G. (2004). An analysis of stages of growth models in SMEs e-business progression. *Proceedings of the 1st European & Mediterranean Conference on Information Systems (EMCIS)*, 25-27 July, Tunis, Tunisia.

Alonso Mendo, F. (2003). The evolution of small companies' Web sites. Proceedings of *the 12th UK Academy for Information Systems (UKAIS) PhD Consortium*, 8-9 April, University of Warwick, Coventry, United Kingdom.



# CHAPTER 1. ROAD MAP OF THESIS

## 1.1. Introduction

This chapter presents an outline of the dissertation. Section 1.2 gives a brief background literature and the next section states the research problem. An examination of the aim, objectives and research questions is offered in Section 1.4. Following, the research methodology designed to accomplish the stated aims and objectives is presented in Section 1.5. Section 1.6 explains briefly the contributions of the research. Finally an outline of the chapters that compound the dissertation is offered in Section 1.7.

## 1.2. Context

The significant economic contributions of Small and Medium-sized Enterprises (SMEs) in virtually all the world economies (i.e. business turnover and employment) are widely recognised. In the UK for example, at the start of 2006 SMEs comprised the vast majority of businesses (99.9%) and employed a significant sector of its workforce (58.9%) and business turnover (51.9%) (BERR, 2007). Given such important role, governments see the adoption of e-commerce technologies by SMEs as vital to their economic development.

SMEs are finding a presence on the web to be important for enhancing their corporate image, increasing brand/product awareness, providing customer service, discovering new business opportunities and information gathering (Chau, 2003; Gribbins and King, 2004; Levy and Powell, 2003). In this context, organisational web sites influence potential customers' impressions of firms' legitimacy, innovation and caring (Winter *et al*, 2003). Thus, customers may have different views of a firm depending on the web features or content available (e.g. design, business policies, security, etc) that might determine whether a customer visits the site again or makes a transaction (Teo and Pian, 2004; Chang *et al*, 2005).

Given the growing importance of web sites in relations between companies and consumers, businesses are ever more aware of the need to improve their offerings. Therefore, a web site is likely to be a dynamic entity, demanding continual maintenance, investments, skill acquisition and management commitment to build and maintain relationships. This implies web site redesign and management of update of content and functionality to address potential gaps between users and the delivered experience (Albert *et al*, 2004).

However, the evolution of web sites is not yet clearly understood and there is little research evidence to explain why and how organisations, and especially SMEs, evolve their web presence. For example, some studies have found evidence to support the assumption that SMEs incorporate particular web site characteristics in sequential stages of e-commerce adoption (e.g.



Poon and Swatman, 1999; Chaston *et al*, 2001; Daniel *et al*, 2002; Rao *et al*, 2003; Burgess *et al*, 2005). These models imply a development of their web sites in successive iterations or redesigns from basic use of the Internet (as a marketing tool) to the most mature stages, where the web site is fully integrated with the various back office systems such as Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), and integrated Supply Chain Management (SCM) applications.

### 1.3. Research problem

Stage Models and the assumptions underlying them, have been highly influential, especially on government policies. At the outset of this research project, governmental programs of the UK, European Union and other governments were using Stage Models to encourage SME e-commerce adoption (e.g. DTI, 2002; SIBIS and European Communities, 2003; NOEI, 2000; Williams and Phillips, 1999). SMEs are typically of great importance to economies and governments have been very interested in anything which may help to stimulate and encourage them. In particular, the UK Department of Trade and Industry (DTI) was using a Stage Model, known as 'adoption ladder' to underpin business support policy (DTI, 2002). In fact, the UK spent more than any other country (£67 million) on a comprehensive 3-year programme from 2001 to help get UK businesses online and increase the e-business readiness of SMEs (Pavic *et al*, 2007). The ladder has laid at the heart of UK governmental understanding of the adoption of information and communication technologies (ICTs) by SMEs and implies that business benefits derive directly from the organisational change and increasing ICT sophistication that the Internet facilitates (Taylor and Murphy, 2004).

However, there are a growing number of authors who have questioned the appropriateness of Stage Models in this context (e.g. Martin and Matlay, 2001; Dixon *et al.*, 2002; Levy and Powell, 2003; Fillis *et al*, 2004; Taylor and Murphy, 2004; Zheng *et al*, 2004; Beckinsale and Ram, 2006; Davis and Vladica, 2006). The main criticism levelled is that they are over-prescriptive and do not reflect the actual behaviour of SMEs. In addition, they are thought to be too generic and fail to take into account the diverse nature and individual needs of SMEs. These are not a homogeneous group and their particular characteristics (e.g. size, age, economic activity, location, resource availability and level of internationalization) can directly affect the needs and opportunities to engage in various aspects of e-commerce (Taylor and Murphy 2004; Levy and Powell, 2003; Drew, 2003).

Martin and Matlay (2001) think that support initiatives using the generalist (or 'blanket') approach of Stage Models are misdirected and likely to fail and indeed the UK government's target of one million SMEs trading online by the end of 2002 was missed by more than 50 percent, which was a decline over previous years. The UK government's other objective was to



have SMEs progressing along its five stage adoption ladder (i.e. email, web site, e-commerce, e-business, transformed organisation) reaching parity with the best world practice. However, these targets were also not achieved and adoption rates of the more complex stages were too low to be reliably measured (Brown and Lockett, 2004). The picture is perhaps even worse than this because several studies in the UK have reported SMEs receding in their e-commerce stages, with a decline in the number of SMEs implementing trading online (CBI and KPMG Consulting, 2002; DTI, 2003) and even using web sites and email (DTI, 2002; DTI, 2003). Thus, despite the various support initiatives that have used these Stage Models in the UK, the number of SMEs achieving advanced stages of e-commerce adoption is very low and lags behind larger companies in their use (DTI, 2003; CBI and KPMG Consulting, 2002).

This low engagement of SMEs could have drastic consequences. Zheng *et al* (2004) argue that SMEs are the backbone of sustainable, local economies and communities. Further, there is a move by the public sector to embrace e-procurement and if SMEs in their supply chains are not developing their e-commerce capabilities they are likely to lose out against larger businesses, with damaging effects on these communities. For example, in a supplier analysis pilot, involving fifteen London authorities, it was found that over 17% of local SME suppliers (that is at least 16,000 local jobs) were potentially at risk due to moves to e-procurement (London Borough of Newham, 2005). Simpson and Docherty (2004) are also critical of business support mechanisms as delivered to SMEs based on Stage Models. They state that “the effectiveness of e-commerce advice and support for UK SMEs is poor and may be dangerous in that it may lead to increased numbers of business failure“ (2004; p. 326). According to the authors, ill-fitting policy can help contribute to distrust of government business support agencies by small firms with the potential effect of encouraging third party vendors to exploit SMEs’ ignorance of new internet technologies and systems.

The failure to engage SMEs in the more advanced stages of adoption and the declines reported suggest a number of important issues. Firstly, the gains from using internet technologies are being realised by larger, rather than smaller, firms (Levenburg, 2005; MacGregor and Vrazalic, 2006). Secondly, the Stage Models that have been used in this context are too limited and perhaps even flawed and inadequate to describe the actual adoption of internet technologies by SMEs (e.g. Martin and Matlay, 2001; Dixon *et al*, 2002; Levy and Powell, 2003; Fillis *et al*, 2004; Taylor and Murphy, 2004; Zheng *et al*, 2004; Beckinsale and Ram, 2006; Davis and Vladica, 2006). Thirdly, despite all the literature on e-commerce adoption there has been limited attention to and understanding of the implementation and management of web technologies over time (Benbunan-Fich and Altschuller, 2005), and especially in SMEs. Finally, despite the low uptake, doing business on the Internet is becoming increasingly a competitive necessity for



SMEs as in most industry activities, large companies and government agencies are requiring suppliers to trade with them online or risk losing their business (Drew, 2003).

#### 1.4. Aims and objectives

Despite arguments being expressed both for and against the concept of stages, there have been few empirical studies seeking to validate this theory in the context of SMEs. Given the problems discussed in the previous section, there is a need for more research to understand the actual practices of SMEs regarding the development of their web sites. Although the recent literature focuses on more complex e-commerce issues (e.g. internet business models, e-business and supply chain, e-business and business value, etc), there is still a need to further research into the more basic and primary use of the Internet, the external web site to interact with stakeholders (Meroño-Cerdan and Soto-Acosta, 2007). It is argued that the sophistication and complexity of an organisation's web site may reflect its e-commerce strategic objectives since the web site is the portal through which most electronic transactions are conducted today (Kowtha and Choon, 2001) and the gateway to organisational information on the Internet (Singh and Dalal, 1999). Therefore, the premise of this study is that examining the evolution of web sites over time provides insights into the actual evolving strategies and motivations behind internet investment decision-making and innovation.

The evolution of SME web sites is not yet clearly understood and there is little research evidence to explain why and how organizations evolve their web presence. While other studies (e.g. Poon and Swatman, 1999; Chaston *et al*, 2001; Daniel *et al*, 2002; Rao *et al*, 2003; Burgess *et al*, 2005) have provided Stage Models for SME web site and e-commerce evolution, none of them has attempted to validate them by examining their web sites over time. However, this research introduces new instruments to characterise the dynamics and evolution of SME web sites. Thus, the overall research aim can be stated as follows:

*to establish an enhanced understanding of the dynamics of SME web site transformations over time to better support SME e-commerce progression.*

This knowledge is important to enable SMEs to plan the evolution of their web sites and internet strategies so that they minimise the risk of unsatisfactory web site redesigns in their e-commerce activities. The specific objectives of this research are to:

- 1) Examine the literature that explain or guide the evolution of web sites and internet strategies and particularly in the context of SMEs. The objectives of this examination are firstly, analyse the Stage Model by investigating its criticisms and strengths. These models have been used by government led e-commerce adoption encouragement policies and it is important to understand their limitations and the reasons why they

have been used in the context of the progression of internet technologies adoption by SMEs. Secondly, examine alternative approaches in the literature, rather than Stage Models because it is important to know what other approaches have been proposed in this area and what their limitations are as well as how Stage Models can be positioned within them.

- 2) Develop a multidimensional framework that combines three different dimensions of organisational change (extent, content and drivers) to characterise and model the evolution of the web presence of SMEs. This framework is important because it provides a range of different perspectives or lenses with which to study SME web site evolution in an insightful way, without assuming a staged development.
- 3) Conduct a study of the types and characteristics of actual changes on a sample of SME web sites over time, to demonstrate the relevance and applicability of the dimensions of the framework. This will help to explore empirically the validity of the existent perspectives of change applied to SME web site evolution and determine whether the sites evolve in the way Stage Models suggest. This lead to the following research questions:

**Table 1-1 Research questions**

<p><b>Extent of change (Chapter 4)</b></p>	<p><b>How do SMEs change their web sites?</b></p> <p>And in particular:</p> <p><b>Is there evidence of a staged development from the extent of the changes in SME web sites over time?</b></p>
<p><b>Content of change (Chapter 5)</b></p>	<p><b>What kind of changes do SMEs make when redesigning their web sites?</b></p> <p>And in particular:</p> <p><b>Is there evidence of a staged development from the features implemented in SME web sites over time?</b></p>
<p><b>Drivers of change (Chapter 6)</b></p>	<p><b>Why do SMEs redesign their web sites?</b></p> <p>And in particular:</p> <p><b>Is there evidence of a staged development from the reasons for the redesign of SME web sites?</b></p>



### 1.5. Overview of methodology

Different research methods, especially from different paradigms (i.e., quantitative/positivist or qualitative/interpretive) focus on different aspects of reality. Thus, combining these methods may lead to a richer understanding of the phenomena under investigation. SMEs are operating in a complex business environment, consisting of a plurality of factors that generate the evolution of their internet strategies occur. By incorporating multiple modes of analysis into the design, additional insights may be revealed that would otherwise remain undiscovered via a single methodological approach.

Therefore, this study employs both quantitative and qualitative techniques to demonstrate the applicability of the developed multidimensional framework and study the types and characteristics of actual changes on a sample of SME web sites over time. The quantitative part of the study includes the observation of a sample of web sites over time to study the extent of their changes (*extent of change*) as well as a content analysis to examine the changes the web sites underwent (*content of change*). The qualitative part of the study involves the collection and analysis of qualitative data related to interviews to seek additional information about the reasons for web site redesigns in the sample (*drivers of change*). Figure 1-1 below illustrates the multi-method research design employed in this study. Chapter 3 discusses each of these methods in more detail and provide justifications for their selection.

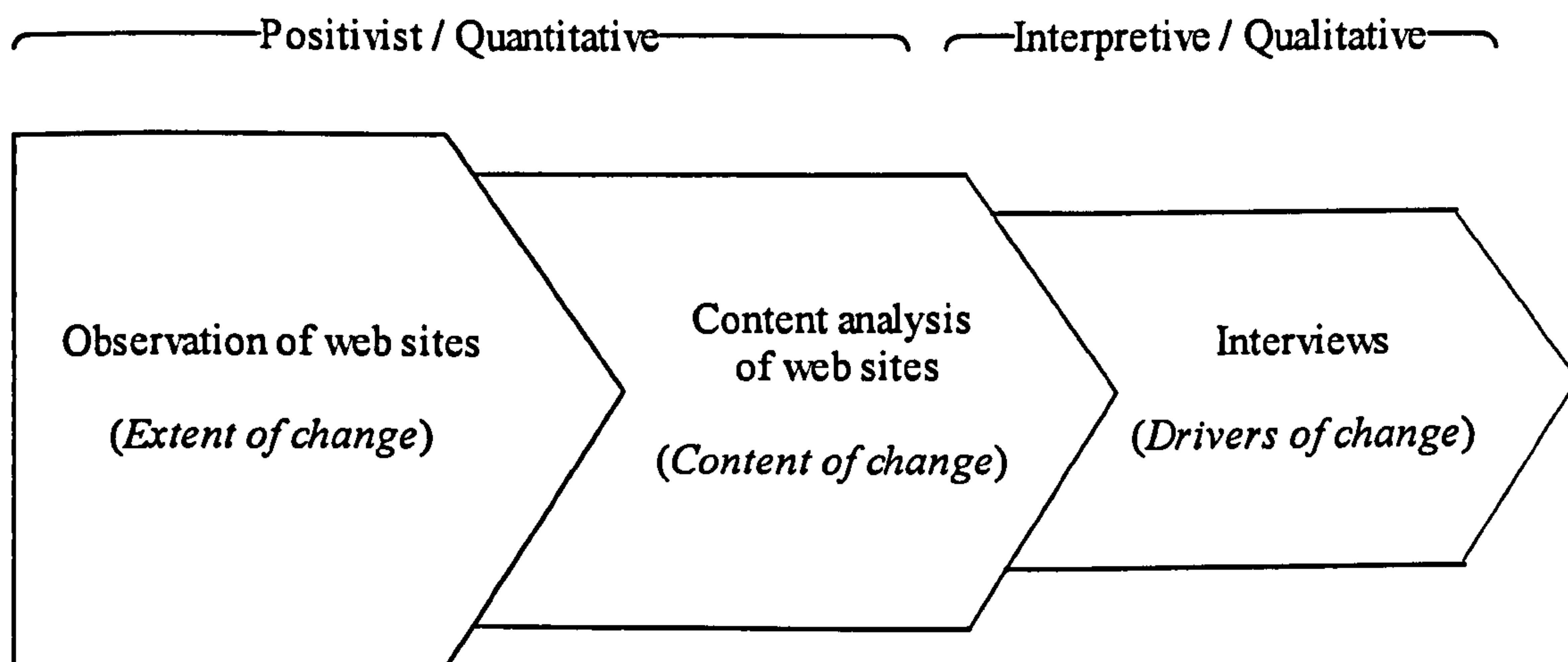


Figure 1-1 Multi-method research design

### 1.6. Summary of research contributions

This research seeks to contribute to both small firm practice and information systems (IS) theory through the elaboration of a research framework for the examination of the evolution of a sample of SME web sites in the UK. In doing so, this study helps to obtain a better understanding of why and how SMEs evolve their web sites and internet strategies over time. A

better understanding of this process will benefit SME theory, policy and practice. The following sub-sections summaries the contributions, which are discussed in more detail in chapter 7 (Section 7.3).

### **1.6.1. Contributions to theory**

The main contribution of this research project is the development of a research framework by which the evolution of SME web sites can be studied. Thus, this research provides an incremental contribution towards theory development in the form of a set of novel instruments to characterise the dynamics and evolution of SME web sites. For example, the *content of change* dimension of the framework allows the design and content of web sites to be analysed under nine distinct web evaluation categories. By offering a generic approach to measuring the functionality that a given web site addresses, the classification provides the tool necessary to compare subsequent generations of a given firm's web site, as well as web site functionality across competing firms.

In addition, the interviews reported in this research, as far as can be ascertained, are the first ever attempt to identify the reasons and drivers for SME web site redesigns. This study provides unique insights in contrast to previous studies because it utilised an inductive approach (i.e. data-driven or bottom-up method), where the drivers emerged from the interviews and were not imposed prior to data collection. These *drivers of change* provide an instrument to researchers interested in the topic of web site redesign. Such a comprehensive classification of drivers of web site redesign can be used as a guide for future work studying evolution of web sites or internet strategies over time for other contexts.

The framework has been subsequently used by Burgess et al (2006) to study the changes in the content and design of web sites of micro businesses in Australia, Canada and the UK. The authors found that the framework provided them with the capability to present web site changes in a more effective manner than stages of growth, as some of the changes being made to the web sites did not involve a change of stage and thus, would have been missed by Stage Models. In addition, Burgess and Bingley (2007) have used the framework to study community based organisations and plan to use the *drivers of change* dimension to make comparisons with SMEs.

### **1.6.2. Contributions to policy and practice**

The insight that this study provides into the actual practices of SME web site development can assist policy makers for supporting better SMEs in their use of internet technologies. This research supports the arguments against the depiction of SME web sites evolution in stages and indicates that models that have been used by government policy, such as the DTI e-business ladder (DTI, 2002), do not reflect actual behaviour of SMEs. Consequently, SMEs can also gain



some practical advantages when receiving training and advice from policy makers that are more aware of how and why SME web sites are actually evolving and are more considerate in meeting their needs. As previous Stage Models did not seem to be successful, any new insights on the matter can be useful guidance for policy makers.

In addition, managers involved in internet investments decision-making can also use the research framework developed in this study. Firstly, the nine web site evaluation categories that form the *content of change* category of the framework can be used to review the completeness of their web presence by comparing themselves with competitor businesses and determining which functionalities may need to be added to their web sites. Secondly, the classification of drivers for redesign and the unique reasons found in this study (*drivers of change*) can assist them to justify, plan and strategise internet investments. A web site redesign is a drastic investment which may result in negative consequences. Therefore, the drivers point to specific situations when it might be necessary for an SME to undertake a redesign rather than incremental upgrades.

### **1.7. Dissertation outline**

This dissertation comprises seven chapters. A brief description of each chapter is provided below.

**Chapter 1** provides an overview of this dissertation. The chapter first describes the context of this study and delineates the research problem. Then it outlines the research aims and objectives that this research addresses, followed by a brief description of the research methodology that was utilised to conduct this research. The chapter then outlines the contributions that this research makes. Finally, a brief description of all seven chapters is provided.

**Chapter 2** first analyses briefly the state of research in the area of e-commerce and SMEs. Then it reviews and assesses the appropriateness of previous approaches to study e-commerce progression, especially in the SME context. The chapter also discusses in more depth the usage of the Stage Model and identifies its strengths and weaknesses. In addition, the chapter describes the development of a research framework that is designed to understand the evolution of SME web sites based on organisational change concepts.

**Chapter 3** provides the justification for the chosen research design, as well as detailed discussions on the specific methods utilised. This chapter discusses first the main philosophical underpinnings within the IS field and the arguments for a pluralistic research approach that combines both quantitative and qualitative research methods. Then it provides the rationale for the selection of a positivist and interpretive approach within the present research project. This is followed by a discussion of the overall design of this research. Finally, this chapter illustrates



the three research methods used for the examination of the three dimensions related to the evolution of web sites: observation of web sites (*extent of change*), content analysis of web sites (*content of change*) and interviews (*drivers of change*).

**Chapter 4** describes the first method, which consisted of an unobtrusive observation of web sites to identify and observe changes to SME web sites over time without the businesses' knowledge. This data was collected as a means to study the types of changes on these web sites (*extent of change*) with no concern that the observation may alter the natural maintenance of the web sites. The chapter discusses first the sampling method utilised and the characteristics of the sample of web sites observed. This is followed by a detailed discussion of the data collection procedures utilised. Then, this chapter illustrates the analysis undertaken on the data gathered and finally, presents and discusses the results obtained.

**Chapter 5** describes the second method, which consisted of a follow up study aimed at examining the web site features that changed (*content of change*) after the redesigns identified during the previous observation. The chapter discusses first the methodological steps recommended by McMillan (2000) for applying content analysis to web sites and the particular challenges that this presents. Then, this chapter presents and discuss the results obtained.

**Chapter 6** describes the third method, which consisted of follow up interviews with SMEs, in order to shed light to the reasons why some SMEs in the sample decided to redesign their web sites (*drivers of change*). The chapter discusses first the sample selection and the planning and conduct of the interviews. Then, a sequential mixed-methodological analysis, involving the use of qualitative and quantitative data analysis, for developing a classification of drivers is described. Then, findings are reported. Finally, this chapter discusses the classification of drivers for web site redesign developed specifically for SMEs and compares the results with previous literature in different contexts.

**Chapter 7** provides an overview to the results and discussions of the research. First, a summary of the research is presented. This is followed by a discussion of the various research contributions and implications of this research in terms of theory, policy and practice. Following that, the research limitations are presented. The chapter concludes by suggesting directions for future research.



## CHAPTER 2. LITERATURE REVIEW

### 2.1. Introduction

The context of this research is the evolution of SMEs in the use of e-commerce technologies. Although there is a considerable body of work already developed in the area of e-commerce and SMEs, little is known about how and why SMEs progress in the use of these technologies, and specifically web sites. Therefore, this chapter first reviews the state of research in the area of e-commerce and SMEs to define the scope of this study. Then it provides an analysis of one of the most common approaches to depict the evolution of web sites and internet strategies, the Stage Model. Next, it provides a review and assessment of different approaches to study SME e-commerce progression and places the Stage Models within these approaches. Finally, it develops a research framework to help understand the evolution of e-commerce practices within SMEs by studying how and why their web sites change over time.

### 2.2. E-commerce and SMEs

E-commerce has been defined with different emphasis on the technologies and business applications considered. As most restrictively defined, e-commerce is “the buying and selling of information, products and services via computer networks” (Kalakota and Whinston, 1997; p.3), more specifically the Internet. However, in the context of this research a broad view of e-commerce is taken, i.e. that is not just about buying and selling goods and services through the Internet, but also about using internet technologies, such as email and web sites, for servicing customers, sharing business information, maintaining business relationships, and conducting business transactions, either within the organisation itself or with external stakeholders (e.g. the kind of definition adopted by Zwass, 1996; Poon and Swatman, 1999; Turban *et al*, 2002; Daniel *et al*, 2002; Fillis *et al*, 2004; MacGregor and Vrazalic, 2006).

In the late 1990s e-commerce was hailed as a revolution and the beginning of a new era that would transform the way business was conducted, with traditional marketing and selling approaches being replaced by new business models (e.g. Kalakota and Robinson, 1999; Currie, 2000). The Internet was perceived as a panacea, able to produce large benefits, such as reaching new markets or customers more effectively, enabling global businesses, and enhancing sales (e.g. Ainscough, 1996; Quelch and Klein, 1996; Poon and Swatman, 1999; KPMG Consulting, 1999). Moreover, organisations were led to believe that they had to embrace and adopt e-commerce to improve their competitiveness and performance otherwise they would fall behind and be forced out of business by their more quick moving competitors. SMEs were particularly going to benefit and it was widely suggested that e-commerce would solve many of their inherent problems, such as their relatively small size and limited resources. The Internet would



enable them to 'level the playing field' when competing with larger businesses (e.g. Quelch and Klein, 1996; Ainscough, 1996; Evans and Wurster, 1997; Hamill and Gregory, 1997; Poon and Swatman 1997). For example, by reducing transaction costs and opening up much wider markets beyond their locality, by enabling them to look and feel like much larger enterprises, and by having 24/7 operations via the Internet.

However, after the bursting of the dot.com bubble in 2000, with some high-profile failures, opinions changed and the literature began to reflect a more critical view of e-commerce (Fitzgerald *et al*, 2005). Other authors such as Porter (2001) and Carr (2003) maintained that the Internet was not as radical as previously suggested and that it was little more than an additional channel of communication and a marketing tool. Several studies in the UK (e.g. Booz Allen Hamilton Inc., 2002; CBI and KPMG Consulting, 2002; DTI, 2003) found businesses now seeing the Internet primarily as a tool for reducing cost, improving efficiency and customer service, and supporting existing links with clients, as opposed to the former aspirations of expanding markets and increasing revenues, as described above. Indeed, some of the actual benefits that SMEs are achieving from e-commerce are cost savings, enhanced customer service and faster response times to customer queries, improved customers' perception of the business and its products, stronger links with customers, suppliers and other collaborators, customer information gathering for marketing and product development and richer information and competitive intelligence for decision-making (Drew, 2003; Hughes *et al*, 2003; Daniel and Grimshaw, 2002; Martin and Matlay, 2003; Jeffcoate *et al*, 2002).

Nevertheless, despite this re-evaluation some authors continued to recognise the strategic importance of e-commerce and its powerful influence on markets and industry structures (e.g. Dans, 2004). It was not necessarily a panacea for all but success depended on the organisations business, background, environment, and objectives which meant that if e-commerce was applied appropriately and in suitable circumstances it could still be of substantial benefit, including for SMEs. Even more, some argue that the Internet is becoming increasingly a competitive necessity for some SMEs, as in many industries large companies and government agencies are requiring suppliers to trade with them online or risk losing their business (Drew, 2003; Soliman, 2004).

The European Union definition of SMEs encompasses organisations with less than 250 employees, a turnover lower than 50 million €, and which are owned less than 25% by non-SMEs, except banks or venture capital companies (EU Commission, 2003). SMEs comprise the vast majority of enterprises in the UK Economy and employ a significant sector of the workforce. At the start of 2006, the percentage of the workforce employed by SMEs was 58.9%,



the percentage of firms that were classified as SMEs was 99.9%, and these firms accounted for 51.9% of the business turnover (BERR, 2007).

SMEs have been found to use IT to support specific organisational tasks such as administration and accounting, relying on standard, off-the-shelf solutions, and on external support (Dixon *et al*, 2002). Most SMEs have been found to lack technical expertise (Barry and Milner, 2002) and adequate capital to undertake technical enhancements (Raymond, 2001). They also suffer from inadequate organisational planning (Tetteh and Burn 2001; Miller and Besser, 2000) and are constrained by lack of the longer-term focus necessary to plan the proper use of IT (Davidson *et al*, 2006). Chappell *et al* (2002) suggest that most small businesses are not able to formally define or understand their competitive strategy and that e-commerce can only exacerbate this problem. However, Daniel and Grimshaw (2002) argue that an advantage of SMEs is that they have the flexibility for trying new approaches due to their processes, structures and systems being simpler than larger firms'. In their comparison study of e-commerce adoption in large and small businesses, these authors found that SMEs viewed e-commerce as an opportunity for improving their performance by responding to competitors, providing enhanced customer services and improving relations with suppliers. However, their larger counterparts viewed e-commerce more defensively, in particular as an opportunity for simplifying complex internal processes and, hence, reducing costs and improving operational efficiency.

Kowtha and Choon (2001) argue that the sophistication and complexity of an organisation web site may reflect its e-commerce strategic objectives since the web site is the portal through which most electronic transactions are conducted today. Depending on the organisation's internet strategy, its web site will have different functional characteristics, the extent of which tends to increase when internet adoption progresses from a lower to higher level (Teo and Pian 2004). The following section reviews Stage Models, which are one of the most common approaches that have been utilised to encourage and study the adoption of e-commerce technologies in businesses.

### 2.3. Stage Models

A web site is the main channel that SMEs adopt for e-commerce and a range of studies have found evidence that SMEs incorporate particular web site characteristics over time in sequential stages of e-commerce sophistication (e.g. Poon and Swatman, 1999; Chaston *et al*, 2001; DTI 2002; Daniel *et al*, 2002; Rao *et al*, 2003; Burgess *et al*, 2005). These models, known as Stage Models, suggest a development of web sites in successive iterations or redesigns, typically starting with a simple web site through to more sophisticated and complex e-commerce features, over time. For example, the UK Department for Trade and Industry (DTI) used the 'e-adoption



a relatively stable and predictable pattern of development through a number of successive, identifiable stages (Van de Ven and Poole, 1995). Each stage is cumulative and reflects a particular level of maturity in terms of the use and management of IS to support and facilitate business activities, processes and operations. Achievement of the first stages of development allows the organisation to gain experience, which it can then use to its benefit to move on to the next stage of development, at which point it will gain further experience. In this way Stage Models offer insights into how IS and organisational strategies evolve over time and have become a popular element of IS planning approaches (Lyytinen, 1991).

These models have been widely used as a way of examining the adoption and progression of various aspects of e-commerce in organisations. Conceptual models depicting the stages involved in the development of internet systems have appeared in the literature (e.g. Kalakota and Robinson, 1999; Willcocks *et al*, 2000; Earl, 2000; CBI and KPMG Consulting, 2001; Rayport and Jaworski, 2002). Recent years have also seen a parallel development of several SME-focused Stage Models, seeking to capture and describe the different phases that SMEs move through, with respect to the sophistication of their use of internet technologies (Poon and Swatman, 1999; Chaston *et al*, 2001; DTI 2002; Daniel *et al*, 2002; Rao *et al*, 2003; Burgess *et al*, 2005). Furthermore, Stage Models have heavily influenced government practice. For example, governments in the UK, EU, Canada and Australia have used Stage Models to encourage and drive SME e-commerce adoption (e.g. DTI, 2002; SIBIS and European Communities, 2003; Industry Canada, 1999; NOEI, 2000), which is seen as important to the development of these economies. For example, the e-adoption ladder was used by the DTI in the UK for setting e-commerce targets and benchmarking with other countries, as discussed in Chapter 1 (Section 1.3).

### **2.3.1. Strengths of Stage Models**

Stage Models are popular frameworks and IS researchers have continued to use them to characterise developmental changes in organisational experiences with internet technologies. This approach continues to be intuitively very appealing, largely because aspects of the models ring true to both practitioners and researchers (King and Kraemer, 1984). They conform to the concept of stages in a person's learning and understanding of something new and suits our desire for orderliness and classification. Therefore, linear models may seem attractive as a simplified way to describe ICTs adoption and use (Martin and Matlay, 2001). For example, a survey of SMEs in Australia, looking at the pragmatic value of the stages concept to map the progression of e-commerce maturity in SMEs, concludes that the stages concept is useful in a pragmatic sense in that it appeals to managers (Prananto *et al*, 2002).



In addition, Sage Models have proved to be useful tools for SMEs that wish to classify themselves for comparison purposes with their major competitors involved in e-commerce within the same industry or sector, and hence, indicating gaps and leading to strategic actions (Rao *et al*, 2003; Azzone *et al*, 2001). The staged approach is thought to be useful in explaining the past, current and future involvement in e-commerce so that it can provide a roadmap to assist companies to determine whether or not it is sensible to progress to a subsequent stage (Rao *et al*, 2003). Thus, the sense of guidance and direction as to where to proceed further as well as where an organisation might focus its goals and resources is one of its major strengths (Prananto *et al*, 2002).

Finally, using the staged approach, an organisation might reduce the complexity of their e-commerce initiatives, breaking them into smaller more flexible and manageable portions (Prananto *et al*, 2002). By doing so an organisation is able to focus more on the task at hand, constantly evaluating and assessing the progression of their e-commerce initiatives. A Stage Model can assist in identifying phases of development required and provides milestones that can be understood by management. Staged development may also help control costs and allow for alteration during the development process.

### **2.3.2. Criticisms of Stage Models**

Although these models are a popular approach to explain the evolution and progression of e-commerce technologies adoption by organisations they have been heavily criticised. Firstly, Stage Models have been criticised for adopting an over simplified perspective of complex issues and circumstances around small firm economic activity (Kai-Uwe Brock, 2000), making use of some very simplistic versions of organisation change and innovation theory (Lyytinen, 1991). However, according to Fallon and Moran (2000) the use of simplified linear approaches to analyse innovation fails to illustrate the complex processes that may take place at macro and micro-economic level within individual small firms.

Secondly, the approach assumes that firms progress from basic to more advanced use of ICTs in a linear fashion. However, recent studies reported the stalling and even decline of small businesses trading online and even a decline in the use of web site and email in the UK (e.g. Booz Allen Hamilton, 2002; DTI 2002; DTI, 2003; CBI and KPMG Consulting, 2002; EU, 2003; Office of the e-Envoy, 2002). These two cases, reverse in e-trading and use of web sites, suggest that the assumption of e-commerce strategies being an unidirectional path (from a lower, simpler state to a higher, more complex one) is not borne out in practice. Actually, a regressive path may occur. For example, Rusten and Cornford (2003) in their 3-year longitudinal study on the evolution of internet strategies in firms in UK and Norway identified a whole range of variation in the way web sites have developed, including regression cases. Some



of the firms had moved from a stage where they were operating on the web merely because everybody else did, to a stage where the Internet had become a fully integrated and useful business tool. However, there were also those who had lost interest in maintaining their web site. Their study concluded that rather than always being a unidirectional stepwise process, web site strategies take different directions.

Other criticisms relate to empirical validation of Stage Models in the absence of longitudinal studies. According to Dixon *et al* (2002) and Taylor and Murphy (2004), much empirical research in SME e-commerce has tended to be cross-sectional in nature rather than longitudinal. Consequently, when organisational snapshots are viewed from a purely technological perspective, they tend to suggest that the adoption of e-commerce technologies is sequential and progressive (Taylor and Murphy, 2004). It has been widely suggested that longitudinal studies examining the same companies sequentially over time is the best approach to analyse the validity of the evolutionary path that e-commerce progression in SMEs may follow (e.g. Prananto *et al*, 2002; Daniel *et al*, 2002; Teo and Pian, 2003; Fillis *et al*, 2004).

A further criticism is that these models are too general and suggest the same path of development for all kind of companies, not taking into account the diversity of SMEs (Martin and Matlay, 2001; Dixon *et al*, 2002; Levy and Powell, 2003; Taylor and Murphy, 2004; Zheng *et al*, 2004; Burgess *et al*, 2006). SMEs are not a homogeneous group and their particular characteristics (e.g. size, age, economic activity, location, resource availability and level of internationalisation) can directly affect the needs and opportunities to engage in various e-commerce strategies (Taylor and Murphy 2004; Levy and Powell, 2003; Drew, 2003). For example, SMEs have varied reasons for establishing a web presence, and these reasons will influence the design and implementation of their web sites. According to McNaughton (2001) conducting online sales, and other business transactions, is seldom the main reason for establishing a web site. Instead, there are a variety of rationales such as enhancing corporate image, increasing brand/product awareness, providing customer service, discovering new business opportunities, and information gathering (Chau, 2003; Gribbins and King, 2004; Levy and Powell, 2003).

In addition, other change theories have been suggested as providing better insights into the actual mechanisms whereby change in the use of IT by organisations takes place. For example, 'evolutionary' models that describe evolution in terms of the mechanisms of change rather than the direction of change or the likely end state, may be more appropriate (King and Kraemer, 1984; Lamb and Davidson, 2004). Conducting research with a single preconceived change theory in mind has the risk of oversimplification and obtaining only a partial account of the development and change process at the expense of others (Van de Ven and Poole, 1995).



Finally, Stage Models have been accused of being concerned with the broad picture of change in the use of IT by businesses, rather than with the actual experiences of change in individual instances (Lamb and Davidson, 2004). Therefore, an understanding of the historical evolution of the advancements in the functionality of commercial internet applications and the growth of industry-wide experience with online business activities itself may well explain the evolutionary stages described in most of the Stage Models. However, the path organisations follow on their web development will not necessarily follow the way web applications have evolved (Deshpande *et al*, 2002).

In conclusion, Stage Models do not appear to be a firm foundation for understanding how SME adoption and implementation of e-commerce technologies develops. Thus, other theories need to be explored.

## **2.4. Approaches to study e-commerce progression**

Diffusion is the process that unfolds over time through which organisations adopt, accommodate and transform innovations. A diffusion model is accordingly a model, which seeks to understand, explain or predict how and why organisations adopt, accommodate and transform innovations (Damsgaard *et al*, 1994; Lytinen, 1991). The organisational adoption of internet technologies or strategies has been studied from a variety of different perspectives, the staged approach being just one of them. These perspectives convey different theoretical assumptions about the driving forces behind organisational adoption and implementation of technology innovations.

### **2.4.1. Factor Approach**

In previous studies of growth of SMEs, it was found that progression seems to occur when the appropriate combination of factors takes place (Storey, 1994). This approach is characteristic of the 'factor' (or 'variance') research stream, which has been the dominant paradigm in the adoption of technology innovation (Wilkins *et al*, 2000; Kurnia and Johnston, 2002). This perspective focuses on identifying the factors that influence the success or failure of the adoption and implementation of a particular technology innovation. These factors are used as independent variables (or 'contributory conditions') to predict the development and implementation of a particular innovation in organisations (Markus and Robey, 1988; Mohr, 1982). This outcome is measured by dependent variables such as the presence/absence of innovation, timing of adoption or extent of innovation (Wilkins *et al*, 2000).

Generally, e-commerce studies following this approach assess the relevance of factors identified from the organisational innovation adoption literature, and in some cases, identify additional variables (Kurnia and Johnston, 2002). There are both exogenous and endogenous factors



influencing the adoption, implementation and the successful management of ICTs (Southern and Tilley, 2000). For example, Storey (1994) suggested the characteristics of the entrepreneur(s), the characteristics of the firm and their strategy or managerial actions. In another example, Martin and Matlay (2001) found the reactive or proactive approach of owners to rapid technological changes in the marketplace to be crucial to ICT adoption and implementation. In addition, Mehrtens *et al* (2001) identified perceived benefits, organisational readiness, and external pressures, as the main factors that influence adoption decisions. Frequently these factors or variables are grouped into three groups: the nature of the technology innovation, the characteristics/capability of the organisations and the external environment (e.g. Tornatzky and Fleischer, 1990; Kurnia and Johnston, 2002).

Under this perspective, adoption is often studied by cross-sectional studies employing positivist and quantitative techniques, such as surveys, to assess various factors affecting adoption at a single epoch (Kurnia and Johnston, 2002). This approach offers useful insights into the complex array of multi-level variables that can potentially influence innovation. However, variance theories do not fully account for the complexity of the interactions between variables and the conditions contingent upon each individual study (Wilkins *et al*, 2000). Therefore, it often neglects to explain exactly how or why the predictors and outcomes are related, providing only a partial explanation of the implementation process (Newman and Robey, 1992). This often leads to contradictions as different studies may find some factors relevant while others do not. Another weakness is its static nature as it ignores changes in the innovation itself during the adoption process (Wolfe, 1994) as well as changes in the factors that influence the adoption (Kurnia and Johnston, 2002).

#### **2.4.2. Rational Approach**

The idea behind this perspective is that different types of business will approach e-commerce in different ways depending on the specific business processes they might want to carry out through the Internet (Tagliavini *et al*, 2001). Thus several internet usage profiles or approaches are possible without necessarily implying a staged implementation. This perspective assumes that a firm purposefully determine which profile or combination of profiles best suits its peculiarities (i.e. company characteristics), business context and strategy. Unlike Stage Models, it does not prescribe a necessary sequence of stages or specify that a firm that is approaching the Internet in a certain way must proceed to another use in order to get more benefits. Rather, models based on this approach imply the idea that firms must consider which mode of e-commerce is right for their business and assess if moving to another mode would be better for them or not. Thus, SMEs will focus on specific adoption strategies to meet their needs rather than follow a Stage Model. Boisvert and Begin (2002) suggest that to determine the most suitable e-commerce approach, a company must set realistic strategic objectives (e.g. business



goals) in line with its peculiarities (e.g. resources, size, age, types of products/services) and with the specific business context (e.g. industry sector, customer expectations, supplier requirements). For example, Tagliavini *et al* (2001) identified five e-commerce approaches, namely, public relations, company promotion, pre/post sales support, order processing and payment management. In a similar vein, Boisvert and Begin (2002) suggested five internet user profiles or roles: promoter, developer, vendor, integrator and PR officer.

These models can be argued to follow a rational (or teleological) perspective that assumes that organisations act purposefully to accomplish planned objectives. Under this perspective, the adoption and implementation of innovations is conceived as a rationalistic decision that involves progression through different states towards a specific objective or an end in itself. This theory states that an organisation constructs an envisioned future, purposefully takes action to reach it and monitors its own progress towards that future (Van de Ven and Poole, 1995). In other words, change is rational and occurs because organisations see the necessity of change (e.g. to accomplish the organisation's goals and objectives more effectively and efficiently).

The rational approach is also open to criticism. For example, the approach is essentially normative, rather than empirically driven, as its prescriptions describe how the organisation should change, not necessarily how it does change (Markus and Robey, 1988). For businesses with a clear vision of their corporate strategies a rational approach to understanding technology deployment is appealing. However, most small businesses do not formally plan their activities in this area (Miller and Besser, 2000; Tetteh and Burn 2001; Chappell *et al*, 2002; Davidson *et al*, 2006). According to Boisvert and Begin (2002), in the majority of companies, executives are advancing prudently, by intuition, one step at a time, often by trial and error. When the results appear poor or insufficient, they add new applications, redesign their web site, or lose interest entirely.

### **2.4.3. Institutional Theory**

Institutional theory rejects the organisational actors' rationality and claims that the structure and behaviour of an organisation are shaped by the characteristics of the environment in which it operates (Scott, 2001). Thus, organisations within a particular industry tend to look like each other over time, as competitive and customer pressures motivate them to copy each other's practices regardless of efficacy (DiMaggio and Powell, 1991). In this context, the institutional environment in which the firm is embedded may influence adoption of internet technologies. This environment (or 'organisational field') is formed by a group of organisations providing similar products or services, with the major suppliers, customers, owners and regulatory agencies, creating incentives and barriers to adoption and use. Therefore, under this perspective the decision to adopt e-commerce technologies, rather than being a purely rational and internal



decision, is likely to be induced by external pressures from competitors, trading partners, customers and government.

The phenomenon by which organisations are structured through their environment requirements is explained by 'isomorphic practices'. DiMaggio and Powell (1991) present two types of isomorphism: competitive and institutional. Competitive isomorphism pressures occur when the forces of competition eventually push organisations toward improving efficiency. On the other hand, institutional isomorphism stresses cultural and political issues as the drivers of change. DiMaggio and Powell (1991) go on to distinguish three types of institutional isomorphism, namely: coercive isomorphism, which is originated from political influences and legitimacy problems (e.g. legally imposed restrictions); mimetic isomorphism, which is driven by uncertainty and may result in the imitation of models of operation from successful companies in order to gain status and legitimacy and; normative isomorphism, which can be associated with actions of professional bodies (e.g. codes of conduct).

The use of this approach, rather than the Stages Theory, helps to explain, it is argued, repetitive practices in a non-deterministic fashion, and change is seen as part of a wider set of dynamic industry practices (Lamb and Davidson, 2004). There is not a predetermined end point, as in Stage Models but instead, change is seen as a reaction to external demands, institutional variables, and the particular environment faced by the firm.

#### **2.4.4. Process Approach**

Process theory research of organisational innovation differs fundamentally from the more common factor (or variance) approach discussed in Section 2.4.1. In variance theories the precursor factors are assumed to be necessary and sufficient condition for the outcomes to occur (e.g. successful adoption) (Markus and Robey, 1988). By contrast, process theories, rather than regarding adoption and implementation as the product of a set of static factors (i.e. predictor variables), are concerned with explaining how and why these outcomes develop over time with reference to the preceding sequence of events (Langley, 1999; Sabherwal and Robey, 1995). Typically, process models specify antecedent conditions that exist prior to the sequence of events, describe the events in the process itself, and relate those events to outcomes (Robey and Newman, 1996). Thus, the outcomes are partially predictable from knowledge of the process and the outcome can happen only under these conditions, but equally the outcome may also fail to happen (Mohr, 1982; Markus and Robey, 1988).

Understanding patterns in events and generating topologies based on similar groupings are thus key to developing process theory (Langley, 1999; Sabherwal and Robey, 1995). These patterns may take a variety of different forms and Wolfe (1994) argues that there have been two



generations of process theory research. An earlier generation termed Stage Model research, and a later generation, known simply as process research.

The earlier generation characterises diffusion of innovations as a linear sequence of phases (or stages) unfolding over time (Langley, 1999). They offer a broad process perspective on how implementation of IT evolves over time by specifying a definitive temporal order to the sequence of activities (Sabherwal and Robey, 1995). This approach of dividing processes into a priori stages can be seen for example in the early Nolan's (1973) model describing the stages of IS growth in organisations, as presented in Section 2.3.

These Stage Models have become very influential in both academia and practice and variations of the early models are widely used as a way of examining the adoption and progression of a range of technological implementations in various domains. For example: Business-to-Business e-commerce (Chan and Swatman, 2004), Knowledge Management (Gottschalk, 2002), Intranet (Damsgaard and Scheepers, 2000), e-marketplaces (Gengatharen *et al*, 2005), e-government (Layne and Lee, 2001), ERP (Ash and Burn, 2003) and SCM systems (Folinas *et al*, 2004). However, some authors have regarded such Stage Models as inappropriate, incomplete and limited. For example, Mohr (1982) points out their lack of specification of the mechanism by which subsequent stages come about and their oversight of the detailed sequences of events that occur within each stage. They have also been criticised because they portray only one possible sequence of events, through which all organisations are expected to progress (Boudreau and Robey, 1999) and because they ignore the rapid rates of environmental and technological change (Sabherwal and Robey, 1995). A more in-depth discussion of these models, including their strengths and weaknesses in the specific context of e-commerce progression in SMEs, is included in Section 2.3.

The second generation of process approaches offers an analytical alternative to Stage Models that assume neat linear progressions of broad implementation phases. It involves the empirical examination at a much finer level of detail of the sequences of events that occur (and may re-occur) during the implementation process (Sabherwal and Robey, 1995; Robey and Newman, 1996). Interpretive studies in IS provide increasing evidence that innovation in organisations is usually a complex iterative process where multilayered and changing contexts, multidirectional causalities, and feedback loops often disturb steady progression toward equilibrium (Langley, 1999). Therefore, instead of presenting innovation as an entity in stages, this approach enables a better understanding of complex innovation events as they emerge and unfold over time (Wolfe, 1994). This approach may be applied through longitudinal or retrospective research methods with small or large-sample studies that employ either qualitative or quantitative analyses (Sabherwal and Robey, 1995).



Markus and Robey (1988) highlight several advantages of process models over other formulations. Firstly, they can enable the finding of patterned regularities over time in empirical data that variance models might miss. This is because variance models do not fully account for the complexity of the interactions between variables, providing only a partial explanation of the implementation process. Secondly, the findings obtained can be generalised to other contexts and predictions can be tested for validity. However, these predictions are limited in the sense that the outcome “is likely (but not certain) under some conditions and unlikely under others” (Markus and Robey, 1988, p. 593). Therefore, this approach is useful to explain how and why the outcomes develop over time (i.e. descriptive value) but it is of limited use to suggest how they should happen (i.e. prescriptive value).

Given the advantages of the later generation of ‘process research’ over Stage Models, the researcher decided to attempt to study how and why SME web sites evolve by adopting this approach. Change theories have provided important perspectives on IT implementation issues (Wilkins *et al*, 2000) and technological innovations such as ERP systems (e.g. Boudreau and Robey, 1999) and Electronic Data Interchange (EDI) (e.g. Chan and Swatman, 1998) have been analysed as change processes as well as technological diffusions. Thus, implementation can also be seen as an organisational change process that extends over time (Walsham, 1993; Lucas 1994). Consequently, it is suggested that a change perspective could provide a useful lens through which to view SME web site evolution. However, there is relatively little research evidence to explain why and how organisations evolve their web presence over time, and less that examines this as a set of change sequences. What would be very useful would be to study different implementation process patterns, by empirically examining the sequences of changes that occur during the implementation process, over time.

## **2.5. Organisational change concepts and process research**

Given the variety of definitions associated with organisational change, it is important to establish a clear indication of what is meant by change and how these concepts might be applied to the context of change in web sites. Robey and Boudreau (1999) argue that when seeking to gain a more complete understanding of a complex phenomenon, a fruitful approach is to employ multiple perspectives. Levy and Merry (1986) suggest that organisational change can be viewed in three dimensions: the process of change, the content of the change, and the reasons for change. Each of these dimensions provides a particular lens for viewing change. The first dimension is concerned with how change occurs, examining the extent or magnitude of change (Weick and Quinn, 1999). The second dimension focuses on what the changes are, examining the empirically observable differences in the form, quality or state of an entity over time (Van de Ven and Poole, 1995). The third dimension examines why change occurs, focusing on the forces and sources for change (Pfeffer, 1982).



These three dimensions of change form the core of the multi-dimensional research framework developed by the researcher to understand the evolution of SME web sites by identifying appropriate dimensions from organisational change concepts. The next subsections discuss how each of the three can be applied to explain change in web site evolution by reviewing previous work related to each dimension.

### 2.5.1. Extent of change

The first dimension examines how change occurs. For example, one of the approaches to understanding change in organisations is by identifying change as being either episodic or continuous (Weick and Quinn, 1999). Episodic change refers to changes that tend to be 'infrequent, discontinuous and intentional'. Sometimes termed 'radical' or 'discontinuous', episodic change often involves replacement of one organisational entity for another (e.g. a strategy or programme). These changes may occur in periods of divergence when external (e.g. technology change) or internal events (e.g. change in personnel) move the organisation away from its equilibrium conditions. Continuous change, in contrast, is 'ongoing, evolving and cumulative'. Also referred to as 'incremental', continuous change is characterised by continuing updates or accommodations of work processes and social practices. Weick and Quinn (1999) argue that episodic change is most closely associated with planned and deliberate change. This type of change is created by intent, and it is normally the product of conscious reasoning and actions based on some clear expectations. In contrast, continuous change is emergent, meaning that it unfolds in an apparently spontaneous and unplanned way. Referring to changes in web sites, Ryan *et al* (2006) used these concepts to distinguish discontinuous changes or web site redesigns from incremental changes. They defined discontinuous change as "a sudden, major shift in a web site between two points in time" that "involve more than mere alterations in appearance, such as changes in the number, nature, and organisation of pages that constitute a site" (p. 657). Incremental changes, in contrast, "occur with normal maintenance of web sites" (Ryan *et al*, 2006 p. 657). This definition of web site redesigns is argued to convey characteristics from software reengineering, which refers to the examination and modification of a software system to reconstitute it in a new form, generally to add new functionality, or to correct errors (Chikofsky and Cross, 1990).

It has been suggested that an evolving approach with gradual and continuous improvements in web sites has the advantage of presenting a consistent look to users and not surprising them with a new design, only having to adapt slightly to new link titles or link placements (Ryan *et al*, 2006). This is the strategy followed by popular sites like Amazon, eBay, Google, Yahoo, etc. Their evolving approach provides time for users to become familiar with new features or presentation, making the changes so fluid that users hardly notice them (Powell, 2001). In contrast, web site redesigns have been suggested to be counterproductive in some cases, as users



generally do not like rapid, drastic changes to their interfaces (Morrison, 2001; Hudson, 2000). A completely new web site frustrates users by depriving them of a familiar system and forcing them to relearn the site, reading content and scanning links for the material they need (Powell, 2001).

In order to understand the dynamic nature of web sites some studies have collected and monitored a sample of sites over time, for example, in relation to mortality rates (McMillan, 2001), and constancy and permanence (Koehler, 1999). The survival and evolution of web sites seems to be related to diverse factors, such as the extent of resources invested in the web sites, technological expertise, organisational commitment to web-based communication, management support, site traffic and the targeted audience (McMillan, 2001). On the other hand a company may decide to shut down their web site under some circumstances. For example, when the temporary objective of the web site was achieved, customers no longer expect the organisation to have a web presence, site activity decreases to a minimal level, or the site misses financial objectives (Buchanan and Lukaszewski, 1997). In addition, Boldyreff *et al* (2001) proposed a set of categories as to how web sites may evolve: (1) 'no evolution' (i.e. no changes at all), (2) 'minor corrections' (i.e. the site is changed on an ad hoc basis), (3) 'managed redesign' (i.e. the whole site is completely removed and rebuilt on new patterns), (4) 'multi-developer maintenance' (i.e. the site is managed in sections by different developers) and (5) 'database' (i.e. when informational data in the site changes so often that a database is used to hold it).

As can be seen from the previous studies, web site evolution can follow a number of different patterns over time and it can be argued that each of them represents a greater or lesser amount of change. For example, web sites sometimes undergo redesigns ('managed redesign' or 'discontinuous changes'), they may be enhanced with additional features or functionality ('minor corrections' or 'incremental changes'), their content may be regularly updated ('database'), they may remain dormant for long periods of time ('no evolution'), or they may just die ('shut down'). Based on the above literature discussion, five a-priori categories (or evolution strategies) were selected for developing the *extent of change* dimension of the research framework as being a comprehensive classification, namely: *web site redesigns*, *incremental changes*, *content updates*, *dormant sites* and *dead sites*. These are discussed in more detail in Chapter 4 (Section 4.4).

### 2.5.2. Content of change

Having presented the first dimension of change that was about how change occurs over time (*extent of change*), this section now moves on to explore the second dimension of change, which focuses on what the changes are (*content of change*). In particular, web site evolution can also be characterised by considering the observable differences that web sites undergo over time. In



this context, different approaches have been applied to evaluate and compare web sites as they existed at two or more points in time, namely: customer-based approach, automated approach and features-based approach. Following the first approach, Barnes and Vidgen (2001) used WebQual, a survey instrument for evaluating web offerings from the ‘voice of the customers’, in order to assess how customer perceptions of web site quality had changed. They administered it before and after a major web site redesign exercise as part of a longitudinal case study investigating the adoption and implementation of the Internet by an SME. WebQual uses an index that gives an overall rating of a web site based solely on customer perceptions of quality according to three dimensions — usability, information quality, and service interaction quality.

The second approach uses software tools for computer-aided analysis of web sites. In this approach, the process is completely automated and objective, allowing the analysis and record of characteristics of a wide sample of web sites. For example, Ivory and Megraw (2005) analysed over 150 quantitative measures of web interface aspects (e.g., amount of text on pages, numbers and types of links, consistency, etc.) for over 1,500 web sites in order to assess their usability and accessibility over time and identify changes in design patterns from 2000 to 2003.

The third approach consists of a web site content analysis to measure the presence, absence, or quantity of certain features or components in a web site over time. Such analysis intends to measure the development of a web site focusing on externally perceivable aspects of the potential functions accomplished by a web site, such as providing product information, customer service, online ordering, etc. For example, Burgess *et al* (2005) examined the development of the web sites of 86 small Australian wineries over a two-year period (2000-2002) on the basis of their information content and e-commerce features. They applied a web content analysis at two points in time that measured the development of winery web sites focusing on their features according to three functions: information provision, community participation and ordering and sales.

The longitudinal evaluation approaches shown above have advantages and disadvantages. For example, the customer-based approach, usually using surveys, implies the utilisation of a small sample of actual users of the web sites and a narrow subset of constructs. The automated approach allows the analysis of many web sites automatically but it is unlikely the software tools used capture the richness of web sites, lacking data on the perceptions of the web users. Thus, the researcher believes the features-based approach to be suitable for an objective comparison of versions of the same web site and studying what features have changed. Chapter 5 (Section 5.2.3) describes and justifies a set of specific evaluation categories that were selected from previous studies and utilised within this research.



### 2.5.3. Drivers of change

Having presented the second dimension of change that focused on what the changes are (*content of change*), this section now moves on to explore the third dimension of change, which examines why change occurs (*drivers of change*). A number of categories of change were identified in the *extent of change* dimension and drivers could be investigated for each of them (e.g. web site redesigns, incremental changes, content updates, etc). However, the researcher decided to focus on web site redesigns as they represent the greatest extent of change that occurs in a web site. Moreover, Albert *et al* (2004) and Piccoli *et al* (2004) suggest that the development of business web sites takes place mainly through distinctive redesigns, when new functionalities are introduced to address gaps between users' expectations and the delivered experience.

Web site redesigns may be motivated by a wide range of reasons. For example, it may be that web sites are changed due to pressure to keep them 'fresh', to make people come back for something new, and to attract good search engine placements (Chikofsky, 1999). Web redesigns could also be motivated by a better understanding of user needs based on feedback and on new requirements, optimisation strategies, and new market directions (Kirda *et al*, 2001). Machlis (1998) argues that there are occasions when major redesigns are unavoidable. For example, if the old site is not bringing in new business or no longer meeting its purpose, if it is not offering up-to-date information and not taking advantage of web technology advances or if it is necessary to address design/architecture shortcomings (Ramlet, 2001).

There have been several attempts to identify and classify the reasons why organisations redesign their web sites. For example, in the context of academic web sites, Ryan *et al* (2006) identified four main drivers: (1) marketing reasons (e.g. to refresh an old and dated organisation's brand image), (2) rational reasons (e.g. to increase effectiveness or efficiency and better accomplish the organisation's goals and objectives), (3) political reasons (e.g. to reflect a new political regime in an organisation) and (4) institutional (e.g. to achieve a better fit with the web sites of other companies in their sector). Using a questionnaire to measure the extent to which web site change was caused by each of the four drivers, rational reasons were found to be the most important (13.6), followed by marketing (11.9), institutional (9.0), and political (6.8). The highest possible score for each driver was 15. The authors suggested that, as in other IS development projects, the justifications for web investments frequently had to do with improving functionality and ease of use. In addition, marketing reasons were important as organisations compete for the attention of web users, who may cease to find the web site interesting when pages go unchanged for a while or look dated (Ryan *et al*, 2006).

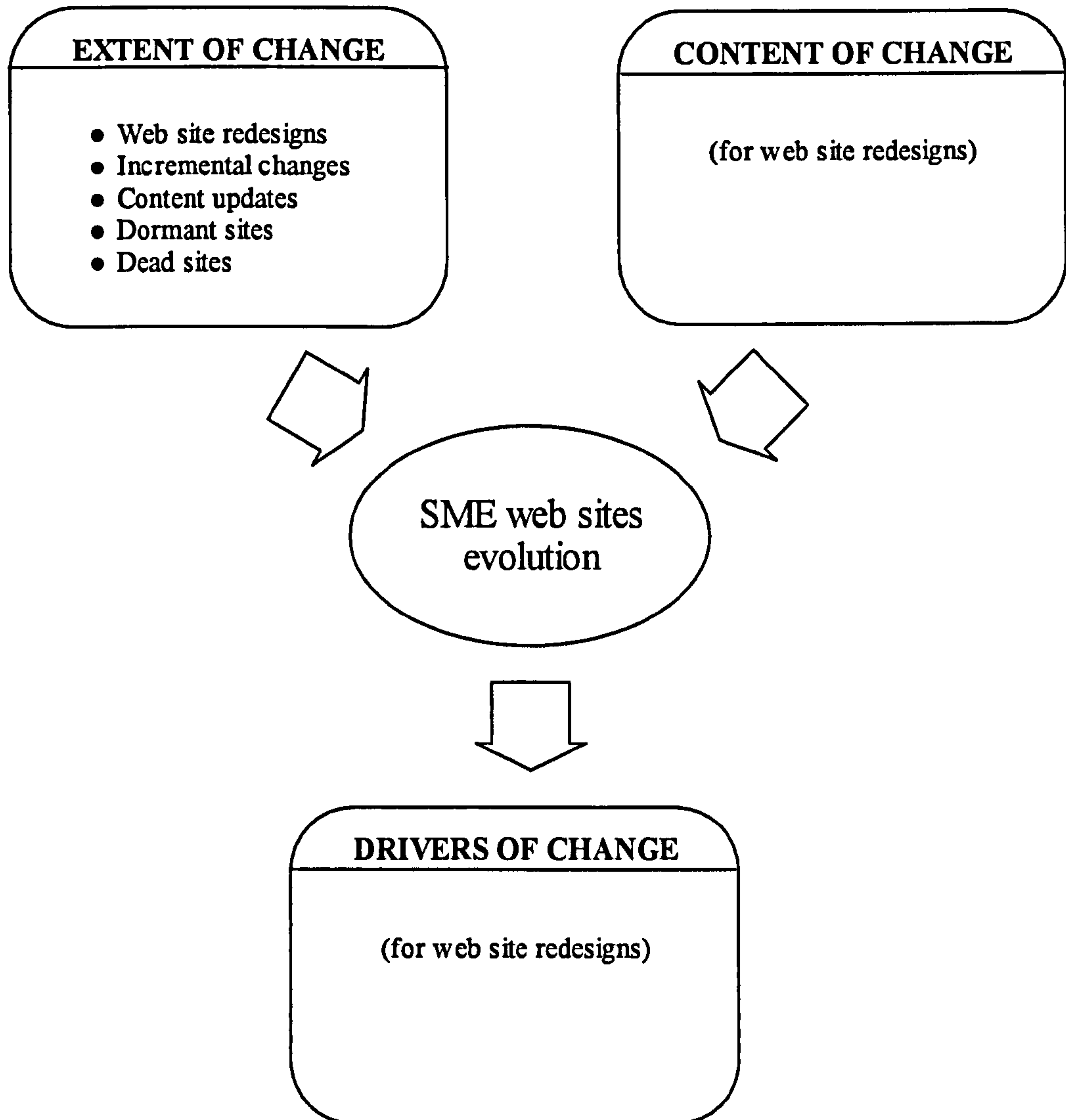


In another study Palmer and Griffith (1998) argue that organisations develop their web sites from both marketing and technical standpoints. Therefore, web site design is influenced by the marketing functions to be offered (e.g. information content, promotions, online sales, customer service/support, etc) as well as the sophistication of the technology and development tools available. Benbunan-Fich and Altschuller (2005) utilise Palmer and Griffith's framework to suggest that any change in the marketing considerations regarding the purpose of the web site and/or the Internet-related technologies would result in a redesign of the web presence to take advantage of the new conditions. Further, they added a third driver which is the firm attempting to better accommodate their users/customers needs by adding functionality and/or improving the usability of the web site. It was found that the need to expand content and change navigation protocols, in an effort to transform the site into a more efficient communication tool, were the main drivers for many of the web site transformations undertaken in Benbunan-Fich and Altschuller's period of study (1995 to 1999).

As shown above there have been some recent attempts to develop categories of drivers for web site redesign. However, the researcher was reluctant to adopt any of these categories for the framework because they were developed for different contexts: academic web sites and large business web sites. Thus, the researcher decided to build up specific categories of drivers of change for SME web site redesigns from data collected during the present study. These specific categories of drivers are discussed in detail in Chapter 6 (Section 6.6).

Figure 2-2 illustrates the conceptual research framework developed so far. It should be noted that this initial conceptual framework is generic at this point and not specific to the SME context. This is because it has not been derived from SME literature, rather from the organisational change and web site evolution literature as described in the previous sections. However, the *content of change* and *drivers of change* dimensions will be made operational with more specific categories developed in Chapter 5 (Section 5.2.3) and Chapter 6 (Section 6.6), resulting in a refined version of the framework specific to the SME context. The direction of the arrows in the figure shows that the specific categories of the *extent of change* and *content of change* dimensions are developed a priori while the categories of the *drivers of change* dimension are derived from the fieldwork.





**Figure 2-2 Conceptual Research Framework**

Previous studies on web site evolution give some insights into why and how organisations evolve their e-commerce strategies and web presence over time. However, as Table 2-1 shows, they focus on different aspects of the evolution, such as the extent of change, the changes incorporated over time or the drivers behind the changes. None of them provide a thorough understanding of all three dimensions of change and specifically in the SME context. Therefore, a comprehensive view of this evolution in the particular context of SMEs is lacking. This lack of comprehensive studies and the discussion on the aforementioned research problem in Chapter 1 (Section 1.3) provided the motivation for this study.

**Table 2-1 Previous studies in web site evolution**

Studies	Extent of change	Content of change	Drivers of change
Barnes and Vidgen, 2001		X	
Benbunan-Fich and Altschuller, 2005		X	X
Boldyreff et al, 2001	X		
Buchanan and Lukaszewski, 1997	X		X
Burgess <i>et al</i> , 2005		X	
Chikofsy, 1999			X
Hudson, 2000	X		
Ivory and Megraw, 2005		X	
Koehler, 1999	X		
Machlis, 1998			X
McMillan, 2001	X		X
Morrison, 2001	X		
Powell, 2001	X		
Ramlet, 2001			X
Ryan <i>et al</i> , 2006	X		X

## 2.6. Summary and conclusions

This chapter provides first a background about SMEs and e-commerce to setting the scope of the thesis. The context for this research is the progression of SMEs in the use of internet technologies, and in particular web sites. It analyses one of the most dominant approaches to depict the evolution of web sites and internet strategies, Stage Models. Section 2.3 discusses in some depth the usage of Stage Models and identifies their strengths and weaknesses. Some of the strengths that make Stage Models so popular for IS researchers are:

- they are intuitively very appealing because aspects of the models ring true to both practitioners and researchers;
- they are useful tools for an SME that wishes to classify itself for comparison purposes with its major competitors;
- they provide a roadmap to assist businesses to determine whether or not it is sensible to progress to a subsequent stage;
- and they reduce the complexity of e-commerce initiatives, breaking them into smaller, more flexible and manageable portions.

Although Stage Models are popular in IS, they have been widely criticised in the context of internet technologies adoption by SMEs on the basis that:



- they adopt an over simplified perspective of complex issues and circumstances around small firm economic activity;
- they assume that firms progress from basic to more advanced use of internet technologies in a linear fashion;
- they have not been empirically tested with longitudinal studies;
- they are too general and suggest the same path of development for all kind of companies, not taking into account the diversity of SMEs;
- they do not consider other change theories that provide better insights into the actual mechanisms whereby change in the use of technologies by organisations takes place;
- they are more concerned with the broad picture of change in the use of technologies by businesses than with the actual experiences of change in individual instances.

Section 2.4 provides an examination of different approaches to explain or guide the evolution of web sites and internet strategies, particularly in the context of SMEs, namely: factor approach, rational approach, institutional theory and process approach. In addition, it positions Stage Models within these approaches, as being an early generation of the process approach. This examination suggests that conducting research with a single preconceived change theory in mind has the risk of oversimplification and obtaining only a partial account of the development and change process at the expense of others. Organisational change is more complex than this and it typically involves a number of simultaneous change drivers, interacting with each other.

In order to move beyond the limitations of Stage Models, a multidimensional process approach was needed to help understand the evolution of e-commerce practices within SMEs by studying the evolution of their web sites. Thus, Section 2.5 describes the development of a multi-dimensional research framework that was designed to understand the evolution of SME web sites by identifying appropriate dimensions from organisational change concepts and previous studies on web site evolution. This section distinguishes three different perspectives in explaining change (extent, content and drivers) and explains how each of the three dimensions could be used to explain change by examining web evolution related work pertaining to each dimension. Whilst the framework itself is new, the contents of the dimensions and elements in the framework are partly, although not totally, derived from existing studies. The framework also comprised the blueprint for the fieldwork (Chapters 4, 5 and 6) and helped to pose its research questions as provided in Chapter 1 (Section 1.4).



## CHAPTER 3. RESEARCH METHODOLOGY

### 3.1. Introduction

The previous Chapter 2 describes a variety of different perspectives on the progression of SMEs in relation to internet technologies. This variety suggested the need for a multidimensional framework to help understand the evolution of e-commerce within SMEs by studying changes in their web sites. All research is based on some underlying assumptions about what constitutes 'valid' research and the appropriate methods of conducting such research, which should be stated explicitly to allow the research to be accurately evaluated (Myers and Walsham, 1998). Therefore, the present Chapter 3 provides an overview of the research approaches utilised within the IS field, which leads to the selection of an appropriate research approach and methodology for the application of the research framework on examining a sample of SME web sites over time.

To understand the evolution of these web sites, a mix of research methods was employed sequentially. The methods were observation of web sites, content analysis of web sites and interviews. The philosophical foundation utilised for guidance was pluralistic, meaning that both positivism and interpretivism were selected and combined in order to successfully address the purpose of the study. Reasons for the aforementioned selection of the philosophical underpinnings and research methods are explained and justified within this chapter.

This chapter discusses first the main philosophical perspectives within the IS field and the arguments for a pluralistic research approach that combines both quantitative and qualitative research methods. Then it provides the rationale for the selection of a positivist and interpretive approach within the present research project. This is followed by a discussion of the overall design of this research. Finally, this chapter illustrates the three research methods used for the examination of the dimensions related to the evolution of web sites as have been presented in Chapter 2 (Section 2.5), namely: *extent of change*, *content of change* and *drivers of change*.

### 3.2. Underlying research assumptions

IS is not rooted in a single theoretical perspective and there is a wide range of philosophical assumptions regarding the underlying nature of phenomena under investigation, research approaches and strategies, which a researcher can select in order to guide a particular research. Within IS, the three major philosophical perspectives are positivism, interpretivism and critical research, positivism being the most used perspective by far (Mingers, 2003; Orlikowski and Baroudi, 1991). Each of these paradigms has characteristic ontological, epistemological and methodological assumptions (Guba and Lincoln, 1994). Ontological assumptions have to do



with the form and nature of reality and what can be known about it. Epistemological assumptions concern the criteria by which valid knowledge about a phenomenon may be obtained and evaluated. Methodological assumptions indicate which research methods and techniques are considered appropriate for gathering valid empirical evidence, given the researcher's ontological and epistemological beliefs (Orlikowski and Baroudi, 1991).

Positivism assumes that reality is objectively given and can be described by measurable properties, which are independent of the researcher and research instruments (Myers, 1997). Positivist researchers maintain the epistemological position that the only valid way of studying reality is for the researcher to remain objective and detached (Myers, 1997). This objectivity is achieved by relying on the rules of formal logic and statistical inference to explain and predict the phenomenon under study and generalise their findings to construct general theories. Thus, positivist studies involve primarily empirical testability of theories, which can be 'verified' or 'falsified', in an attempt to increase predictive understanding of phenomena (Orlikowski and Baroudi, 1991). Research can therefore be classified as positivist if there was evidence of formal propositions, theoretical models, quantifiable measures of variables, hypothesis testing, and the drawing of inferences about a phenomenon from a representative sample to a wider population (Orlikowski and Baroudi, 1991). Positivist research methods include observations, measurements, surveys, questionnaires, instruments, laboratory and field experiments, statistical analysis, simulations, and case studies (Mingers, 2003).

Interpretivism assumes that reality itself is a social construction by human actors and hence incapable of being understood independently of the social actors (including the researchers) that construct and make sense of that reality (Orlikowski and Baroudi, 1991). In contrast to the positivist approach, the interpretivist paradigm maintains that social phenomena cannot be studied objectively, since the researcher is always implicated in the phenomena being studied. Consequently, the perceptions of the researcher and the observed are altered in the enquiry process (Orlikowski and Baroudi, 1991). Interpretive researchers assume that our knowledge of reality is gained only through social constructions such as language, consciousness, shared meanings, documents and other artefacts (Myers, 1997). Interpretivist research methodologies should therefore encompass the full complexity of human sense making and deal not only with the collection of objective facts and data, but also with interpreting the meanings and behaviour of the observed human actors (Lee, 1991; Myers, 1997). In other words, an interpretive study attempts to understand the meanings or reasons behind people's actions. Examples of interpretative methods include action research, case study research, qualitative content analysis, and ethnography. The most common interpretative data collection methods include participant observations, interviews and questionnaires, documents and texts, and the researcher's impressions and reactions (Myers, 1997).



Critical research assumes that social reality is historically constituted and people can consciously act to change their social and economic circumstances, although their ability to do so is constrained by various forms of social, cultural and political domination (Myers, 1997). Critical researchers hold the epistemological position that the researcher and investigated object are interactively linked, and knowledge of the social world is value-laden (Ngwenyama, 1991; Guba and Lincoln, 1994). In contrast to the interpretive school, the critical philosophy is mainly characterised by an evaluative and emancipating perspective which is not obvious in interpretive research (Orlikowski and Baroudi, 1991). The task of the critical researcher is therefore not only to explain or understand the social phenomenon, but also to expose and criticise the restrictive conditions of the status quo, thereby initiating change in the social relations and practices, and helping to eliminate the causes of alienation and domination (Orlikowski and Baroudi, 1991; Myers, 1997). According to Ngwenyama (1991), critical social theory adapts the research methodology of the interpretive school to meet certain requirements (e.g. must be collaborative and sensitive to individual and organisational needs). The research methods of choice are long-term historical studies and ethnographic studies of organisational processes and structures (Orlikowski and Baroudi, 1991).

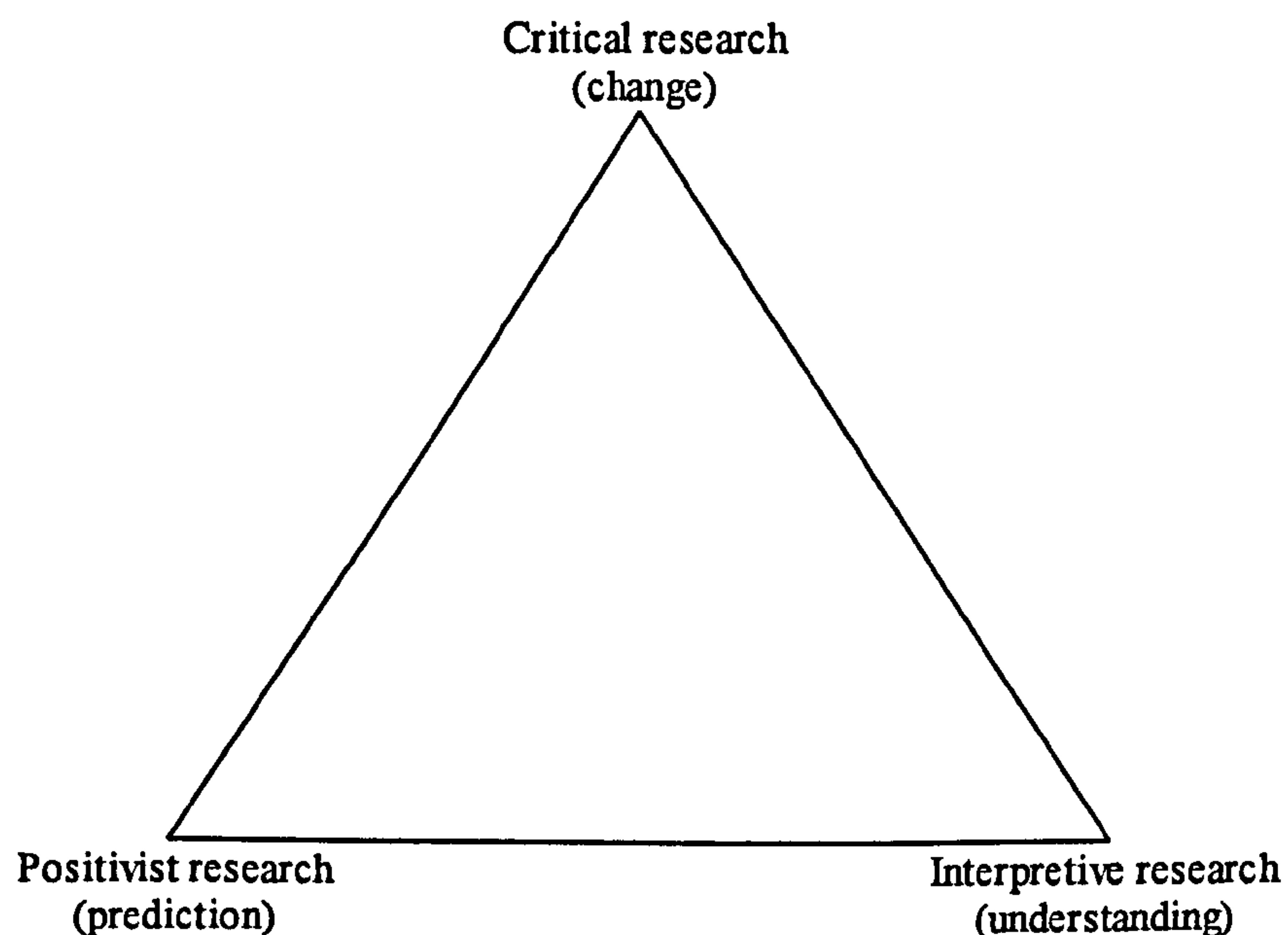
Research approaches are also generally categorised as either quantitative or qualitative (e.g. Creswell, 1994; Neuman, 2003). Quantitative methods are strongly related with the positivist approach, whereas qualitative methods are related to the interpretivist approach. Quantitative research methods were originally developed in the natural sciences to study natural phenomena. They strive for objective measures of phenomena, which try to reduce the complexity of a given organisational set up to a simpler model, measurable by means of numerical designations. In other words, quantitative research is based on translating the object of study into numbers and typically applies some form of statistical analysis. For example, it tends to learn 'what', 'how much' and 'how many' (Pinsonneault and Kraemer, 1993), and involves collecting objective numerical data that can be charted, graphed, tabulated, and analysed using statistical methods. Examples of quantitative methods include survey methods, laboratory experiments, formal methods (e.g. Econometrics) and numerical methods such as mathematical modelling (Myers, 1997).

On the other hand, qualitative research methods were developed in the social sciences to enable researchers to understand people and the social and cultural contexts within which they live (Myers, 1997). In contrast to the quantitative approach, the qualitative approach is characterised by an emphasis on interpreting meaning in textual data and the spoken word, rather than on statistical analysis of objective metrics. For example, qualitative researchers “develop categories and meanings from the data through an iterative process that starts by developing an initial understanding of the perspectives of those being studied” (Kaplan and Duchon, 1988; p. 573).



Qualitative research involves the use of qualitative data, such as interviews, documents, participant observation and the researcher's impressions and reactions, to understand and explain social phenomena.

Positivism and interpretivism are often depicted as "incommensurable paradigms", which are fundamentally incompatible and in direct opposition to one another (Myers, 1997). However, some authors argue that in practice, the divisions between them are often blurred (e.g. Weber, 2004; Easterby-Smith *et al*, 1991) and it would more accurate to portray them as a continuum because adopting an extremist stance might be utterly futile, perhaps even nonsensical (Fitzgerald and Howcroft, 1998). The research framework presented by Braa and Vidgen (1999) to divide the outcomes of IS research is useful for representing this continuum. They use a triangle (see Figure 3-1) where each vertex represents one of the main outcomes of any research: make a valid prediction (i.e. positivist research), gain understanding (interpretive research) or interact and make deliberate changes (critical research). According to their division, the three vertexes represent the three pure approaches but hybrid methods are possible within the segments between them.



**Figure 3-1 Research approaches and outcomes (adapted from Braa and Vidgen, 1999; p. 28)**

Mingers (1997) argues that in adopting a single paradigm, researchers are often gaining only a limited view of a particular research situation. He maintains that "each research approach focuses on different aspects of reality and, therefore, it is best to try to combine several together in a single piece of research or intervention in order to gain the richest appreciation of the situation" (p. 761). Such a view is also consistent with Lee's (1991) when he argues that

positivist and interpretivist designs are not only mutually exclusive, but they are mutually supportive within the same study. Pluralism in IS methods and theories is argued to be required in order to capture the richness of IS reality (Landry and Banville, 1992) and to avoid the partial view provided by any single method (Orlikowski and Baroudi, 1991). A single perspective for studying IS phenomena is thought to be unnecessarily restrictive but much can be gained if a plurality of research perspectives is effectively employed (Orlikowski and Baroudi, 1991). By incorporating multiple research methods into the research design, additional insights may be revealed that would otherwise remain undiscovered via a single methodological approach. According to Eisenhardt (1989) by combining qualitative and quantitative data a synergistic view of evidence can be achieved because data leaves room for both a positivistic and an interpretivist approach. Miles and Huberman (1994, p.40) also supports the combination of both quantitative and qualitative approaches: ". . . we have to face the fact that numbers and words are both needed if we are to understand the world".

Greene *et al* (1989) presented five categories of 'purposes' of mixed methods research in the context of evaluation research that later were adapted for use within the IS field by Petter and Gallivan (2004), namely triangulation, complementarity, initiation, development and expansion:

- Triangulation seeks to improve the accuracy and validity of results through the collection and analysis of different types of data, thereby overcoming weaknesses or intrinsic biases associated with a single observation or method. Triangulation implies convergence or corroboration of results from different methods used to assess the same conceptual phenomenon, simultaneously and independently.
- Complementarity seeks elaboration, enhancement, illustration and clarification of the results from one method with the results from other methods. Thus, different methods are used to study overlapping phenomena or different facets of the same phenomenon, yielding an enriched, elaborated understanding of that phenomenon.
- Development involves the sequential use of different methods, where the results from one method are used to help develop or inform another method. For example a first method could be used to identify a purposive sample for a more in-depth study. One method is implemented first, and the results are used to help select the sample, develop the instrument, or inform the analysis for the other method.
- Initiation seeks the discovery of paradox and contradiction to obtain a new understanding of the problem, suggest areas for further analysis, or reframe the research question from one method with questions or results from the other method. Its rationale



is to increase the breadth and depth of inquiry results and interpretations by analysing them from the different perspectives of different methods and paradigms.

- Expansion seeks to extend the scope, breadth and range of inquiry by selecting the methods most appropriate for multiple inquiry components. For example, using a qualitative method to assess implementation processes and quantitative methods to assess outcomes. Its rationale is to provide a more comprehensive understanding of the phenomena being studied.

It should be noted that the above mixed-method categories are applicable for integrating different method types not only at the level of data collection but also at the level of data analysis (Greene et al, 1989).

### 3.3. Research strategy and justification of specific approaches

In the light of the above discussions about the philosophical underpinnings and methods in IS research, a pluralist approach, as suggested by Mingers (1997) and Lee (1991), was adopted. Thus, both positivism and interpretivism were selected and combined in order to successfully address the purpose of the study, which aimed to establish an enhanced understanding of the dynamics of SME web sites transformations over time, that to date have been inadequately theorised (see Section 2.3.2). It is assumed that both paradigms represent complementary components of the research process and that by combining them the research results are arguably rich and reliable. In particular, the pluralist approach adopted for this study applied both quantitative and qualitative methods in sequential phases. Mingers (1997) argues that a research study is a process that proceeds through phases posing different problems. Thus, combining a range of approaches may yield better results because different methods are more useful in relation to some phases than others.

Initially, a positivist view was taken which aimed to investigate the *extent of change* and *content of change* dimensions as presented in the previous chapter (Section 2.5). This involved the use of two different quantitative methods (i.e. observation of web sites and content analysis of web sites) for objectively studying how a sample of SME web sites evolved over time regarding the extent or magnitude of the changes undergone (*extent of change*) and the observable differences in the web sites before and after being redesigned (*content of change*). The positivist paradigm was appropriate because it aims to facilitate the objective measurement and exploration of an external reality of objects (e.g. web sites). This was followed up with an interpretive view to gain an understanding of the *drivers of change* dimension. Thus, qualitative data was collected through interviews to investigate reasons for web site redesigns. Interpretivism was appropriate at this point because organisational phenomena, such as the decision to redesign the company

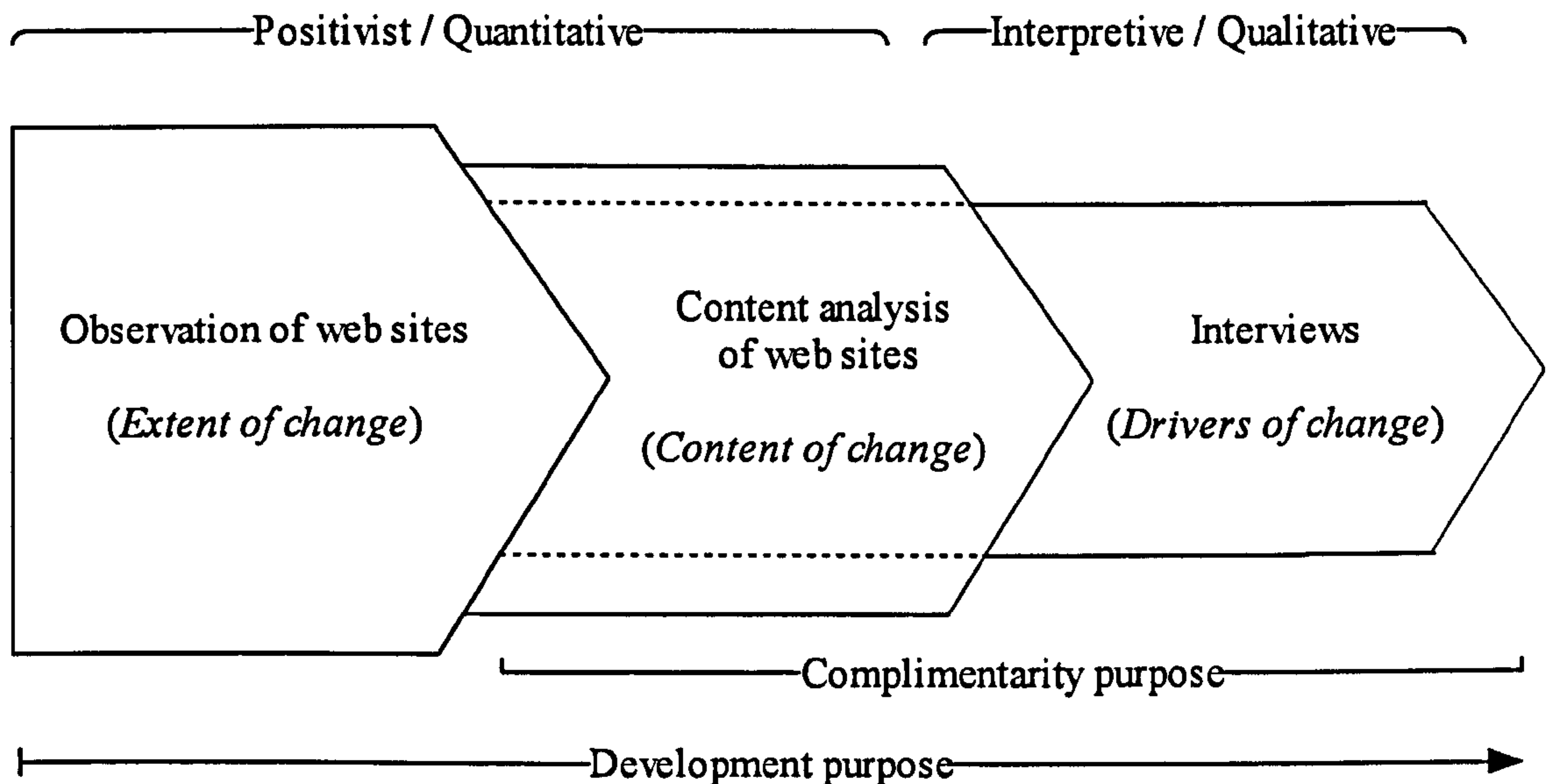


web sites, are regarded not as being objective reality but as being the result of interpretations or sense making by the social actors involved (including the researchers). A critical paradigm was not applicable because the present research project did not intend to change the social and economic circumstances of the SMEs studied.

Straub *et al* (2005, p. 229) distinguish exploratory and confirmatory research approaches. They define confirmatory studies as those "seeking to test (confirm) a pre-specified relationship" and exploratory studies as those which "define possible relationships in only the most general form and then allow multivariate techniques to estimate a relationship(s)". In exploratory research, the researcher is not looking to confirm any relationships specified prior to the analysis, but instead allows the method and the data to define the nature of the relationships (Straub *et al*, 2005). The design of an exploratory study must be flexible enough to permit the consideration of many different aspects of the phenomenon as emphasis is on obtaining a greater understanding of a particular issue (Neuman, 2003). Due to the lack of a substantial body of research and an established theoretical base in the field of SME web site evolution, this study was exploratory, employing a combination of appropriate paradigms and research methods. Accordingly, the present study did not bring a priori formal hypothesis, only guiding research questions (see Chapter 1, Section 1.4).

According to the Greene *et al*'s (1989) classification of purposes of mixed methods presented in the previous section, the three different data collection methods in which this research was carried out were applied with the purposes of 'development' and 'complementarity'. As illustrated in Figure 3-2, the shape and size of the different blocks show the stepwise nature of the work through the three phases. This is, the results from the first observation of web sites were used for selecting a particular sample of companies where a web redesign had taken place so that further content analysis of changes and interviews could be conducted (development purpose). The blocks decrease in size as each step focus on a specific sub-sample of the previous phase. This first purpose fits also the multi-method described by Mingers (2001) as 'sequential design' when different methods are employed in sequence with results from one feeding into the later one. For example, when a quantitative approach identifies suitable organisations or individuals for subsequent qualitative analysis. In addition, the findings from the content analysis of redesigned web sites were also combined with the findings of the interviews to obtain a better understanding of the evolution of these web sites (complementarity). The dotted lines in the figure show that the interviews were conducted with a sub-sample of the cases where web redesigns were identified and analysed. Thus, the complimentary purpose applies only to the overlapping area where both content analysis of web sites and interviews refer to the same cases.





**Figure 3-2 Research approaches and methods used**

In the following sub-sections, each phase is discussed and justified separately. However, further details about the specific data collection and data analysis techniques employed within each of the three phases of the research are explained in detail in the next three fieldwork chapters. By presenting these details in separate chapters, it is the researcher's hope to help the flow of presentation.

### 3.3.1. First phase: observation of web sites method

*Extent of change*, the first dimension of the research framework developed in Chapter 2 (Section 2.5.1), examines how change occurs in terms of the magnitude or extent of the changes occurred on web sites. Web site evolution can follow a number of different patterns over time, each of them representing a greater or lesser amount of change. For example, web sites sometimes undergo redesigns, they may be enhanced with additional features or functionality, their content may be regularly updated, they may remain dormant for long periods of time or they may just disappear. Thus, a method was needed for observing these changes over time.

Longitudinal case studies and/or questionnaire surveys at multiple points in time have been suggested to be helpful in examining e-commerce progression within organisations (Prananto *et al*, 2002; Teo and Pian, 2003; Daniel *et al*, 2002). However, self-report methods, such as interviews and questionnaires, have weaknesses as they may change the attitudes and behaviour of those being studied and may be limited by the availability of research participants and their willingness to cooperate with the researcher (Lee, 2000). For example, presenting a set of descriptions in advance might 'lead' to certain extent respondents into believing there is an evolutionary path that forms stages of development in their use of IS (King and Teo, 1997).



Observational methods, however, attempt to reduce participant reactivity by directly observing behaviours rather than asking research subjects about them (Tashakkori and Teddlie, 1998). A way of classifying observation methods is by distinguishing between participant and non-participant observation, depending on the role of the researcher during the data collection. In participant observation researchers observe behaviours or events in their natural setting and record them. The researcher is an active participant in the interpersonal environment of the phenomena that is being observed and his/her main objective is to measure or document the behaviours and interaction patterns as they occur in the 'natural setting' (Tashakkori and Teddlie, 1998). Non-participant or unobtrusive observation, in contrast, sets the researcher aside as a non-intrusive part of the setting in which the behaviours and/or interactions are being observed (Lee, 2000).

Webb *et al* (1981) coined the term 'unobtrusive measures' to refer to data gathered by means that do not involve direct elicitation of information from research subjects. Unobtrusive measures are 'non-reactive' (Webb *et al*, 1981) in the sense that they are presumed to avoid making interferences with the behaviour they are observing. In other words, as the research subjects do not know they are being observed, there is not the concern that the observer may change the subject's behaviour.

The advantage of employing unobtrusive observation of web sites in this research is that it allows a non-obtrusive identification of different evolution strategies, such as web redesigns and incremental changes, over time with no explicit interaction with the organisations. In addition, observations are usually flexible and do not necessarily need to be structured around a priori hypothesis. However, the observations were recorded in accordance with a predetermined classification of categories of *extent of change* (or evolution strategies). Thus, the particular observation method employed in this phase can also be classified as structured or systematic observation (Bryman and Bell, 2003). Finally, it is useful to notice that longitudinal unobtrusive observation of web sites has been used in a number of studies related to this research. These studies have been presented in Chapter 2 (Section 2.5.1) and were undertaken for a wide array of purposes. For example, in order to study web site mortality rates, constancy and permanence (Koehler, 1999) and to study the survival of web sites (McMillan, 2001).

There are also negative aspects in observational research. One of its limitations consists of being a descriptive method, not an explanatory one. Consequently, it can rarely provide reasons for the observed patterns. That is, behaviour can be described but conclusions about cause-and-effect relationships cannot be drawn as it is difficult to make inferences regarding intentions and motivations on the basis of observable behaviours. Because unobtrusive measures are inferentially weak, they are more useful when combined with other methods of collecting



information (Bryman and Bell, 2003; Tashakkorie and Teddlie, 1998; Lee, 2000). Therefore, it was necessary to combine the observations with other sources of information (i.e. content analysis of web sites and interviews) in the present research to get a more comprehensive picture of how and why web sites evolve over time.

### 3.3.2. Second phase: content analysis of web sites method

*Content of change*, the second dimension of the research framework (see Chapter 2, Section 2.5.2), examines what the changes are in terms of the observable differences that web sites may experience over time. The previous unobtrusive observation allowed the identification of different evolution strategies (*extent of change*), such as web site redesigns. Thus, a second method was needed for evaluating the changes that occur on the web sites after a web redesign. A major challenge for research of web sites over time is to assess changes in the rich multi-media environments of cyberspace (McMillan, 2001). In order to obtain an accurate depiction of how a firm's web presence evolves over time, Piccoli *et al* (2004) suggests coding the functionality that a sample of web sites offers across several generations. In this way, a web site content analysis can be applied before and after a web redesign to see whether the web site experienced any growth in functionalities and/or technical sophistication and identify trends or paths for similar cases.

Content analysis may be briefly defined as the systematic, objective, quantitative analysis of message characteristics (Neuendorf, 2002). It has been used for decades and has come to be a widely recognised research tool used in a variety of research disciplines (McMillan, 2000). Neuendorf (2002; p.10) provides a full working definition of content analysis:

*Content analysis is a summarizing, quantitative analysis of messages that relies on the scientific method (including attention to objectivity-intersubjectivity, a priori design, reliability, validity, generalizability, replicability, and hypothesis testing) and is not limited as to the types of variables that may be measured or the context in which the messages are created or presented.*

The various techniques that make up the methodology of content analysis have been growing in usage and variety. While the Internet is a dynamic medium, presenting unique challenges for use of this method, content analysis is increasingly employed for examining web-based content. McMillan (2000) examined nineteen of the earliest studies that applied content analysis to the World Wide Web, and concluded that content analysis is an appropriate technique for studying many different aspects of this dynamic environment.

In recent years, the content analysis research method has been applied to a variety of e-commerce research. There are however, different ways of analysing web content, ranging from



software-based to entirely manual approaches. For example, Bauer and Scharl (2000) developed an automated software program to analyse the content of a web site and count the number of pages, images, and external links. On the other hand, manual approaches require the use of human coders to measure the presence, absence, or quantity of certain features or components in a web site that a machine-based comparison may not detect. Examples of this kind of web content analysis include Burgess *et al* (2005) who studied a range of facilities that the web sites of small wineries offer according to three categories: information provision, online ordering, and community participation. In addition, Boisvert and Caron (2006) developed a methodology to measure, classify and compare web site function development and Waite and Harrison (2007) mapped the configuration and evolution of web sites of the pensions sector over time.

Automated tools allow the objective analysis of many web sites automatically but it is unlikely they capture all the richness of web sites, in terms of features or components. Although manual classifications can suffer a degree of subjectivity, it was decided that for this research a manual web analysis approach would be more suitable for comparing two versions of the same web site at different points of time (i.e. before and after a redesign) and studying what features of the web sites change. In order to reduce the subjectivity of the analysis, no attempt was made to evaluate the quality of the various features on the different web sites and the analysis was limited to recording the presence of specific web site features according to a set of specific *content of change* categories that are developed in Chapter 5 (Section 5.2.3).

### 3.3.3. Third phase: interviews method

*Drivers of change*, the third dimension of the research framework (see Chapter 2, Section 2.5.3), examines why change occurs and in particular, the reasons for undertaking the web site redesigns analysed in the previous phase. The two previous methods examined the extent and content of the changes but a more in-depth approach was needed so that the circumstances around the changes with the greatest extent, web redesigns, could be investigated. A variety of approaches are potentially appropriate for exploring these drivers but for the purpose of this phase of the research it was decided to adopt an interview based approach as it was felt that this would be the best way of obtaining a detailed understanding of the drivers and perceptions behind the redesigns, without imposing an artificial conceptual framework (such as an a-priori classification of drivers) on the subjects.

According to Walsham (1995) interview is the method that the researcher can best access the interpretations that participants have regarding the actions and events under investigation. Interviewing as a source of evidence has the strengths of being targeted, as it focuses directly on the study topic, and being insightful, as it provides perceived causal inferences (Yin, 1994). In addition, conducting interviews has certain advantages over other methods utilised in previous



research, such as surveys (e.g. Ryan et al., 2006) and content analysis of press releases about web site redesigns (e.g. Benbunan-Fich and Altschuller, 2005). For example, unlike surveys, interviews encourage participants to discuss issues relating to the study without biasing or imposing limitations on how the questions might be answered (e.g. multiple choice questions) (Doolin, 1996). In addition, interviews make it possible to identify the relevant and most knowledgeable key informants within the companies, unlike a questionnaire. Finally, interviews offer the advantage of allowing researchers to ask follow-up questions to obtain additional data that would probably not come to light otherwise. Therefore, for the purpose of this research it was decided to interview the SMEs that had recently undertaken a web site redesign.

In particular, semi-structured interviews (Darke *et al*, 1998) were calculated to be the best way of getting to the heart of participants' reasons and perceptions. In a semi-structure interview there is a clear structure, sequence and focus, but the format is open-ended, enabling the respondent to respond in his/her own terms. A semi-structured interview thus, provides respondents the opportunity to expand in their answers and allows the researcher to ask specific and follow-up questions to obtain additional data that would not have come to light otherwise. This method could be referred as a 'field study' rather than a multi-site case study. This is because a case study generally involves the use of numerous sources of data (Yin, 2003). However, due to limited access and the time constraints of SME managers/owners, this could not be done in this research project.

### **3.4. Summary and conclusions**

This chapter provides an overview discussion of the various research philosophical underpinnings utilised within the IS field (i.e., positivist, interpretive and critical) regarding their characteristic ontological, epistemological and methodological assumptions. Following this, quantitative and qualitative research approaches are introduced and their relations to the three main philosophical paradigms discussed. Although positivism and interpretivism are often depicted as incompatible paradigms, arguments are presented for pluralistic approaches that incorporate multiple research methods into a single study so that additional insights may be revealed.

In the light of the discussions about the philosophical underpinnings, the research approach that was followed throughout this study that examines web site evolution is both positivist and interpretive. Due to the lack of a substantial body of research and an established theoretical base in the field of web site evolution, this study was exploratory, employing a combination of appropriate paradigms and both quantitative and qualitative research methods. Thus, the study did not bring a priori hypothesis, only guiding research questions, and its aim was to establish



an enhanced understanding of the dynamics of SME web site transformations over time, that to date have been inadequately theorised.

The research questions presented in Chapter 1 did not lend themselves uniformly well to any single research method. Therefore, it was decided to adopt a mixed-methods research design consisting of three different phases:

- The first general research question (How do SMEs change their web sites?) was especially well suited to observational research because it involves the investigation of the state of web sites over time. Thus the first quantitative method was an unobtrusive observation of the extent of change of a sample of web sites over time to identify and record evolution strategies (*extent of change*).
- The second general research question (What kind of changes do SMEs make when redesigning their web sites?) called for a quantitative content analysis approach because it involved the study of the differences experienced by web sites over time. Thus, the second method was a content analysis of the redesigned web sites before and after a redesign to identify the web features most commonly added or removed to/from the web sites (*content of change*).
- The third general research question (Why do SMEs redesign their web sites?) however, entailed not merely descriptive data but also the generation of explanatory insights. Thus the third and final method was follow-up qualitative semi-structured interviews to investigate the reasons behind the web site redesigns (*drivers of change*).

These three methods were applied sequentially with the purposes of ‘development’ and ‘complementarity’ for guiding this particular research. The results from the first observation of web sites were used for selecting a sample of companies where a web redesign had recently taken place so that further content analysis of changes and interviews could take place (development). In addition, the findings from the content analysis of redesigned sites were also combined with the findings from the interviews to obtain a better understanding of the evolution of these web sites (complementarity).

Other methodological critical issues such as sample selection, data collection and analysis are discussed and detailed justifications are provided in the next three fieldwork chapters. In addition, the data that were gathered during the study is analysed and interpreted and the main trends and patterns are also discussed in the subsequent chapters.



## CHAPTER 4. EXTENT OF CHANGE: OBSERVATION OF WEB SITES

### 4.1. Introduction

The previous Chapter 3 presents an exploratory mixed research design and justifies the three different research methods selected to conduct this research (i.e. unobtrusive observation of web sites, content analysis of web sites and semi-structured interviews). This chapter describes the first of these methods, an unobtrusive observation study that was performed to identify and observe changes to SME web sites over time without the businesses' knowledge. Consequently, a sample of 256 web sites was monitored over a 24-month period and their changes recorded.

This data was collected as a means to study the types and characteristics of changes on these web sites (*extent of change*) with no concern that the observation may change the natural maintenance of the web sites. As explained in Chapter 2 (Section 2.5.1), web site evolution can follow a number of different patterns over time, each of them representing a greater or lesser amount of change. For example, web sites could sometimes undergo *redesigns* or they may just have *incremental changes* (i.e. enhancements with additional features or functionality). These evolution strategies, and some additional ones presented later (i.e. *content updates*, *dormant sites* and *dead sites*), are assessed by considering the extent of the change and whether there is a replacement of a web site for a new one. The general question that this monitoring study was designed to address was:

**How do SMEs change their web sites?**

And in particular:

**Is there evidence of a staged development from the extent of the changes in SME web sites over time?**

If the staged approach were to hold true, it would be expected to find that SME web sites are mainly redesigned, rather than incrementally enhanced, over time. This is because web site redesigns have been recognized in the literature as being often related with a revolution of functionalities and a change in stage in the evolution of a web site (Piccoli et al, 2004; Albert et al, 2004). In addition, it would be also expected to find few cases of dormant sites, which do not change over time.

This chapter discusses first the sampling method utilised and the characteristics of the sample of web sites observed. This is followed by a detailed discussion of the data collection procedures



utilised. Then, this chapter illustrates the analysis undertaken on the data gathered and finally, presents and discusses the results obtained.

## 4.2. Sample selection and characteristics

Because the number and distribution of web sites are undeterminable due to the size and dynamics of the web, many probabilistic sampling methods, such as random or stratified sampling, are not applicable (Neuendorf, 2002). Thus, a non-probability 'criterion sampling' method was used and a sample of SME web sites was chosen according to specific selection criteria (Creswell, 1998). The criterion was being registered on a recently created online directory of small business ([www.small-business-finder.co.uk](http://www.small-business-finder.co.uk)). The directory was a free information service provided by an online marketing consultancy, Mediafusion Ltd. When the sample for this study was drawn (October 2003), it contained about 300 entries, according to its founder and webmaster, Andy Cox.

The study targeted this specific group of companies because it consisted of small businesses that had very recently submitted voluntarily their web sites to the directory. This implied a proactive internet strategy in the part of the businesses, given that the directory required them to register themselves. At the time of this study, the directory had no vested interest in promoting any particular web site, which were from various industries and geographic areas in the UK. The directory provided a brief description of each company, the products/services provided, contact details and a link to the business web site when available.

In addition, each of the businesses was checked to comply with the EU definition of SME, in terms of size (less than 250 employees), turnover (lower than 50 million Euros) and ownership (owned less than 25% by non-SMEs) (EU Commission, 2003). The company databases FAME and Kompass were used to obtain financial information and the Internet Archive (<http://web.archive.org>) was used to investigate the web lifespan of each company (i.e. number of years the web site had been in operation). The businesses that did not comply with the SME definition presented above or did not have a web site address listed in the directory were not included in the sample. Out of the initial 282 businesses that complied the SME definition and had a web site address listed in the directory, 14 web sites could not be loaded, or appeared to not even exist, 5 were redirected to a different company and 7 other were under construction, holding an under-construction page, while the web site was being redesigned. Therefore, the final sample size was 256 web sites. No other constraints were placed on the sample, such as industry sector. Indeed it was preferred that a wide spread in business characteristics be achieved in order to ensure that results obtained were sufficiently robust and had the widest applicability (Remenyi *et al*, 1998; Yin, 1994).



This sample of SME web sites was chosen with the intention to explore a number of typical development patterns without making any claim that they were representative of the total SME population in the UK. However, the sample selected was deemed to provide enough variety in terms of company size, location and industries for the exploratory purpose of this study. This is in line with previous studies of e-commerce in SMEs, which often cover a wide range of industry sectors and sizes (e.g. Levenburg, 2005; Chau, 2003; Drew, 2003; Levy and Powell, 2003; Rao *et al*, 2003 and Daniel *et al*, 2002). A description of the sample is provided in the Table 4-1 below. The businesses in the sample were assigned to one of three broad business categories: *Services*, *Computer/IT* and *Retail/wholesale*. This scheme was chosen for reasons of simplicity and in recognition of the limited sample size. The classification in each instance was based on the activities described on the web site.

**Table 4-1 Characteristics of sample of companies**

	Category	Frequency	Percent (%)
<b>Business category</b>	Services	122	48%
	Computer/IT	55	21%
	Retail/wholesale	79	31%
		<b>256</b>	<b>100%</b>
<b>Business size</b>	Micro (1-9)	161	63%
	Small (10-49)	81	32%
	Medium (50-249)	14	5%
		<b>256</b>	<b>100%</b>
<b>Web presence lifespan</b>	Short (1-3 years)	60	23%
	Medium (4-7 years)	160	63%
	Long (8-10 years)	36	14%
		<b>256</b>	<b>100%</b>

Fowler (2002) argues that there are three commonly used approaches to determine a study sample size: based on the total size of the target population, on the basis of sample sizes in existing studies, and based on how large a margin of error can be tolerated in a research. Given that this study does not aim for statistical generalisation the sample size of 256 was considered reasonable and within the range of those used in related studies of change in web sites (e.g. 105 in Tan *et al*, 2001; 184 in Veronin, 2002; 221 in Hackett *et al*, 2004 and 361 in Koehler, 1999).

### **4.3. Data collection procedures**

In October of 2003, a copy of each of the web sites in the sample was made by downloading web pages using WebCopier v.3.5 ([www.maximumsoft.com](http://www.maximumsoft.com)), an offline browser. This tool records entire web sites and stores them locally allowing them to be analysed and compared, even when they have been replaced or changed on the Internet. It was decided to download the whole web sites, not only the homepages, so these files would allow the subsequent study of



their full functionality and menus (see next Chapter 5, Section 5.2.3). There are several other tools for making local copies of web sites, for example: HTTrack ([www.httrack.com](http://www.httrack.com)) or WGet ([www.gnu.org/software/wget](http://www.gnu.org/software/wget)). However, WebCopier was chosen mainly because it has an easy to use interface, is highly configurable and can zip the saved web pages for backups on DVDs. Given that some of the web sites were very large in size, WebCopier was configured to download each site for a maximum of 200 Mb and for no more than 60 minutes download time. In a few instances one or other of these limits was reached and the download was automatically interrupted. This was mostly caused by the existence of large PDF or video files and catalogues with hundreds of products. The total download of such files was deemed not necessary for the subsequent analyses. Overall, the procedure of creating offline copies of the sites was very time-consuming as the researcher had to supervise the download of each of the sites and then check that up to two levels of web pages could be browsed correctly. This procedure took around a month. WebCopier is described in some detail in the next Chapter 5 (Section 5.2.3).

Given the unobtrusive nature of the observation method, the owners of the web sites were not asked for permission for creating a copy of their web pages. However, it could be argued that there is an implied license to download the pages by virtue of being publicly accessible. For example, the Internet Archive (<http://web.archive.org>) has taken the stance that previously produced web resources should be preserved and made available in the public domain, and generally operates on a opt-out mechanism (Bercic, 2005). In order to opt out, certain machine readable internet standards are in use, such as disallow statements in the robots.txt file which is read whenever a web spider visits a web page. Thus, business owners who do not want their web sites cached or permanently preserved can explicitly exclude them from being archived. In addition, owners of an already archived web site can request its manual removal from the Internet Archive. In a similar line, the researcher assumed that if the web sites were already present in the Internet Archive and had no spider prohibition in their robots.txt file, there was an implied consent and no need of explicit approval to download these sites for academic purposes. Thus, the legitimacy of using this approach to capture web pages is also based on fair use in support of academic research. However, in order to ensure the anonymity and confidentiality of the businesses it was decided to name neither URLs nor organisations in this thesis and any published findings.

According to Lee (2000), observation is always selective and purposeful, and the researcher should decide how many periods of observation are needed and what should be noted and recorded during the observation. One of the procedures that has been developed for sampling elements is 'scan sampling' (Lee, 2000). This observational sampling method involves scanning a group of research subjects at regular intervals and recording the behaviour of each individual at the moment of scanning. In order to observe the evolution of the sample of web sites, scan



sampling was undertaken at two points: the first one in October 2003, when the sample web sites were first downloaded, and the second one after 24 months (September 2005). It could be argued that using only two snapshots during the period has the limitation of overlooking potential changes in between. However, this is an approach that has been commonly used in related research. For example, Poon and Swatman (1999) longitudinal study of small business internet use was made up of two surveys carried out twenty months apart, between 1995 and 1997. Similarly, McMillan (2001) longitudinal study of health-related web sites involved an email survey and a content analysis of the same sites at two time-points, 1997 and 2000. In addition, Barnes and Vidgen (2001) administered the survey instrument WebQual before and after a web site redesign in order to assess how customer perceptions of the web site quality had changed.

A web site-monitoring tool, Web site-Watcher 3.50f ([www.aignes.com](http://www.aignes.com)), was used to identify and track changes on the sample web sites. This tool allows the automatic monitoring of web pages for updates and changes, such as new links and content. When changes in a web page are detected, Web site-Watcher saves the last two versions and highlights all changes in the page. See Appendices 4-1, 4-2 and 4-3 for examples of an *incremental change*, a *web site redesign* and a *content update* in the sample as detected by this tool (these *extent of change* categories are described in Section 4.4). The panels on the left of the screen show the newer version of the homepages next to the old version on the right.

Although Web site-Watcher can monitor complete web sites as well as single web pages, it was decided to focus on the homepages in the efforts to identify changes. According to Nielsen and Tahir (2002), the homepage is the most important page on any web site, providing the first impression and getting more page views than any other page. Therefore, it is reasonable to assume that substantial changes in the web sites would be reflected in the homepages. In addition, configuring the monitoring tool to follow all links in the homepages would result in several thousands of web pages to monitor, making it impracticable for the researcher to double check the changes manually, given time and financial constraints. Nevertheless, the researcher double checked manually all the sites which home pages did not show any change and found the previous assumption to be valid in all cases.

Therefore, in what follows, web sites as a whole are the units of analysis. That is, the units for which findings are reported. However, the observation units that triggered subsequent analysis on the web sites were their home pages. Operationally, in this study, a home page was defined as the first screen of information that appears upon entering the URL address of a web site (i.e. default page). The only exceptions to the 'first screen' rule occurred occasionally when the first page was a referral from an older to a newer location, or was a 'Splash/Intro page' (i.e. an



animation page that a user sees before moving on to the original site). In these cases, the URL was replaced by the exact URL that pointed to the actual home page or main page. There were only 11 of such instances, and there was no ambiguity in interpreting them.

Web site-Watcher detects changed pages by checking their content, size and date (timestamp). It supports any kind of web page with textual content, independent of the file extension. That means that changes in both static pages (i.e.HTML) and dynamically generated or database-driven pages (e.g. ASP, PHP, etc) are detected and highlighted. However, Web site-Watcher is not able to highlight changes in the content of Macromedia Flash-driven web sites and within images. Therefore, it was necessary to complement the automatic monitoring by examining manually all the homepages. The researcher used IECapt (<http://iecapt.sourceforge.net/>), which is a command line utility that allows the render and capture of Internet Explorer web pages in the form of JPEG screenshots. These screenshots allowed the researcher to manually compare each of the current web sites with the archived ones.

Those web sites where change was detected were then entirely downloaded again with WebCopier for further analysis. This manual capture and comparison took around 12 hours. If web sites were unavailable, the researcher checked twice more on different days to see if the sites were back after a temporary interruption. When the sites were still unavailable, the researcher contacted the business to find out whether they were still operating or they have ceased to exist. In addition, the researcher looked up their business records in the Companies House ([www.companieshouse.gov.uk/webcheck](http://www.companieshouse.gov.uk/webcheck)) when they could not be contacted.

#### 4.4. Data analysis

The general analytical strategy was to analyse the collected data alongside the evolution strategies as delineated by the *extent of change* dimension of the research framework developed in Chapter 2 (Section 2.5.1). Thus, in order to analyse the unfolding web site evolution process over time, the observations were coded into the following *extent of change* categories: *web site redesigns*, *incremental changes*, *content updates*, *dormant sites* and *dead sites*. These categories were selected from previous web evolution studies to form a comprehensive set of categories that could be easily applied by considering the extent of the changes on the web sites:

- *Web site redesigns* are discontinuous changes in a web site that involve its reconstitution in a new form but involve more than mere alterations in appearance, such as changes in its purpose, structure and functionality. The criteria utilised for identifying a redesign objectively was to meet at least three out of the four following conditions: 1) redevelopment of the web site appearance (e.g. layout and aesthetics), 2) different



navigational mechanisms in the home page, 3) at least half of the hierarchical structure of the site being different and 4) change in the purpose of the web site.

- *Incremental changes* are upgrades that occur with the normal maintenance of a web site and do not entail a redesign. For example, adding a privacy policy page, adding a sitemap or removing some pages.
- *Content updates* refer to modification of the information presented to existing web pages, without changes to the functionality, look and feel or features of the web site. For example, update of news about the company, changes in prices and even daily automatic changes (e.g. number of visits, number of members or share prices).
- *Dormant sites* are those with no apparent updates or changes during the monitoring period.
- *Dead sites* are web sites that have disappeared and where the domain is found to be unavailable or its URL produces an error.

Then, a frequency analysis was performed to ascertain the relevance of these web site evolution categories. It is important to note that the approach of examining only two snapshots during the period has the limitation of overlooking potential changes in between. This is, in some cases more than one of these evolution strategies might have taken place during the 24-month monitoring period. For example, the same web site having *content updates* and then an *incremental change* or a *redesign*. However, for simplification and comparison purposes, this study only reported on the differences between the web sites between October 2003 and September 2005. In this way, each case was counted under only one category, that having the greatest extent of change. Should the second snapshot been taken any time earlier a different picture would have been obtained.

It is known that SMEs are not a homogeneous group and that their particular characteristics can directly affect their needs and opportunities to engage in various aspects of e-commerce (Taylor, Murphy 2004). For example, different length of experience operating a web site may mean that the business have more time to reflect on the effect of the web site on their business (Davidson *et al*, 2006). Therefore, it was considered interesting to investigate whether their web site evolution strategies vary across different type of business, sizes and lengths of experience with their web sites (i.e. web site lifespans). Thus, the frequency of occurrence of each evolution strategy was broken down by these business characteristics in order to determinate possible relationships between the evolution strategies and those business characteristics.

## 4.5. Results

After the 256 web sites were monitored for the 24-month period, a number of different *extent of change* categories or evolution strategies were identified. Table 4-2 shows the types of changes for the sample web sites in order of magnitude. Web sites that just updated content were the most numerous group (77, 30%). It is interesting to note that the second most common category of change in the sample was redesign (69, 27%). Therefore, it seems that the web sites in the sample were more frequently redesigned than incrementally enhanced (54, 21%). Sites that seemed to have disappeared, or *dead sites*, were a relevant group too (32, 13%). A small proportion of sites seemed to not have any change or update during the monitoring period (24, 9%).

**Table 4-2 Evolution strategies.**

Type of change	Web sites	Percent (%)
Content updates	77	30%
Web site redesigns	69	27%
Incremental changes	54	21%
Dead sites	32	13%
Dormant sites	24	9%
<b>Total</b>	<b>256</b>	<b>100%</b>

These evolution strategies were further explored to investigate whether different kinds of SMEs tended to evolve their web sites differently. Table 4-3 shows the detail of the evolution strategies found broken down into business categories. Given that the number of SMEs belonging to each of the business types in the sample was different, a percentage column is provided in this table to allow their comparison. Thus, this column shows what percentage each evolution strategy comprises of the total web sites for each sector so that all values from the same column (business category) add up to 100%. The highlighted cells indicate which categories of businesses differ most from the proportions of the total sample (last column on the right), in terms of the evolution strategies found. Figure 4-1 shows and highlights the same percentages but in graphical form.



Table 4-3 Evolution strategies by business category

Evolution Strategy	Computer/IT		Retail/wholesale		Services		Total Frequency	Total %
	Frequency	%	Frequency	%	Frequency	%		
Content updates	11	21%	26	33%	40	32%	77	30%
Web site redesigns	21	40%	21	27%	27	22%	69	27%
Incremental changes	8	15%	20	25%	26	21%	54	21%
Dead sites	8	15%	5	6%	19	15%	32	13%
Dormant sites	5	9%	7	9%	12	10%	24	9%
<b>Total sample</b>	<b>55</b>	<b>100%</b>	<b>79</b>	<b>100%</b>	<b>122</b>	<b>100%</b>	<b>256</b>	<b>100%</b>

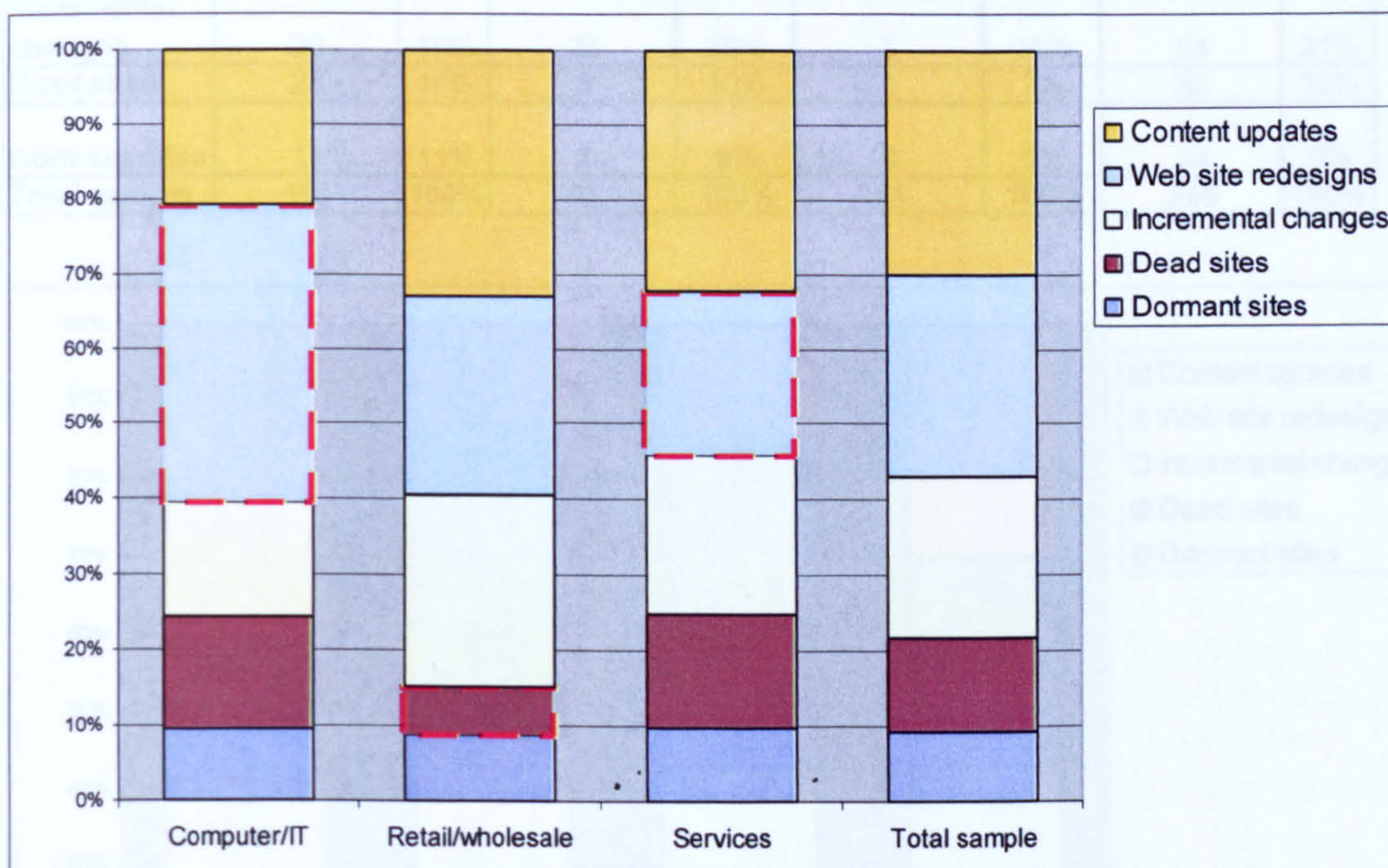


Figure 4-1 Evolution strategies by business category

The highlighted cells indicate that the SME web sites in the sample could be subject to different evolving strategies depending on their business category, particularly regarding *web site redesigns* and *dead sites*. For example, *Computer/IT* businesses seem to be characterised by redesigning their web sites more often than other businesses. In contrast, *Services* businesses were characterised by having less redesigns than other businesses. In addition, *Retail/wholesale* businesses seem to be characterised by having fewer *dead sites* than other categories of businesses. These differences may indicate that different categories of business are subject to different business pressures, in terms of frequency of web site redesigns, and different tendency of disposing of their web sites. For example, one would expect that businesses in such a constantly changing and demanding sector as the *Computer/IT* should try to keep up with this

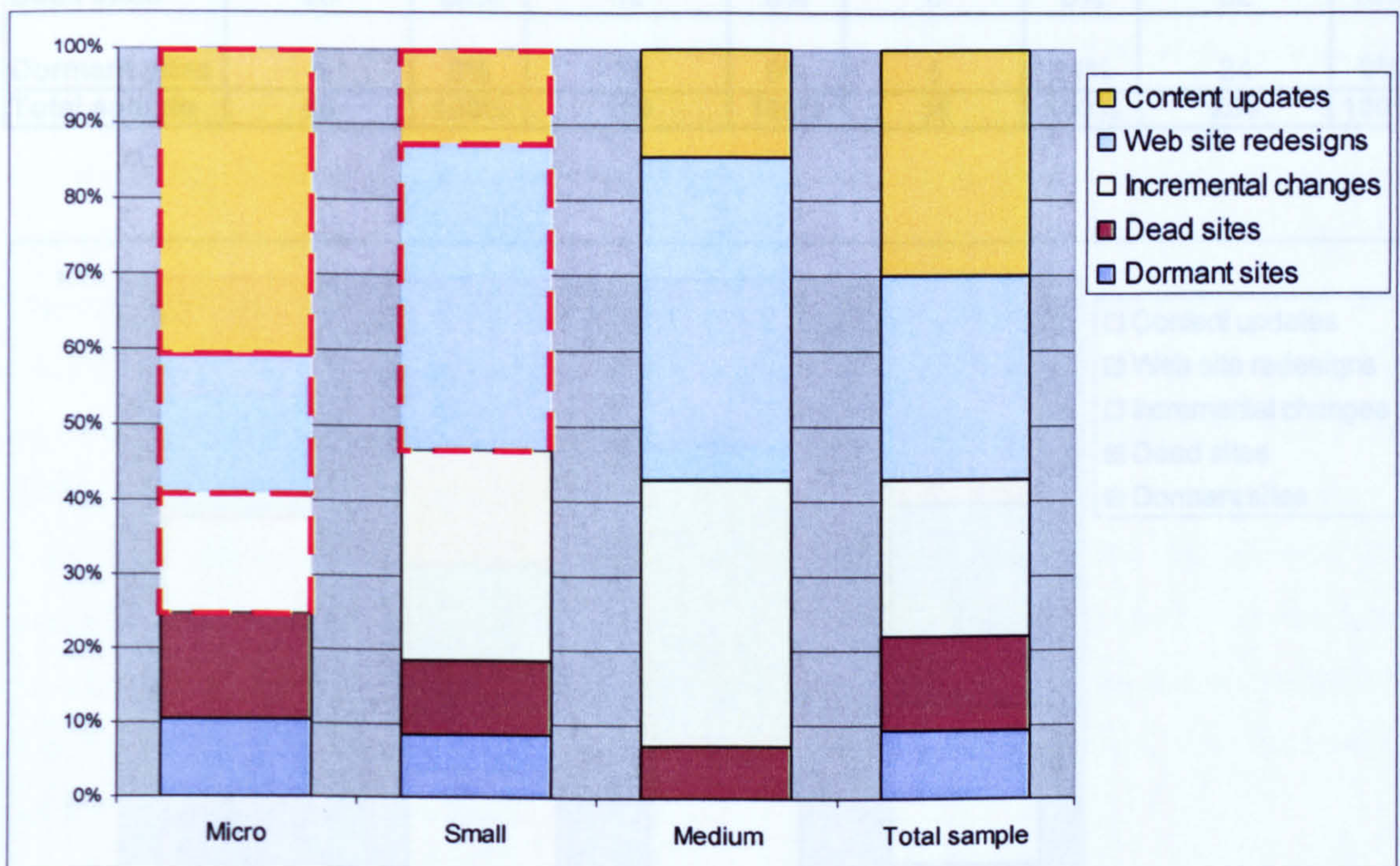


pace and so tend to change their web site structure and technologies more often than other businesses.

Table 4-4 shows the detail of the evolution strategies found broken down into business sizes while Figure 4-2 shows and highlights the same percentages but in graphical form.

**Table 4-4 Evolution strategies by business size**

Evolution Strategy	Micro (1-9)		Small (10-49)		Medium (50-249)		Total Frequency	Total %
	Frequency	%	Frequency	%	Frequency	%		
Content updates	65	40%	10	12%	2	14%	77	30%
Web site redesigns	30	19%	33	41%	6	43%	69	27%
Incremental changes	26	16%	23	28%	5	36%	54	21%
Dead sites	23	14%	8	10%	1	7%	32	13%
Dormant sites	17	11%	7	9%	0	0%	24	9%
<b>Total sample</b>	<b>161</b>	<b>100%</b>	<b>81</b>	<b>100%</b>	<b>14</b>	<b>100%</b>	<b>256</b>	<b>100%</b>



**Figure 4-2 Evolution strategies by business size**

The highlighted cells indicate that the SME web sites in the sample could be subject to different evolving strategies depending on their business size, particularly regarding *content updates*, *web site redesigns* and *incremental changes*. For example, businesses of *micro* size seem to be characterised by evolving their web sites mainly by *content updates* rather than by *web site redesigns* or *incremental changes*. In contrast, businesses of *small* size seem to show the opposite tendency with a predilection for *web site redesigns* rather than *content updates*. This may be due to *small* businesses having more resources available than *micro* businesses to invest

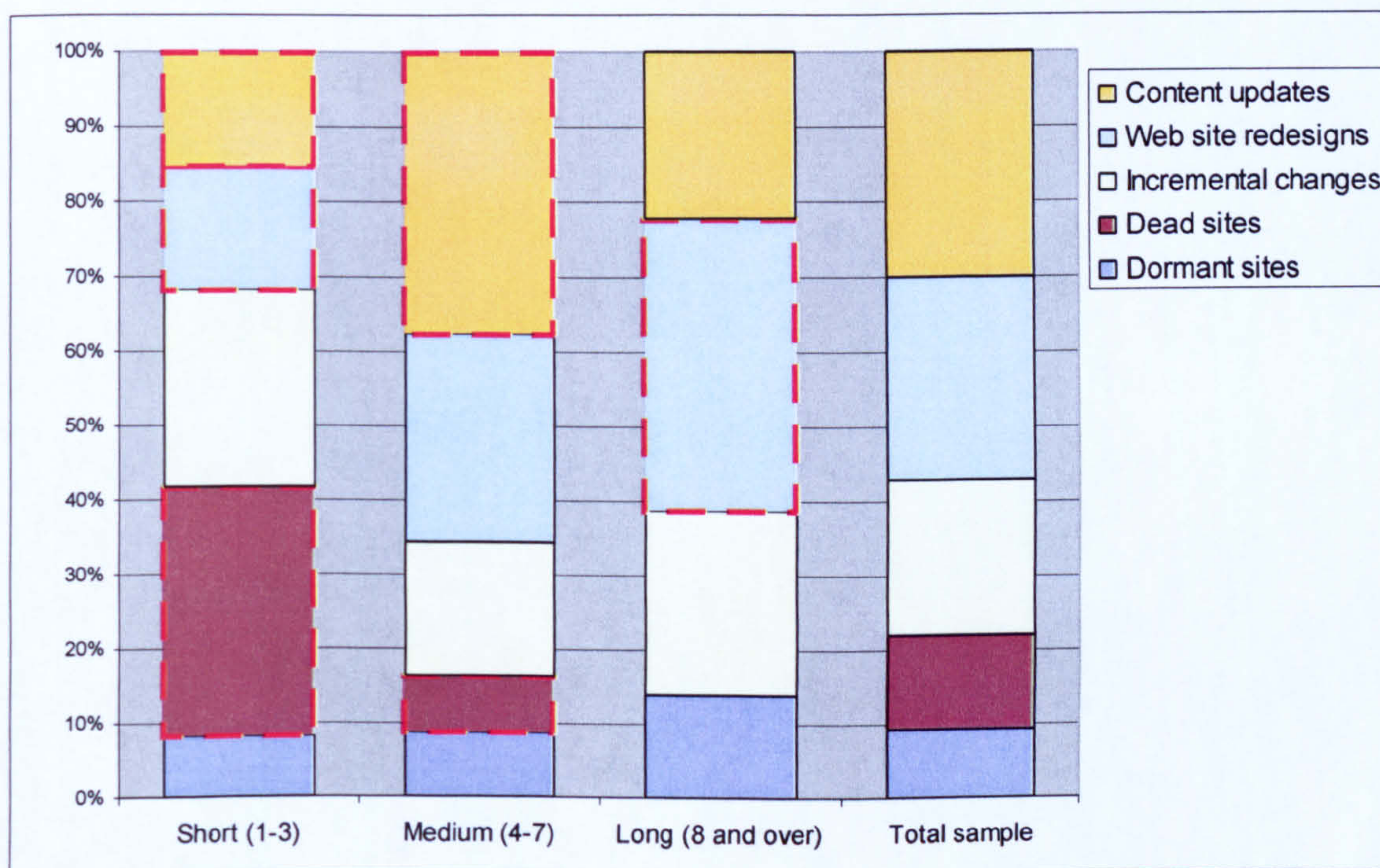


in redesigning their web sites. Interestingly, *dead sites* and *dormant sites* did not seem to be related with the size of the businesses. There were few businesses of medium size in the sample from which to make any conclusions.

Table 4-5 shows the detail of the evolution strategies found broken down into *web site lifespan* categories while Figure 4-3 shows and highlights the same percentages but in graphical form.

**Table 4-5 Evolution strategies by web site lifespan**

Evolution strategies	Short (1-3)		Medium (4-7)		Long (8 and over)		Total Frequency	Total %
	Frequency	%	Frequency	%	Frequency	%		
Content updates	9	15%	60	38%	8	22%	77	30%
Web site redesigns	10	17%	45	28%	14	39%	69	27%
Incremental changes	16	27%	29	18%	9	25%	54	21%
Dead sites	20	33%	12	8%	0	0%	32	13%
Dormant sites	5	8%	14	9%	5	14%	24	9%
<b>Total sample</b>	<b>60</b>	<b>100%</b>	<b>160</b>	<b>100%</b>	<b>36</b>	<b>100%</b>	<b>256</b>	<b>100%</b>



**Figure 4-3 Evolution strategies by web site lifespan**

The highlighted cells indicate that the SME web sites in the sample could be subject to different evolving strategies during their lifespan, particularly regarding *content updates*, *web site redesigns* and *dead sites*. For example, during the first 3 years of lifespan SME web sites are



more likely to disappear (*dead sites*) at this early stage than later on. In addition, they are also unlikely to have *content updates* or *web sites redesigns* at this stage. However, during the next 4 years of lifespan these web sites seem to be more likely to have *content updates* than during any other moment. Finally, after 8 years of lifespan they seem to be more likely to have *redesigns* than at earlier stages. This may indicate that once a SME has had the experience of maintaining its web site for at least 3 years is more likely to continue to do so and keep it up to date.

#### 4.6. Discussion

This unobtrusive observation was designed to address the general research question: **how do SMEs change their web sites?** Five different evolution strategies were studied and the frequency of each in the general sample was presented. It seems that the main way these sites evolved was by updating their content. In addition, the considerable differences found alongside business categories, sizes and web presence lifespan may indicate that SMEs in different circumstances are subject to different maintenance needs, in terms of extent of changes.

In addition, the study found the sample web sites to be more dynamic than in early web site evolution work. For example in the Boldyreff *et al* study (2001), a category termed as 'no evolution' was found to be the most frequent one. However, in the present study the equivalent *dormant sites* category was found to be the last in relevance (9%), maybe showing the improvements reached in the web maintenance area since 2001. Similarly, the *dead sites* category (13%) was found to be smaller than in previous studies about the permanence and mortality of web sites, which found mortality rates of 18% (Koehler, 1999) and 27% (McMillan (2001). However, some specific companies such as those with a web presence of less than 3 years were characterised by having greater numbers of *dead sites* (33%). In addition, the researcher found out that 8 businesses, out of the 32 with dead sites, had been declared liquidated or dissolved during the monitoring period. In addition, 4 other businesses stated that they did not need their web sites anymore as they had changed the direction of their business or did not have time to maintain them.

Interestingly, *web site redesign* was the second strategy most commonly found, being more frequent than incremental enhancements. This finding answered also the more particular research question: **Is there evidence of a staged development from the extent of the changes in SME web sites over time?** Thus, the findings regarding the *extent of change* dimension seemed to initially support the staged approach. Although evolving approaches with gradual and continuous improvements can have advantages over disruptive redesigns, it seems that some SMEs in the sample, specially *Computing/IT* businesses of *small* size and of *web site lifespan* longer than 8 years, are still launching their sites in cycles, each new redesign bringing a whole new look and user experience. According to Hudson (2000), major redesigns could be



counterproductive, as users generally do not like rapid, drastic changes to their interfaces. A completely new web site can frustrate users by depriving them of a familiar system and forces them to relearn the site, reading content and scanning links for the material they need. Instead, an evolving approach, with gradual and continuous improvements, has the advantage of presenting a consistent look to the user and not surprising them with a new design, only having to adapt slightly to new components (Ryan *et al*, 2003). Despite some evidence in the practitioner literature about a design preference for on-going incremental changes over major redesigns, this study found redesigns to be prominent over incremental changes.

#### 4.7. Summary and conclusions

Chapter 5 provides a detailed discussion of the application of the first research method (i.e. unobtrusive observation) to study the evolution of a sample of SME web sites over time. The initial unobtrusive observation identified changes to SME web sites over a 24-month period (*extent of change*).

The chapter discusses first the sampling method utilised and the characteristics of the sample of SME web sites observed. Given the difficulties of applying a probabilistic sampling method on web sites, a criterion sampling method was used and a sample of 256 SME web sites was chosen according to specific selection criteria. This is followed by a detailed discussion of the data collection procedures that involved the use of three software tools: an offline browser tool (WebCopier), a web monitoring tool (Web site-Watcher) and a web pages rendering tool (IECapt).

The general analytical strategy was to analyse the collected data alongside the categories of the *extent of change* dimension as delineated by the research framework developed in Chapter 2 (Section 2.5.1). Thus, in order to analyse the unfolding web site evolution process over time, the observations were coded into the following categories: *web site redesigns*, *incremental changes*, *content updates*, *dormant sites* and *dead sites*. Then, a frequency analysis was performed to ascertain the relevance of the above evolution strategies, both for the sample as a whole and for a break down into business categories, business sizes and web site lifespan categories.

In addressing the general *extent of change* research question (i.e. How do SMEs change their web sites?), a number of different evolution strategies were studied. The main way the SME web sites in the sample evolved was by updating their content (30%). Interestingly, redesigning was the second strategy most commonly found (27%), being these more frequent than incremental enhancements (21%). In addition, *dead sites* and *dormant sites* were found in a significant number of cases (13% and 9%), maybe indicating possible maintenance problems or barriers in SMEs. The breakdown into business characteristics seem to indicate that SME web



sites in the sample could be subject to different evolving strategies depending on their business category (regarding *web site redesigns* and *dead sites*), their business size (regarding *content updates*, *web site redesigns* and *incremental changes*) and their web site lifespan category (regarding *content updates*, *web site redesigns* and *dead sites*).

Concerning the more particular *extent of change* research question (i.e. **Is there evidence of a staged development from the extent of the changes in SME web sites over time?**), the findings regarding the *extent of change* dimension seemed to initially support the staged approach because web site redesigns were more frequent than incremental enhancements and there was a significant amount of dormant sites. Therefore, these results directed the research towards investigating the web site redesigns more in detail. Especially, what the changes were in the redesigns (*content of change*) and why these redesigns were undertaken (*drivers of change*) to obtain a more comprehensive understanding of the evolution of the sample web sites. This is covered in the following two chapters.



## CHAPTER 5. CONTENT OF CHANGE: CONTENT ANALYSIS OF WEB SITES

### 5.1. Introduction

The previous Chapter 4 presented the application of the first of three methods utilised in this research (i.e. unobtrusive observation of web sites, content analysis of web sites and semi-structured interviews). The initial unobtrusive observation identified and observed changes to SME web sites over time (i.e. *extent of change*). Among other findings, 69 web sites were found to have been redesigned. The second method presented in this chapter consists of a follow up study aimed at examining the web site features that changed after the redesigns (i.e. *content of change*). Consequently, a web content analysis study was performed on that subset of 69 web sites before and after the redesigns.

This data was collected as a means to identify changes over time in the content and design of SME web sites. As explained in Chapter 2 (Section 2.5.2), web site evolution can be characterised by considering the observable differences that web sites experience over time (*content of change*). For example, organisations may decide to implement additional features and/or functionality on the web sites or even remove them. These changes were measured by using the nine web content analysis dimensions described in this chapter (Section 5.2.3).

As explained in Chapter 2 (Section 2.3), there is a school of thought that suggests that changes made to the web sites of SMEs follow a staged approach with a growth in e-commerce functionalities and these models have been employed to advise SMEs on developing their web sites. Therefore, this second study investigates whether the actual web changes related to new internet investments (i.e. *web site redesigns*) in a sample of SME web sites implied any growth in functionalities and/or technical sophistication in the way that Stage Models suggest. The general question that this content analysis study was designed to address was:

**What kind of changes do SMEs make when redesigning their web sites?**

And in particular:

**Is there evidence of a staged development from the features implemented in SME web sites over time?**

This chapter discusses first the methodological steps recommended by McMillan (2000) for content analysis of web sites and the particular challenges that this method presents. Then, this chapter presents and discuss the results obtained.



## 5.2. Content analysis of web sites

McMillan's (2000) investigation of early web site content analysis studies identified a number of challenges of applying this method to the Web. These challenges are discussed in detail below alongside the five primary web site content analysis steps that she suggested, namely: (1) formulating the research questions/hypothesis; (2) selecting the sample web sites; (3) defining the unit of analysis and coding units categories; (4) training coders examining the web sites, coding and checking reliability; and (5) analysing and interpreting the data.

### 5.2.1. Research Question

The first step is to formulate research questions and/or hypothesis. McMillan (2000) suggests that researchers should build on earlier theoretical and empirical work in defining their web-based research. A challenge is to find a context for the identified research questions in existing theory. The general research question that this second phase of the research addresses is:

**What kind of changes do SMEs make when redesigning their web sites?**

And in particular:

**Is there evidence of a staged development from the features implemented in SME web sites over time?**

These research questions are exploratory in nature as the purpose of this study is to examine patterns in the development of the sample web sites, rather than testing any a priori relationships among variables. However, the particular research question is framed in the context of Stage Models of e-commerce development as these have often been used in this area (see Chapter 2, Section 2.2).

### 5.2.2. Sample of web sites

The next step is to select the sample. Given the rapid growth and change of the Web, with new web sites appearing or being removed and available directories always incomplete, drawing a rigorous probabilistic sample may be one of the most difficult aspects of content analysis on the Web (McMillan, 2000). Two common ways of defining a sampling frame are to use an online list of web sites in a given category and to identify web sites that met criteria related to the purpose of the study.

As used in the previous chapter, the particular sample strategy in the second phase of the study was criterion sampling, which requires all participants in the study to meet certain criteria and to have experienced the phenomena being studied (Creswell, 1998). The sampling frame was the 256 SMEs web sites that were monitored for 24 months during the first phase of this research



(unobtrusive observation, Chapter 5). The selected sample for this second phase (web content analysis) was the SME web sites that had been redesigned during the monitoring period (October 2003 to September 2005), 69 in total. McMillan (2000) found that the majority of the studies she investigated had a sample size of between 50 and 500 web sites, so the sample size of the present study was considered within the range of similar previous studies, albeit at the lower end. A description of the sample is provided in the Table 5-1 below.

**Table 5-1 Characteristics of sample of companies that had web redesigns**

	Category	Frequency	Percent (%)
<b>Business category</b>	Services	27	39%
	Computer/IT	21	30%
	Retail/wholesale	21	30%
		<b>69</b>	<b>100%</b>
<b>Business size</b>	Micro (1-9)	30	43%
	Small (10-49)	33	48%
	Medium (50-249)	6	9%
		<b>69</b>	<b>100%</b>
<b>Web presence lifespan</b>	Short (1-3 years)	10	14%
	Medium (4-7 years)	43	62%
	Long (8 years and over)	16	23%
		<b>69</b>	<b>100%</b>

### 5.2.3. Unit of analysis and coding units

The unit of analysis is the element on which data are analysed and for which findings are reported (Neuendorf, 2002). Defining the unit of analysis is a unique challenge for web content analysis as coding an entire site could be extremely time-consuming (McMillan, 2000). As for the previous phase of the present study (i.e. unobtrusive observation of web sites), the web sites as a whole were the units of analysis. Thus, they were browsed at least two levels down the site hierarchy, taking an average of 30 minutes for each site, so that their main features could be identified. Some researchers suggest limiting the analysis to the home page because this is the most visited page in the site and many users decide whether they will continue to browse it on the basis of their first impression of this page (McMillan, 2000). However, given the relatively small size sample of the present study, it was decided to employ a more comprehensive approach that would allow the coding of web features that might not be included in the home page.

Given the changing nature of the Web and frequent changes in the content of web sites, defining the time frame of the study is another challenge (McMillan, 2000). Content analysis necessitates rapid collection of data to make sure that all coders are analysing the same content. Thus, it has been suggested to use software tools to download entire web sites in an attempt to capture a



snapshot of their content that will not change between the coding times (e.g. Koehler, 1999; McMillan, 2000). Following this advice, a copy of each of the web sites in the sample was made at the beginning of the monitoring period (October 2003) by downloading web pages using WebCopier v.3.5 ([www.maximumsoft.com](http://www.maximumsoft.com)), an offline web browser. Those sites where a redesign was detected during the first phase of the study (unobtrusive observation) were then fully downloaded again (69 in total).

WebCopier records entire web sites and stores them locally allowing the subsequent study of their full functionality, structure and content, even when they have been replaced or changed on the Internet. It creates a static copy of any dynamic pages (e.g. ASP, PHP, etc) and converts all web site links to relative form so that these sites could be later browsed off-line (see Figure 5-1 for an example). There are two main panels in the figure. The panel on the left is the 'Contents Tree' and it displays graphically the logical structure of a web site (i.e. how pages on a web site are linked to each other). The panel on the right is an integrated browser that displays the web page that is highlighted in the Contents Tree. This tree is saved in a project file (.wcp) but the web pages created in WebCopier do not require the proprietary browser and can be viewed by using any regular browser (e.g. Netscape or Internet Explorer). The advantage of using the WebCopier integrated browser is that the researcher can see the logical structure of a web site and then click on any node of the Contents Tree to load a specific web page. The toolbar that dominates the interface is a row of large buttons at the top for saving, closing and copying projects and managing the download of web pages. Then there is a smaller toolbar directly above the right panel that serves as the viewing screen for the page that is selected. This bar looks like a standard browser bar, and it works like one.

A further challenge is to define the coding units, which are the smallest segments of content counted or scored in content analysis (McMillan, 2000). Neuendorf (2002) suggest that all decisions on coding units, their measurement and coding rules (i.e. coding scheme), must be made in advance in order to make valid inferences. Having a predetermined analysis structure allows the systematic and objective collection of data uniformly across all the observations. However, Neuendorf also advises that some exploratory work should be done before a final coding scheme is 'set in stone'. Thus, the coding process may be viewed as a combination of induction and deduction. In line with this recommendation, the coding scheme used in this study came together in a manner that was both top-down and bottom-up. This is, a number of web evaluation categories and features were initially derived from a review of literature, then the content of these categories was refined by the pilot coding described in the next section.



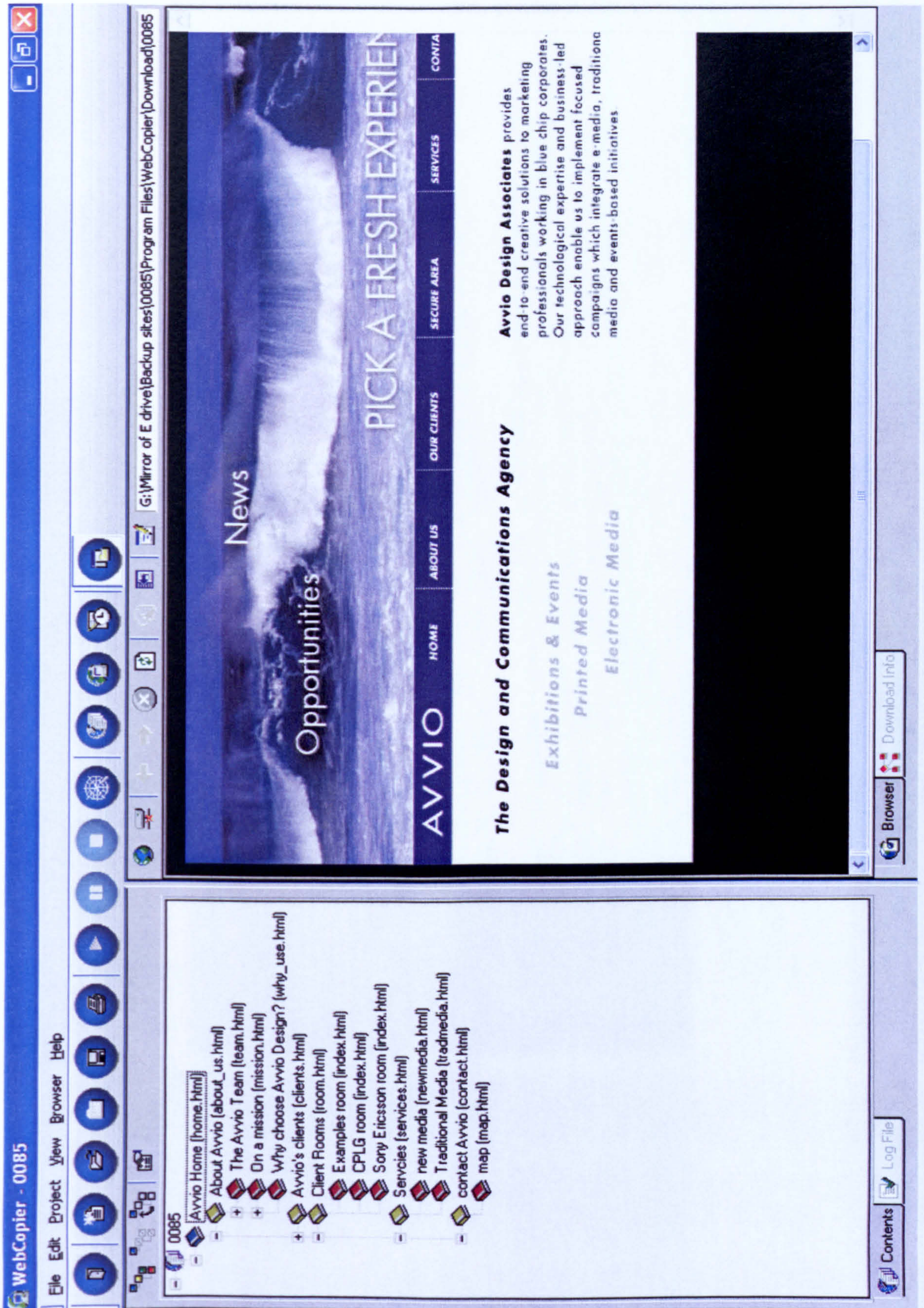


Figure 5-1 Example of a web site archived with WebCopier

In the area of web content analysis, categorisation systems of coding units used by researchers are mainly web content features (e.g. about us, contact information, products information, etc)



or design features of web sites (e.g., links, animation, video, sound, etc). These features have been grouped in different categories corresponding to potential functions that can be performed by a web site; for example, identifying the company that owns the site, making it easier to find information, providing product information, customer service, online ordering, etc. However, standard lists of categories and features are rarely used and these categorisations are often specifically related to the goals of each particular study and focused on specific industries.

Due to the lack of any generally-accepted criteria that is robust enough to allow it to be used over a broad range of SME web sites, it was decided to develop web site evaluation categories by integrating the criteria used by previous studies. This integration would form a comprehensive set of categories and features that could be objectively applied by browsing SME web sites and recording the presence or absence of web features. Thus, the nine web evaluation categories presented in Table 5-2 below are based on a range of categories as utilised in studies by Elliot *et al* (2000), Azzone *et al* (2001), Burgess *et al* (2005), Hassan and Li (2005) and Boisvert and Caron (2006).

**Table 5-2 Categories of web content analysis derived from previous studies**

<b>Integrated evaluation categories</b>	<b>Previous categories</b>	<b>Studies</b>
<b>Navigability</b>	Navigability Ease of use Navigation	Boisvert and Caron (2006) Elliot et al (2000) Hassan and Li (2005)
<b>Accessibility</b>	Accessibility	Hassan and Li (2005)
<b>Content for Identification &amp; Image</b>	Identification, Image, Expertise General Information Company Information & Functions Background Information General Information, Contact Information	Boisvert and Caron (2006) Azzone et al (2001) Elliot et al (2000) Hassan and Li (2005) Burgess et al (2005)
<b>Content for Promotion &amp; Contract</b>	Products, Services, Contract Product & Service Information Product / service information and promotion Product Information	Boisvert and Caron (2006) Azzone et al (2001) Elliot et al (2000) Burgess et al (2005)
<b>Content for Relationship Enhancement</b>	Customer service, Customer loyalty, Investors, Internal relations Complementary Information, Customer service, Customer support Customer Services, Communities, Customisation Entertainment	Boisvert and Caron (2006) Azzone et al (2001) Elliot et al (2000) Hassan and Li (2005)
<b>Relational Interactivity</b>	Partners, Monitoring & leadership Specific collection of information Community building, Customisation Interactivity Community	Boisvert and Caron (2006) Azzone et al (2001) Elliot et al (2000) Hassan and Li (2005) Burgess et al (2005)
<b>Transactional Interactivity</b>	Transaction Online transaction Transaction processing Ordering & sales	Boisvert and Caron (2006) Azzone et al (2001) Elliot et al (2000) Burgess et al (2005)
<b>Security &amp; Confidentiality</b>	Security, Respect	Boisvert and Caron (2006)
<b>Site Management &amp; Maintenance</b>	General collection of information	Azzone et al (2001)

The categories found on the above studies were grouped into nine general categories based on suitability and context of use. Only generic and objective categories were selected so that they are applicable to all types of SME web sites. Some categories, such as *Content for Identification*



& *Image* or *Relational Interactivity*, were found on all previous studies. However, other web design aspects, such as *Accessibility* or *Security & Confidentiality*, were only covered by a few of the studies. Consequently, the proposed categories have advantages in terms of coverage compared to the previous studies, whereby the proposed categorisation covers wider web site issues. The new categorisation includes not only content and interactivity aspects but some design aspects overlooked by previous studies. These nine categories lay the foundation to examine the *content of change* dimension in the present research:

- ***Navigability (NAV)***: This category identifies features that facilitate simple, intuitive and consistent navigation, which is important for all kind of web sites. These features guarantee the ease of use of the entire set of web pages so that users can find their way around the web site. Without efficient navigation, users are easily confused. Thus, they should always know where they are in the site and where they can go from their current position (Hassan and Li, 2005). Discovering specific information on a web site is also of crucial importance, especially when sites are complex and contain several hundred of web pages. Availability of search engines enables users to quickly and easily find the information they need. In commercial web sites with online ordering, search capabilities assist the users in finding a specific product quickly. In addition, a web site may need to cater for a range of users with specific needs so that access to different areas/objects is provided through different paths (Elliot *et al*, 2000). This category is addressed by features such as *menu bars*, *sitemap*, *path followed*, *in-site search*, *links to target audience*, etc.
- ***Accessibility (ACC)***: One of the goals of having a web site is to attract as many visitors as possible from various locations and in order to achieve this, the site should be accessible to the target users (Hassan and Li, 2005). Thus, this category deals with features that make the site and its content more accessible in different browsers, for different connection speeds, and for users with disabilities so that they are able to browse all available content. This category also includes providing a printer friendly environment within web pages to ensure they will print on standard A4 size paper. Other example features include *text only version*, *links to plug-ins required* and *option to change the text size*.
- ***Content for Identification & Image (CII)***: The most obvious thing one would expect to find on a web site is the company's details. Elliot *et al* (2000) suggest that a problem with a virtual company with no physical address or contact numbers is that it may alienate customers. Brands create a basis for trust between a business and its customers. Burgess *et al* (2005) argue that a business dealing with customers over the Internet may



require even stronger branding because the nature of the medium makes it so easy for them to look elsewhere. Consequently, this category reflects the necessity for organisations using the web to establish a corporate entity in the Internet market and to promote its expertise, legitimacy and credibility. This category deals with features such as *about the company, mission and values, customer testimonials, press releases, etc.*

- **Content for Promotion & Contract (CPC):** An important category of content in any commercial web site is the availability of information about the range of products or services currently provided, including pricing, promotions and conditions related to business transactions. Some example features in this category are: *electronic catalogue of products, promotions, services offered, terms and conditions of sale, etc.*
- **Content for Relationship Enhancement (CRE):** This category relates to specific information to support customers, including technical support and professional after-sales service, and to develop preferred relationships with other stakeholders (e.g. candidates and investors). For example, providing frequently requested information (FAQs) in a way that is easy to access and a broader approach to customer service by including links to other relevant sites. This category also includes customer loyalty marketing campaigns, such as contests and prizes, which can help companies collect specific information about their web site visitors and drive more traffic to the web site. Other example features are *downloads of company literature, generic information of products and financial data.*
- **Relational Interactivity (RI):** This category refers to features in a web site that facilitate a two-way communication between users and the company. This entails not only allowing users to give feedback and comments on issues raised by the web site but also providing the means for these users to interact or communicate one another. Where a company is interested in creating, monitoring or leading changes in an online community of interest, forums let customers share their opinions and experiences. This interaction could help them in decision making and also help the company to improve its services. Companies interested in developing personalised relations with customers and business partners can also offer secure areas for members only. Some examples of features related to this category are *contact form, discussion forum, members' area, newsletter sign-in, chat, etc.*
- **Transactional Interactivity (TI):** This category provides an assessment of the extent to which a web site supports full transaction processing, such as selling on-line or other transactions, such as reservations for service firms. These online features complete as



large a part of the transaction as possible. For example, *print & fax order form, online ordering, online payment, etc.*

- **Security & Confidentiality (SC):** Security and privacy is an ever increasing important issue and all type of web sites should have written policies defining how the security of transactions on the web site is ensured as well as statements about how the web site will keep any personal information collected safe and it will not be misused. Thus, this category deals with features such as *privacy policy, security certifications and entry in secure zone of web site (padlock).*
- **Site Management & Maintenance (SMM):** It is important that web sites indicate how current the content is as this may suggest the level of attention web site creators are paying to the audience and the content of their site. Moreover, it is a good practice to provide contact details for those wishing to advise of web site problems and other issues. This category also deals with the enabling technologies for building web pages, which vary from static HTML pages to dynamic technologies (e.g. ASP, PHP) and rich interactive multimedia Flash presentations. Thus, some of the features that this category includes are *date of last update, webmaster link and dynamically generated pages.*

#### 5.2.4. Training coders, coding and checking reliability

The researcher and a postdoctoral Research Fellow from the same department at Brunel University worked as coders. According to Holsti (1969), training is necessary to ensure that coders are relying upon the same aspects of their experience in their decisions. Thus, prior to the actual coding, the researchers became familiar with the instructions and coding sheets, and they coded together 7 randomly-selected web sites from the sample (i.e. 10%) to check their understanding of the procedure, identify possible areas of difficulty and refine the list of web features to be included in the coding sheets. In evaluating each web site with the coding sheets, the question was asked: “does this web site contain any of the following features?” A simple presence/absence measure was used to code the data. After training and pilot testing, they worked independently to analyse the rest of web sites from the sample. The coding of the web sites took approximately 30 hours for each coder.

A content analysis of two versions of the same web site in different points of time (i.e. before and after being redesigned) was undertaken in January 2006 by surveying the newer and older versions of the web sites in detail and mapping all existing features on a coding sheet. Thus, 138 analyses were undertaken; this is two versions for each of the 69 sample web sites. A copy of the coding sheet is included in Appendix 5-1. Such sheet consists of 73 individual features classified in nine web evaluation categories. Each of the individual features was assigned a



binary numerical code of '1' when it was present in the web site and '0' when it was not. The set of web evaluation categories utilised were found to be comprehensive and relevant as all the web elements identified were able to be placed in one or other of the categories.

When human coders are used in content analysis, reliability, that is the extent to which the measuring procedure yields the same results on repeated trials, is paramount (Neuendorf, 2002). Krippendorff (1980) advises that at least two coders must be used in content analysis to perform the analysis independently and determine the reliability of the coding scheme. This translates to inter-coder reliability, or level of agreement among two or more coders. According to Neuendorf (2002), the reliability sub-sample should not be smaller than 50 units and should rarely need to be larger than about 300. In the present study, the researcher and the postdoctoral Research Fellow coded independently 62 web sites (making a total of 124 analyses) and compared the recorded data.

The simplest and most common method of reporting inter-coder reliability is the simple percentage agreement statistic. This statistic reflects the number of agreements per total number of coding decisions (e.g. Holsti (1969) coefficient of reliability). However, the simple percentage agreement has weaknesses as it does not take account of chance agreement between coders, which increases when there are only two coders and two values (presence/absence) as in this case. According to Neuendorf (2002), the Perreault and Leigh (1989) reliability index is particularly appropriate to binary (two-choice) nominal variables. Thus, this reliability index was selected as the most appropriate measure due to its superior qualities over other measures. Perreault and Leigh (1989) provide a formula for calculating percent agreement:

$$I_r = \sqrt{\left(\frac{F_0}{N} - \frac{1}{k}\right)\left(\frac{k}{k-1}\right)}$$

In this formula,  $F_0$  is the number of coding decisions upon which the coders agree,  $N$  is the total number of coding decisions made by each coder and  $k$  is the number of coding categories. Perreault and Leigh note that their reliability index ( $I_r$ ) is an estimate of the true proportion of reliably coded observations. Thus, they also provide a formula to calculate an approximate confidence interval for  $I_r$ :

$$Limits = I_r \pm z_c \sqrt{\left(\frac{I_r(1-I_r)}{N}\right)}$$



In this second formula,  $z_c$  is the critical value for the  $c$  percent confidence interval. For example, for a 95% confidence interval, the critical value ( $z_c$ ) would be 1.96. Perreault and Leigh's reliability index ranges from 0.00 (no agreement) to 1.00 (perfect agreement). As shown in Appendix 5-2, the reliabilities were calculated on a total of 73 variables (or web features) and ranged from 0.90 to perfect agreement (1.00), with an overall average of 0.98. These reliability coefficients are being reported separately because an average of the reliability coefficients could cover very low levels of reliability for specific variables (Neuendorf, 2002). Although acceptable levels of inter-coder reliability are subject to debate, a widely accepted rule of thumb is that coefficients exceeding 75% - 80% indicate high reliability and 70% is considered reliable (Neuendorf, 2002). Based on these thresholds, all the variables exhibited very high levels of reliability. McMillan (2000) found that the studies she investigated had reliability scores ranged from 62% to 100%, with an average of 90%. So the reliability obtained in the present study was considered within the range of similar previous studies, albeit at the upper end.

To proceed with the analysis, the differences in coding were individually discussed and solved. The discrepancies between the coders can be broadly classified in two categories: 'errors of omission' (e.g., overlooking particular features), and 'errors of interpretation' (e.g., coding the same components as different web features). For example, some of the features that were overlooked were the *Company mission/values* and the *Directors/Team profiles* when they consisted of a paragraph of text within the homepage or the *About us* page, rather than a specific section of their own. Errors of interpretations included some features that were coded as a *Contact form* (under the *Relational Interactivity* category) by one coder, were coded as *Order by form* (under the *Transactional Interactivity* category) by the other coder. These discrepancies were solved by deciding to code as *Order by form* when the form requested to include product details, such as product codes or quantities. In all other instances, it was decided to code as *Contact form*. For example, when inviting customers to make enquiries about general products or company information. This consensus process took approximately 10 hours. The resulting consensus coding was used for the data analysis.

### 5.2.5. Analysing and interpreting the data

McMillan (2000) found that the Web does not pose any new challenges in this step and suggested that the statistical tools used for analysis will depend on the type of data collected and on the questions that are addressed by the research. As the present study was mainly exploratory, it was decided to use descriptive statistics, such as analysis of frequencies to determine what kinds of changes were made to the sample of SME web sites.

The analysis of frequencies was undertaken at two different levels. Firstly, an examination of the number of web sites that contained each of the 73 individual web features was performed,



before and after the redesigns, and reported as a percentage of all cases investigated. This analysis shows which particular web features were most frequently added to or removed from the web sites during the study period, for each of the nine web evaluation categories.

Secondly, the changes were also examined at the web evaluation category level. Thus, an examination of the number of redesigns that involved any change within each of the nine web site evaluation categories was performed and reported as a percentage of all cases investigated. The results at this level were not additive: if more than one individual feature was added or removed within the same evaluation category, it was counted only once. Specifically, for each web site, a score of '1' was given for a given web evaluation category if it contained at least one of the web features added or removed after the web redesign; otherwise, a score of '0' was given for that category. For example, if a redesign involved the addition of a sitemap (NAV), a search facility (NAV), print-friendly options (ACC), a FAQs page (CRE) and a newsletter subscription facility (RI), that web site redesign would be coded '1' for the dimensions NAV, ACC, CRE and RI and '0' for CII, CPC, TI, SC and SMM. This procedure led to the formation of a matrix of binary codes for 9 categories by 69 redesigns (see Appendix 5-3).

### 5.3. Results

The following nine tables show the absolute and relative number of web sites implementing specific web features before and after the redesigns, for each of the nine evaluation categories. The tables also show the differences in the number of web sites implementing each web feature before and after being redesigned. These differences were negative when features were removed and positive when were added. A difference of 0% indicates that a given feature was found implemented on the same number of web sites before and after the redesigns. The web features that were added and/or removed more frequently are highlighted in yellow.

**Table 5-3 Differences in the Content for Identification & Image Features**

Content for Identification & Image Features	Sites implementing before redesigning	% (out of 69)	Sites implementing after redesigning	% (out of 69)	Difference	% (out of 69)
Customer testimonials	7	10%	14	20%	7	10%
Directors/Team profiles	12	17%	18	26%	6	9%
Company directions (map)	23	33%	28	41%	5	7%
Press releases / Company news	29	42%	34	49%	5	7%
Company registration/VAT no.	5	7%	10	14%	5	7%
Business partners	33	48%	38	55%	5	7%
Portfolio of achievements	12	17%	15	22%	3	4%
Individual email addresses	19	28%	21	30%	2	3%
About us	54	78%	55	80%	1	1%
Telephone number	65	94%	65	94%	0	0%
Awards, certifications & memberships	12	17%	12	17%	0	0%
Company mission/values	14	20%	13	19%	-1	-1%
Postal address	61	88%	60	87%	-1	-1%
General email address	61	88%	58	84%	-3	-4%
Fax number	53	77%	49	71%	-4	-6%



Regarding *Content for Identification & Image* (Table 5-3), some of the web features most frequently added to the web sites were *Customer testimonials*, *Directors/Team profiles*, *Company directions*, *Press releases/Company news* and *Company registration/VAT number*. These features indicate a desire to increase credibility and legitimacy of the company. On the other hand, the web features most frequently removed from the web sites were *General email address* and *Fax number*. Some companies seem to be replacing a general company address by a *Contact form* (RI category) and/or individual emails for specific functions (e.g. sales, support, etc). In addition, the removal of fax indicates a decline in its use or an attempt to fight against fax spam.

**Table 5-4 Differences in the Navigability Features**

Navigability Features	Sites implementing before redesigning	% (out of 69)	Sites implementing after redesigning	% (out of 69)	Difference	% (out of 69)
Horizontal top navigation bar	33	48%	51	74%	18	26%
Search engine within the site	5	7%	17	25%	12	17%
Drop-down navigation bar	3	4%	13	19%	10	14%
Footer Navigation Links	23	33%	31	45%	8	12%
Path followed	5	7%	10	14%	5	7%
Quick links	2	3%	4	6%	2	3%
Site map	13	19%	15	22%	2	3%
Search engine for products	8	12%	9	13%	1	1%
Vertical right-hand navigation bar	5	7%	4	6%	-1	-1%
Target audience of site	2	3%	0	0%	-2	-3%
Intro/Splash page	9	13%	2	3%	-7	-10%
Vertical left-hand navigation bar	44	64%	35	51%	-9	-13%
Frames	19	28%	4	6%	-15	-22%

Regarding *Navigability* (Table 5-4), some of the web features most frequently added to the web sites were *Horizontal top navigation bar*, *Search engine within site*, *Drop-down navigation bar*, *Footer navigation links* and *Path followed*. These features indicate a tendency to implement better and more sophisticated navigation mechanisms and a desire to improve usability. On the other hand, the web features most frequently removed from the web sites were *Intro/Splash page*, *Vertical left-hand navigation bar* and *Frames*. These features indicate a fashion or design tendency to implement more sophisticated horizontal navigation bars with drop down menus over some initial left hand navigation bars and a removal of features that may hinder the usability of a site, such as the use of frames and intro pages.



**Table 5-5 Differences in the Site Management & Maintenance Features**

Site Management & Maintenance Features	Sites implementing before redesigning	% (out of 69)	Sites implementing after redesigning	% (out of 69)	Difference	% (out of 69)
Use of css	33	48%	49	71%	16	23%
Dynamic pages (PHP, ASP)	19	28%	34	49%	15	22%
Java scripts	28	41%	41	59%	13	19%
Use of Flash technology	15	22%	18	26%	3	4%
Last update	4	6%	6	9%	2	3%
Hits/Visitors counter	3	4%	1	1%	-2	-3%
Java applets	4	6%	0	0%	-4	-6%
Webmaster email address	10	14%	6	9%	-4	-6%

Regarding *Site Management & Maintenance* (Table 5-5), some of the web features most frequently added to the web sites were *Cascading Style Sheets*, *Dynamic pages* and *Java scripts*. These features indicate a tendency to better maintenance approaches and more use of web scripting. On the other hand, *Java applets* seem to be used less and less.

**Table 5-6 Differences in the Relational Interactivity Features**

Relational Interactivity Features	Sites implementing before redesigning	% (out of 69)	Sites implementing after redesigning	% (out of 69)	Difference	% (out of 69)
Contact form	36	52%	46	67%	10	14%
Members area	10	14%	19	28%	9	13%
Newsletter sign-in	10	14%	16	23%	6	9%
Tell a friend	1	1%	4	6%	3	4%
Chat facility	1	1%	3	4%	2	3%
News feeds (RSS/XML)	0	0%	1	1%	1	1%
Discussion forum	1	1%	1	1%	0	0%
Bookmark this page	2	3%	2	3%	0	0%

Regarding *Relational Interactivity* (Table 5-6), some of the web features most frequently added to the web sites were *Contact form*, *Members area* and *Newsletter sign-in*. These features indicate a tendency to limit the distribution of company information to registered users (maybe to avoid competitors getting too much company information) and more effective collection and marketing use of customer data. It is interesting to note that there were no web features removed under this category.

**Table 5-7 Differences in the Content for Relationship Enhancement Features**

Content for Relationship Enhancement Features	Sites implementing before redesigning	% (out of 69)	Sites implementing after redesigning	% (out of 69)	Difference	% (out of 69)
Company literature (downloads)	11	16%	16	23%	5	7%
Careers (vacancies)	13	19%	15	22%	2	3%
FAQs	7	10%	7	10%	0	0%
Generic information (tips)	8	12%	8	12%	0	0%
Financial data	2	3%	1	1%	-1	-1%
Games, contests and drawings	3	4%	1	1%	-2	-3%
Useful links	28	41%	25	36%	-3	-4%



Regarding *Content for Relationship Enhancement* (Table 5-7), the web feature most frequently added to the web sites was *Company literature (downloads)*. It is interesting to note the little tendency in providing more features of this type. Even more, some features as *Games, contest and drawings* and *Useful links* were removed from several sites.

**Table 5-8 Differences in the Content for Promotion & Contract Features**

Content for Promotion & Contract Features	Sites implementing before redesigning	% (out of 69)	Sites implementing after redesigning	% (out of 69)	Difference	% (out of 69)
Product promotions	12	17%	17	25%	5	7%
Language selection	2	3%	6	9%	4	6%
Terms and conditions of sale	23	33%	25	36%	2	3%
New products announcements	4	6%	6	9%	2	3%
Price of products/services	23	33%	24	35%	1	1%
Product samples	2	3%	3	4%	1	1%
Images of company products	25	36%	25	36%	0	0%
Services offered	53	77%	53	77%	0	0%
Conditions regarding use of the site /	12	17%	9	13%	-3	-4%
Catalogue of products	37	54%	32	46%	-5	-7%

Regarding *Content for Promotion & Contract* (Table 5-8), some of the web features most frequently added to the web sites were *Product promotions* and *Language selection*. It is surprising *Electronic catalogues* and *Conditions regarding use of the site* were removed from some sites.

**Table 5-9 Differences in the Security & Confidentiality Features**

Security & Confidentiality Features	Sites implementing before redesigning	% (out of 69)	Sites implementing after redesigning	% (out of 69)	Difference	% (out of 69)
Privacy policy	16	23%	19	28%	3	4%
Entry in secure zone (padlock)	4	6%	6	9%	2	3%
Other security certification	1	1%	1	1%	0	0%

Regarding *Security & Confidentiality* (Table 5-9), the web features most frequently added to the web sites were *Privacy policy* and *Entry in secure zone of site*. These additions are in line with more awareness of data protection responsibilities and improvements in web security. There were no web features removed under this category.

**Table 5-10 Differences in the Accessibility Features**

Accessibility Features	Sites implementing before redesigning	% (out of 69)	Sites implementing after redesigning	% (out of 69)	Difference	% (out of 69)
Accessability statement or logos	1	1%	3	4%	2	3%
Plug-ins required	8	12%	9	13%	1	1%
Choose speed connection/version	1	1%	1	1%	0	0%
Print friendly version	4	6%	4	6%	0	0%
Change text size	1	1%	1	1%	0	0%



Regarding *Accessibility* (Table 5-10), the only apparent web features added to the web sites were *Accessibility statement or logos* and *Plug-ins required*. Despite requirements to comply with the Disability Discrimination Act (DDA), it seems that few accessibility features were added. There were no web features removed under this category.

**Table 5-11 Differences in the Transactional Interactivity Features**

Transactional Interactivity Features	Sites implementing before redesigning	% (out of 69)	Sites implementing after redesigning	% (out of 69)	Difference	% (out of 69)
Online payment	10	14%	16	23%	6	9%
Online ordering	9	13%	12	17%	3	4%
Print & fax order form	2	3%	3	4%	1	1%
Order by form	6	9%	3	4%	-3	-4%

Regarding *Transactional Interactivity* (Table 5-11), the web features most frequently added to the web sites were *Online payment*, and *Online ordering*. These features indicate a move towards more sophisticated e-commerce in some web sites. Accordingly, some web sites also removed their more primitive *Order by form* option.

Table 5-12 below shows the analysis of the frequency of the web site evaluation categories affected during the period of analysis. The figures reported represent the relative percentage of web site redesigns for which a given category was altered. These figures show that most of the redesigns in the sample incorporated changes in NAV (90%) and CII (88%) features. Following these were SMM (71%), RI (71%), CRE (54%) and CPC (49%) features. The least affected categories were SC (23%), ACC (22%) and TI (17%). Table 5-12 also shows which percentage of the changes were additions and removals for each particular web evaluation category. It is interesting to note that most changes were additions of features, ranging from 53% to 73% of total changes. However, removals were also a significant part of the changes for some of the categories, ranging from 28% to 47%.

**Table 5-12 Frequency of dimensions changed and addition/removal changes**

Web evaluation categories	Number of redesigns	% (out of 69)	% addition changes	% removals changes
Navigability (NAV)	62	90%	58%	42%
Content for Identification & Image (CII)	61	88%	63%	37%
Site Management & Maintenance (SMM)	49	71%	68%	32%
Relational Interactivity (RI)	49	71%	73%	28%
Content for Relationship Enhancement (CRE)	37	54%	53%	47%
Content for Promotion & Contract (CPC)	34	49%	59%	41%
Security & Confidentiality (SC)	16	23%	65%	35%
Accessibility (ACC)	15	22%	59%	41%
Transactional Interactivity (TI)	12	17%	68%	32%

#### 5.4. Discussion

This analysis was designed to address two research questions. Firstly, **what kind of changes do SMEs make when redesigning their web sites?** After being redesigned, most of the web sites



in the sample were found to have added (and also removed) web features related to *Navigability* (e.g. *Navigation bars* and *Drop-down menus*, *Search options*, *Path followed*, etc) and *Content for Identification & Image* (e.g. *Customer testimonials*, *Directors/Team profiles*, *Company directions*, etc). These top two frequencies suggest that the majority of companies evolved their web sites to improve their navigation and ease of use, as well as to improve the image and credibility of the company. The third, fourth and fifth most relevant categories affected were *Site Management & Maintenance* (e.g. *Using CSS*, *Dynamic pages*, *Java scripts*, etc), *Relational Interactivity* (e.g. *Contact form*, *Members area*, *Newsletter sign-in*, etc) and *Content for Relationship Enhancement* (e.g. *Company literature (downloads)*, *Careers*, etc). These frequencies suggest an effort to achieve better web maintenance and more efficient communication with customers. Some of these findings are in line with previous work describing transformation of commercial web sites, that found a tendency to expand information and improve usability (Benbunan-Fich and Altschuller, 2005) and to focus on information convenience, site navigation and customer confidence (Piccoli *et al*, 2004). Another interesting finding is that while most changes were additions of features, in some cases features were actually removed after the redesigns. For example, *Order by form*, *Java applets*, *Frames*, *Intro/Splash page*, *Useful links*, *Conditions regarding use of the site* and *Fax number* are some of the features that tended to be removed from the web sites.

Secondly, is there evidence of a staged development from the features implemented in SME web sites over time? If the Stages Theory was to be supported it would be expected to find similar kind of changes across the sample of SMEs and specially, a large amount of transactional changes. Stage Models view the SME sector as a homogeneous group that take a single sequential path of development, this is, increasing the sophistication of their web sites and implementing transactional features. However, only 10 out of 69 redesigns introduced Transactional Interactivity features (e.g. online shopping), which would have moved them into an e-commerce stage, while two actually removed these features. This finding provides little evidence of staged growth and seems to support the notion that Stage Models are not the best way of representing the e-commerce progression of SMEs as such models assume that web sites grow in sophistication and e-commerce functionality over time. However, the changes identified indicated different directions of development such as improving usability of the sites, building the image and credibility of the company, improving the maintenance of the site, etc. Should a Stage Model been used to analyse these changes over time they would have not been considered as changes of stage, rather they would be seen as further refinements within the same stage (mostly not exceeding the use of simple web sites for identification and promotion purposes). It should be note that as discussed in the literature review (Section 2.4.4), Stage Models and 'process research' (to which the developed framework belongs to) are both considered to be 'process approaches' according to Wolfe (1994). However, Stage Models are argued to be an

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earlier generation that offer a broad process perspective on how implementation of IT evolves over time by dividing processes into a priori stages and specifying a definitive temporal order to their sequence. The developed framework is argued to be more in line with the second generation of process approaches that offer an analytical alternative to Stage Models that assume neat linear progressions of broad implementation phases. This involves the empirical examination at a much finer level of detail of the sequences of events that occur during the implementation process. In addition, the finding of some businesses removing features from their web sites over time supports the notion that the web presence of some SMEs can regress over time. This observation contradicts the Stage Models' assumption of progression in a linear fashion.

SMEs are not a homogeneous group and their different characteristics (e.g. sector, size, experience with web sites, etc) can directly affect their ability, needs and opportunities to engage in various aspects of e-commerce (Taylor and Murphy, 2004). Essentially, what works for one SME does not necessarily work for another as they may face totally different opportunities and constraints in doing so. Furthermore, transactional web sites are often not the primary strategy of small business to generate online sales. Alternative strategies, such as selling by online auctions, have been found to be more suitable for the limited resources and technical skills of small business (Gribbins and King, 2004). Additionally, the external services provided by web portals are other options available to small businesses. They may consider the use of the transactional capabilities offered by specialised or regional web portals without having to be concerned about implementing the online shopping technology on their own web site.

In addition, the first and second phases of this research (i.e. observation of web sites and web content analysis) demonstrate that the research framework developed here (with the *extent of change* and *content of change* dimensions) is applicable and useful in showing changes that are occurring in the web sites of SMEs. Thus, this research framework provides a means by which the changes made to web sites by SMEs can be classified in a simple manner, without implying a staged implementation (i.e. it shows developments within stages rather than progression from one stage to the next). It also provides the capability to present web site changes in a more effective manner than Stage Models, as some of the changes being made to the web sites may be missed by Stage Models (i.e. changes within the same stage).

## 5.5. Summary and conclusions

Chapter 5 provides a detailed discussion of the second research method (i.e. content analysis of web sites) to study the evolution of a sample of SME web sites over time. Based on the findings of the initial unobtrusive observation (*extent of change*), which identified 69 web sites that had



been redesigned during the monitoring period, this second method consisted of a further analysis to investigate the changes that had occurred in the content and design of these subset of web sites after being redesigned (*content of change*).

The chapter also discusses the method of content analysis in the context of web sites. Applying content analysis to web sites has a number of challenges which are discussed in detail alongside the primary steps suggested by McMillan (2000), namely: (1) formulating the research question; (2) selecting the sample web sites; (3) defining the unit of analysis and coding units categories; (4) training coders examining the web sites, coding and checking reliability; and (5) analysing and interpreting data.

In order to analyse the development of the web sites, the changes were coded into the following categories: *Navigability*, *Accessibility*, *Content for identification & image*, *Content for promotion & contract*, *Content for Relationship Enhancement*, *Relational Interactivity*, *Transactional Interactivity*, *Security & Confidentiality* and *Site Management & Maintenance*. Then, a frequency analysis was performed both at the web features level and at the web categories level.

In addressing the general *content of change* research question (What kind of changes do SMEs make when redesigning their web sites?), it was found that after being redesigned, most of the web sites in the sample had changed features related to *Navigability* and *Content for Identification & Image*. The third and fourth most relevant categories affected were *Relational Interactivity* and *Site Management & Maintenance*. It is discussed that the majority of the SMEs in the sample seem to have evolved their web sites for improving site navigation and ease of use, as well as their image and credibility, and achieving more efficient communication with customers.

Regarding the more particular *content of change* research question (Is there evidence of a staged development from the features implemented in SME web sites over time?), it was found little support, within the sample studied, for the notion that changes made to the SME web sites follow a staged approach from simple web sites to full e-commerce. As explained in Chapter 2 (Section 2.3.2.), there is a school of thought that changes made to the web sites of SMEs follow a staged approach with a growth in e-commerce functionalities and these models have been employed to advise SMEs on developing their e-commerce strategies. Therefore, this second study matters in helping to inform what the actual changes on the sample web sites were.

It is important to note that the web site content analysis alone may overlook the implementation of some e-commerce capabilities related to business-to-business interactions, especially for some companies that relied on extranets or private networks for dealing with suppliers and



customers. Therefore, this research needed to be complemented by interviews to further investigate the reasons for the web redesigns (i.e. *drivers of change*). This is covered in the following Chapter 7.



## CHAPTER 6. DRIVERS OF CHANGE: SEMI-STRUCTURED INTERVIEWS

### 6.1. Introduction

The previous Chapter 5 presented the application of the second of three methods utilised in this research (i.e. unobtrusive observation of web sites, content analysis of web sites and interviews). The second method studied what were the changes (*content of change*) that occurred in the 69 web sites that had been redesigned during the 24-month study period (October 2003 to September 2005). Among other findings, transactional features were found to be implemented on few of the web site redesigns studied. This Chapter 6 is devoted to the interpretive third part of the research and presents and analyses follow up interviews with SMEs, in order to shed light to the reasons why those 69 SMEs decided to redesign their web sites.

These interviews were performed as a means to study the drivers behind the redesigns of the SME web sites (*drivers of change*). As explained in Chapter 2 (Section 2.5.3), web site evolution can also be characterised by considering the forces and sources for change. For example, businesses may decide to redesign their web sites to take advantage of new technologies, implement new business strategies, better accommodate user needs, etc.

As explained in Chapter 2, although there have been some attempts to study the dynamic nature of SME web sites (e.g. Stage Models), there is still little research evidence to explain why SMEs evolve their web presence. The literature reviewed has suggested a number of drivers for redesign in relation to large businesses (e.g. Benbunan-Fich and Altschuller, 2005) and for academic web sites (e.g. Ryan *et al*, 2006). However, as far as the researcher can discover, there is no research that has been devoted to understanding web site redesign drivers in the context of SMEs, and especially in relation to Stage Models and business variables, such as type of business or size. This gap in knowledge is particularly important in the context of SMEs, since continuous web maintenance and innovation investments form a significant part of their limited financial resources, technical skills and knowledge. The previous two exploratory chapters provided some indications of how a sample of SME web sites evolved and what changes were implemented. However, a more interpretative approach was necessary to better understand why these changes took place. Thus, this third part of the research aims to explore the drivers behind web redesign investments and develop a comprehensive classification. The general question that these interviews were designed to address was:

*Why do SMEs redesign their web sites?*



And in particular:

*Is there evidence of a staged development from the reasons for the redesign of SME web sites?*

If the staged approach were to hold true, it would be expected to find SMEs redesigning their web sites with the intention of implementing more advanced e-commerce features. Moreover, it would be reasonable to assume that the study of a sample of web sites with a wide range of lifespans (i.e. from one year to eight years old) would find many SMEs intending to advance to a higher stage. However, if the staged approach was erroneous it would be expected to find a whole variety of drivers of redesign, mostly not featuring a change of stage.

This chapter discusses first the sample selection and the planning and conduct of the interviews. Then, a sequential mixed-methodological analysis, involving the use of qualitative and quantitative data analysis, was used with the purpose of developing a classification of drivers. Then, findings are reported. Finally, this chapter discusses the classification of drivers for web site redesign developed specifically for SMEs and compares the results with previous literature in different contexts.

## **6.2. Sample selection and characteristics**

As used in the previous two chapters, the particular sample strategy used in this third phase of the study was criterion sampling, which requires all participants in the study to meet certain criteria and to have experienced the phenomena being studied (Creswell, 1998). The sampling frame was 256 SMEs, whose web sites have previously been observed over a 24-month period (see Chapter 5). The selection criterion was having had their web sites redesigned during the monitoring period of October 2003 to September 2005. The fact that the businesses had recently redesigned their web sites, at the time they were approached by the researcher, was considered crucial because it was believed that the persons responsible for the web redesign projects, which were to be interviewed, would have had a very recent experience of the changes in their web sites and thus, understood fully the reasons behind them.

The criteria for a redesign used was as defined in Chapter 4 (Section 4.4). In total, 69 businesses were found to meet the criteria and were approached by the researcher. However, this sample has the limitations of not being representative of any definable population, what means the results are not statistically generalisable. 41 businesses agreed to participate in the interviews, representing a 59% participation rate. It is argued that qualitative studies typically investigate a relatively small number of individuals or situations, preserving their individuality in their analysis (Maxwell, 1996). Thus, this relatively small number of participants is reasonable for the stringent criteria adopted and for the explanatory purpose of this study, representing the



majority of SMEs approached. The rest of businesses indicated that they did not wish to participate on the research, mostly because they were very busy or because they had already participated in numerous surveys. A description of the respondents is provided in Table 6-1. As can be seen, most of the responses were obtained from managing directors and owners of the companies. This is in accordance with SME literature that find most owner/managers directly involved in all aspects of the decision-making processes relating to management and strategy. In just two cases the researcher was referred to web site managers external to the companies.

**Table 6-1 Interview participants' characteristics**

	Category	Frequency (N=41)	Percent (%)
<b>Business category</b>	Services	14	34%
	Computer/IT	13	32%
	Retail/wholesale	14	34%
		<b>41</b>	<b>100%</b>
<b>Business size</b>	Micro (1-9)	23	56%
	Small (10-49)	15	37%
	Medium (50-249)	3	7%
		<b>41</b>	<b>100%</b>
<b>Web presence lifespan</b>	Short (1-3 years)	10	24%
	Medium (4-7 years)	18	44%
	Long (8 years and over)	13	32%
		<b>41</b>	<b>100%</b>
<b>Respondent position</b>	Managing director	18	44%
	Owner	9	22%
	General manager	5	12%
	Business development manager	2	5%
	Marketing manager	2	5%
	Web site Manager (external)	2	5%
	Account manager	1	2%
	Chief executive officer	1	2%
	It manager	1	2%
		<b>41</b>	<b>100%</b>

### 6.3. Planning and conduct of interviews

#### 6.3.1. Interview questionnaire design

The interviews were primarily aimed at gaining a greater understanding into the reasons behind the decision of the businesses to redesign their web sites. However, the open-ended questions were also developed to explore the businesses' web site planning and maintenance and their business background.

A semi-structured question frame was developed based on current literature surrounding web site development and maintenance. Questions regarding factors that may influence web site



development were arranged in three broad sections; business background, web site maintenance and web site strategy and planning:

- Section 1: Business background

The aim of the first section was to collect background information about the business. The questions in this section delivered a description of the business activities and the informant position within the company.

- Section 2: Web site maintenance

The questions in the second section focused specifically on the current implementation and use of the business web site. In particular, reasons for the last redesign (Elsammani, 2006), web site lifespan (Davidson *et al*, 2006; McNaughton, 2001), frequency of content updates and redesigns (Elsammani, 2006) and in-house/outsourced web management (Elsammani, 2006; Davidson *et al*, 2006).

- Section 3: Web site strategy and planning

Section three questions explored planning practices for their web site implementations. For example, strategy/objectives with the web site (Davidson *et al*, 2006; McNaughton, 2001), evaluation of web site performance/effectiveness (Davidson *et al*, 2006; McNaughton, 2001), formality of web site planning (Elsammani, 2006; McNaughton, 2001) and possible problems/barriers for further develop their web sites (Elsammani, 2006).

One SME general manager, who was known to the researcher and had recently undertaken a web site redesign, was asked to complete the questionnaire prior to the study being carried out and to provide feedback on the clarity, meaning and relevance of the questions, which lead to the rephrasing of some of them. This data was not included in the final data set. The interview questions, concerning all the above mentioned issues, are presented in Appendix 6-1.

### 6.3.2. Pre-notice letters and follow-up calls

Following the recommendation of Dillman (2000) to help increase survey participation, a brief pre-notice letter was sent by both post and email to the 69 SMEs to notify them that in a few days they would be receiving a telephone call and that their participation would be greatly appreciated. The pre-notice letters were personalised for each business and addressed directly to the current owner or director (Dillman, 2000). These individuals were initially identified as the most appropriate informants for this study given their authority and responsibility to make investment decisions for their organisation. Considerable effort was exerted to ensure that the



current names of the owners and/or directors were compiled so that the letters would not be considered junk mail. To determine this information, a variety of reference sources were consulted, including the WebCheck service of the Companies House ([www.companieshouse.gov.uk/webcheck](http://www.companieshouse.gov.uk/webcheck)), the FAME company information service, the businesses own web sites, web domains name registration information ([www.nominet.org.uk/whois](http://www.nominet.org.uk/whois)) and extensive web searches. All this effort was rewarded by achieving a very high level of response (i.e. 59%)

The pre-notice letters also described the purpose and importance of the study, assured confidentiality of the responses and stated that participation was voluntary. In addition, they included the name and contact information of both the primary researcher and his supervisor, the Brunel University logo, and a hand written signature. The names and addresses of the respondents were also hand written on the envelopes rather than printed onto labels as recommended by Dillman (2000). See Appendix 6-2 for a copy of the pre-notice letter.

Follow-up calls were made three days after sending the pre-notice letters. The purpose of these calls was to ascertain who had been responsible for the redesign project and their willingness to participate in the research. The researcher called some businesses up to five times in order to obtain a response from the targeted individual and to arrange a convenient time to conduct the interview.

### **6.3.3. Conduct of interviews**

Semi-structured interviews (Darke *et al*, 1998) were conducted during the period of February to April 2006. The interviews were standardised, consisting of ten open-ended questions with every participant asked the same questions. However, the researcher was allowed to digress from the questionnaire when other interesting issues arose or to ask for elaboration of incomplete or vague responses (e.g. tell me more about that or, can you expand on that thought?). In addition, the formulation of questions (including terminology) had to be adapted some times to fit the educational background and technical level of the respondents. The length of the interviews ranged from 20 to 45 minutes with an average time of 30 minutes, depending on the participant's time and willingness to answer in detail. At the beginning of each interview telephone interviewees gave their permission to be tape-recorded. Additional notes were also taken during the course of the interviews. At completion of the interview the researcher proceeded to their transcription, which was also shared with the participants to check for possible errors and omissions in the researcher's account of the interview (see example of interview transcript in Appendix 6-3).



Some informants indicated that they would prefer to respond to the questions via email and it was decided to accept data in this way, sometimes this was so they could think about their answers or they were currently too busy. Consequently, 18 of the informants came into this category and a number of emails were exchanged with them in order to pose and answer the main questions and any further explanations needed. This form of email interview has been found to be effective as a complementary method when it is difficult to arrange a mutually convenient time to conduct an interview over the phone with busy research subjects (Bampton and Cowton, 2002). It is important to acknowledge that each of these interview methods has advantages and disadvantages (Murray and Sixsmith, 1998). Email for example allows participants more time to reflect and construct a considered response and allows the researcher to email the participants again when further clarification of their responses is required. However, potential disadvantages are that some of the verbal communication nuances available in telephone interviews are absent in email. For example, acquiescent responding which, while this may be more apparent in telephone interviews is not so readily identifiable in email interviews (Murray and Sixsmith, 1998). In retrospect it was found that participants interviewed via email tended to be as detailed in their responses as their telephone counterparts, and even in some cases they provided more thoughtful and in depth accounts. This is not to disparage the quality of the telephone interviews, but to highlight the unanticipated benefits of the email interview, which was possibly aided by the extra time such participants had to reflect upon questions prior to responding. The responses received from email were added to the telephone responses and analysed on the same way. For shorthand purposes, all the responses are referred to as interviews in the rest of the chapter whether it was via email or telephone.

#### **6.4. Data analysis**

A sequential mixed-methodological analysis (SMMA), as described by Onwuegbuzie and Teddlie (2003), was undertaken to analyse the responses concerning the reasons for the web site redesigns. In accordance with the framework of Greene *et al* (1989) presented in Chapter 3 (Section 3.2), the purpose of this mixed-methodological analysis was 'development'; that is, using qualitative and quantitative analytic methods sequentially such that results from one data-analytic method inform the use of the next method. More specifically, the goal of the SMMA was typology development (Caracelli and Greene, 1993); that is, developing a classification of reasons and drivers for web redesign. The SMMA involved two phases, namely: (1) interpretative phenomenological analysis of responses and (2) descriptive statistics.

##### **6.4.1. Interpretative phenomenological analysis of responses**

The first qualitative phase consisted of an interpretative phenomenological analysis (Smith and Osborn, 2003) to examine the responses of the informants regarding the reasons for their web



site redesign. This method essentially attempts to understand phenomena from the perspective of those being studied (Goetz and Le-compte, 1984). Phenomenological analyses are inductive, generative, and constructive because they require the researcher to attempt not to form any a priori hypotheses with respect to participants' perceptions of the phenomena being studied in order to avoid biasing the analyses. Thus, this method of analysis was utilised to reveal a number of themes or categories relating to participants' perceptions of their businesses' reasons for redesigning their web sites. This was done to systematically and rigorously derive a classification of drivers for web site redesign in SMEs.

As explained in Chapter 2 (Section 2.5.3), there have been some recent attempts to develop classifications of drivers for web site redesign. However, none of them has been widely employed and the disparity of these studies, in terms of purpose, method, type of web sites focused on, etc., makes comparison very difficult. What is clear is that there is very little consensus on theory to inform the selection of categories and thus the researcher was reluctant to adopt a theory-driven approach that might force-fit the data obtained into pre-existing categories. Instead it was decided to utilise an inductive approach where the categories or themes emerge from the interview data itself and are not imposed prior to data collection. That is called a 'data-driven' or 'bottom-up' method of building category trees (Richards and Richards, 1995), where researchers build up hierarchical categories as they code for rather specific and basic categories, then thinking about the more general themes or higher order categories that could lie above those specifics with a great deal of shifting around and reorganisation of categories.

Miles and Huberman (1994) highlight several advantages of this kind of inductive and data-driven approach. Firstly, it shows that the researcher is more open-minded and more context-sensitive. Secondly, the data gets well 'moulded' to the categories that represent them and finally, the categories are better grounded empirically. The phenomenological analysis undertaken in the present investigation involved the following four procedural steps:

- The transcripts of the 41 interviews describing the reasons and circumstances for the web redesign initiatives were entered into an Atlas/ti project ([www.atlasti.com](http://www.atlasti.com)). This is a software package for qualitative analysis (Muhr, 1997). All the transcripts were read in order to obtain an overall picture of the reasons.
- The transcripts were then more closely read, and this time fragments (i.e. phrases, sentences, or paragraphs) which referred to specific reasons were coded as basic categories. No list of pre-defined categories was imposed; rather, a set of basic categories was allowed to emerge from the data as analysis proceeded in an 'open coding' technique similar to that suggested by Strauss and Corbin (1990). Thereby the



researcher applied code categories drawn from words which were used by the participants ('vivo codes') or his own general knowledge in the area.

- Miles and Huberman (1994) advise that something of the order of 50 to 60 categories is cognitively manageable without having to constantly refer to the full list. When the number of basic categories generated reached this critical mass, they were compared, and categories that contained the same or nearly the same reasons were eliminated, merged or re-named accordingly, such that each basic category corresponded to a unique reason. These categories served as the basis for extracting a list of non-repetitive, non-overlapping significant reasons, with each unique reason treated as having equal worth (i.e., 'horizontalisation' of data in Lincoln and Guba (1985) terms). The resultant list of reasons identified is shown in the results section (Table 6-2).
- Individual reasons, that appeared to have conceptual similarities, were then categorised into more general themes or higher order categories using the method of 'constant comparison' (Glaser and Strauss, 1967). Each one of the themes represented a distinct driver for web site redesign. These groupings or drivers were then compared and contrasted with the original transcripts for validation. Each time a basic category was subsumed under a higher order category or driver, the researcher went back and examined all instances previously coded using that category. The purpose of this examination was to ensure that no original descriptions were unaccounted for by the drivers and that no driver contained basic categories that did not share similar characteristics. Marginal or isolated categories that were not subsumed under any driver became drivers on their own (i.e. themes with only one category). The resultant list of individual reasons grouped by the identified drivers is shown in the results section (Table 6-3).

#### **6.4.2. Descriptive statistics**

The second quantitative phase of the analysis involved utilising descriptive statistics (SPSS v.11.5) to analyse the hierarchical structure of the emergent drivers. In particular, each driver was 'quantitized', in Tashakkori and Teddlie's terms (1998). This is a process in which qualitative data are converted into numerical codes that can be statistically analysed. The rationale being that identifying patterns and allocating them to themes, categories, typologies, and the like based on the frequency with which a facet occurs is rigorous (Miles and Huberman, 1994). Such processes of transforming qualitative data into numerical form, which can be represented statistically, has been found to be effective and to more fully interpret narrative descriptions (Sandelowski, 2001). Moreover, Huberman and Miles (1984) suggest that such a qualitative-quantitative linkage enables the identification of overall trends, new leads, and helps



identify unexpected differences in a mass of answers. Although well used in a number of other domains this method of data analysis appears to be novel in the IS literature.

Specifically, for each participant in the sample, a score of '1' was given for a driver if it represented at least one of the reasons cited by that individual; otherwise, a score of '0' was given for that driver. This procedure led to the formation of a matrix of binary codes for 7 drivers by 41 redesigns (see Appendix 6-4). Such 'quantitizing' also allowed the frequency of each driver to be calculated. From these frequencies, percentages were computed to determine the prevalence rates of each driver.

### 6.4.3. Reliability and validity

Traditional research validation criteria such as representative samples and reliability were inappropriate in this phenomenological analysis because they are based on the assumption of researcher objectivity and disengagement from the analytical process (Yardley, 2000). As a qualitative research method, interpretative phenomenological analysis is inevitably subjective as no two analysts working with the same data are likely to come up with an exact replication of the others' analysis. Thus, the aim of validity checks in this context is to not prescribe to 'the singular true account', but to ensure the credibility of the final account (Smith and Osborn, 2003). Alternative criteria to assess the internal validity and reliability of qualitative research are internal coherence and presentation of evidence (Smith, 1996).

Firstly, internal coherence refers to whether the argument presented within a study is internally consistent and supported by the data. In order to check whether the interpretations made in this study were reflected within the data, the final lists of individual reasons for redesigns and the drivers of change, together with the interview transcripts, were inspected by a postdoctoral Research Fellow at Brunel University with qualitative research experience. This researcher, who also assisted with the content analysis of web sites (Chapter 5), took responsibility for checking that the emerging drivers were grounded in the raw data and agreed with the researcher interpretations and coding decisions. In addition, a preliminary report of the research was sent to all participants to allow them to check the data interpretations and to provide what Elliott *et al* (1999) have termed a 'credibility check'. All of the four participants who replied welcomed the interpretations that were offered and did not dispute the researcher's findings, thereby enhancing the credibility of the analysis.

Secondly, presentation of evidence refers to the availability of sufficient data from participants' discourse to enable readers to evaluate the interpretation. Therefore, emergent basic categories are presented in the next section (Table 6-2) supported by example quotes from the interview transcripts, to make the analysis and interpretations more transparent and easier to evaluate by,



the reader. However, individual and company names are not used because respondents were promised anonymity.

## 6.5. Results

First, a simple list of individual reasons given was constructed as mentioned in the interviews. It should be noted that just around a third of the respondents (14) gave a single one reason. A total of 23 identifiably different reasons were found and are listed in Table 6-2 together with an example quote from one of the interviewees which typifies that particular reason. As can be seen the most often quoted reason for redesign was in relation to refreshing the brand image with 19 mentions through to four reasons that were only mentioned once.

**Table 6-2 Frequency of individual reasons and example quotes**

Reason	Freq.
<b>Refresh brand image (new look):</b> "We just wanted a fresh and more professional looking web site really. The first one was done a little bit on a budget and we didn't think it look that good. So we just wanted to refresh it up, use different colours and making it look better really."	19
<b>New services/products or capabilities:</b> "The main reasons why we changed it was actually because the services that we offer changed. We changed the focus of our business, so the redesign we did was really to reflect the changes that we made inside the business."	9
<b>Increase customer confidence:</b> "The most important aspect was to give potential customers confidence in the legitimacy of the business and therefore to buy from you. Additional areas such as the privacy policy page have been added to increase customer buying confidence."	8
<b>Re-branding:</b> "We have gone through a branding change and the redesign also came into it. We re-branded the company logo, corporate image, etc. The new web site reflects this trend."	7
<b>Improve site management/maintenance:</b> "There were a couple of reasons why I redesigned the site, the first one being the fact that the site was made of static HTML pages, which meant updating the prices was a nightmare. I cannot remember exactly how many pages there were, a couple of hundred perhaps. I have now changed to a database driven site using PHP/MYSQL and I can update the prices on the whole site in less than two minutes."	6
<b>Improve navigation:</b> "The purpose of investing in redesign is quite simply to improve navigation. The web site was too technical, too difficult to navigate. We put the strategic groups around our organisation into the forefront so that people can start there and then drill down. So if we are looking at the web site, we sell software, we offer a service package, we have hardware connections, we offer manufacturing solutions, that are my areas of work, so we want to bring them to the forefront of the web site."	6
<b>Search engine optimisation (attract traffic):</b> "One of the main aspects of the redesign of the web site was around having improved the optimisation of the web site so it was more easily identified by the search engines in order to appear higher in the rankings with the major search engines."	6
<b>Improve usability and user-friendliness:</b> "One of the main facets that we were looking for was a more customer-oriented and user-friendly site. We wanted the new web site to not only be visually attractive and functional, but also to offer intuitive and successful user experiences."	5
<b>Add/Improve e-retailing functionality:</b> "The redesigned web site allows a more sophisticated proposition for customers. For instance, bulk order discounts are automatically calculated. A user database allows corporate customers to open accounts with us and to view all their previous orders."	5
<b>Improve accessibility:</b> "The redesign was strongly based upon a need to move away from Flash. Although the majority of users have the Flash player, Flash sites do not perform for	4



users with 56k modems (as they cannot cope). We do a lot of work for small companies of which many found us from home on a 56k modem connection."	
<b>Site architecture/design shortcomings:</b> "Another reason was the fact that it was the first commercial web site I have ever made and there were a lot of layout errors, which at the time of constructing I didn't know how to correct. Also, the site needed restructuring as there were a lot of pages and images and they needed sorting in a more sensible way."	3
<b>Audience/user needs and expectations:</b> "The web site was originally designed for our customers to use to place their orders online with us. However, we found that most of our customers either use EDI or that they have software specially designed to print out stock re-orders at any given time in CSV format. It would have been pointless for them to re-enter this information onto our web site so the decision was made to drop the member's trade area and use the web site for mail order retail requirements. Having said that, all aspects of our web site are constantly changing and metamorphosing to fit in with consumer requirements, product changes, and design ideas."	3
<b>Provide better (products/services) information:</b> "We improved all the information on it for our customers. We got a lot more accurate description of our services and we added a portfolio of our work as well."	3
<b>Improve advertising:</b> "The main purpose of the redesign was to more effectively promote service offerings and provide more of an advertising resource. It seems that more often than not it is the Internet that provides the first contact between a potential customer and us as a company. So improving the usability, content and completeness of our web site will help to advertise our company better than the previous site did."	3
<b>Improve security:</b> "Valuable contact information from our customer database was available to the public since the old web site did not allow restricting access to members only. We needed a secure, organised way for our staff and clients to easily share information."	2
<b>Change of audience:</b> "Initially our web site was more directed towards business-start ups and traders. We wanted the web site also to show the increase of our audience towards medium and larger businesses. So we wanted the web site to look like we also provide our services to bigger companies at this point."	2
<b>Increase conversion rates and visiting time:</b> "At the end of the day what we tried to do is to create what we call stickiness, trying to get the visitors to stay longer in the web site and getting more involved in order to convert more of our site's casual visitors to buyers."	2
<b>Internal company restructuring:</b> "We underwent a fairly major company reorganisation to better serve our customer base so we needed to reflect the transformation of the company in the web site."	2
<b>New technological possibilities:</b> "The business is run by myself from a home based office and is continually under development to take advantage of advancing technology."	2
<b>Customer feedback/demand:</b> "The need for a "Non-Frames" version was brought to our attention by a customer who could not access the site properly on his Mac computer. The frames page in the old web site used a JavaScript to give the main menu and this was causing him some problems."	1
<b>Improve customer service/support:</b> "We had a wish-list of features that would offer better quality customer service. For example, we spent a lot of time answering phone calls from our customers, often with the same support enquiries. We wanted to provide some way of answering many of these questions in the new web site and reducing the amount of time we devote to answering phone calls."	1
<b>Fit with peers/competitors:</b> "We used to rank quite well in Google and got quite a lot of visitors from it but Google changed its algorithm and we disappeared completely from the results. I looked at competitors sites who were still ranking good in Google to see what the differences were between their site and our site and most of them seem to have more pages and more information, generally, more text about the subject. So I redesigned the site to add more general information pages, about history and FAQs and so on".	1
<b>Web developers influence:</b> "The owner was impressed with the work of this designer on a web site he had visited. During talks on his own project, he was impressed by the honesty and grasp of wider issues (search engine marketing) that the designer showed. A whole set of improvements were listed by the designer regarding the implementation of new technologies (PHP, database-driven site)."	1
<b>Total</b>	<b>101</b>



The individual reasons in Table 6-2, although interesting, were too numerous to be useful as they stood, and so the researcher returned to the data to produce a set of higher order categories of reasons, or drivers of redesign, as described in the Section 6.4.1. Thus, the textual interview data was systematically examined and themes identified and coded, using Atlas/TI, to emerge significant categories of drivers. Table 6-3 shows the result of this analysis with the identified categories, or drivers of redesign, in the first column of the table, the associated individual reasons in column 2, and their frequency in column 3.

**Table 6-3 Individual reasons and drivers**

<b>Drivers of change (higher order categories)</b>	<b>Individual reasons (basic categories)</b>	<b>Occurrence frequency</b>
<b>Business requirements</b>	Refresh brand image (new look)	19
	New services/products or capabilities	9
	Re-branding	7
	Company re-structuring	2
<b>Internet strategy</b>	Increase customer confidence	8
	Search engine optimisation (attract traffic)	6
	Add/Improve e-retailing functionality	5
	Provide better (products/services) information	3
	Improve advertising	3
	Increase conversion rates and visiting time	2
	Improve customer service/support	1
<b>User-oriented</b>	Improve navigation	6
	Improve usability and user-friendliness	5
	Improve accessibility	4
	Audience/user needs and expectations	3
	Change of audience	2
	Customer feedback/demand	1
<b>Web site maintenance</b>	Improve site management/maintenance (CMS)	6
	Site architecture/design shortcomings	3
	Improve security	2
<b>Technology</b>	New technological possibilities	2
<b>Fit with peers/competitors</b>	Fit with peers/competitors	1
<b>Developers influence</b>	Web developers influence	1
	<b>Total</b>	<b>101</b>

In order to gauge the level of importance and rating of the drivers, it was assumed that those drivers commented on most by respondents were also considered the most important. Table 6-4 shows the totals and percentages of interviewees specifying at least one reason under these drivers. Column 2 shows the absolute number of cases where a given driver was mentioned by an interviewee as being a key reason for the redesign, and column 3 provides the relative percentage (relating to the total number of cases analysed). The frequencies are different to those shown in Table 6-2 because, for the next stages of analysis (phase 2 and 3 of the mixed methodology), only one answer per category of driver, for each company, was allowed, i.e. if a



company mentioned more than one reason in a particular driver, e.g. *Internet strategy*, this was coded as just one occurrence.

**Table 6-4 Analysis of the frequency of the categories of drivers**

CATEGORIES OF DRIVERS	TOTALS	Percentage (out of 41)
Business requirements	31	76%
Internet strategy	18	44%
User-oriented	15	37%
Web site maintenance	8	20%
Technology	2	5%
Fit with peers/competition	1	2%
Developers influence	1	2%

In this analysis the most important drivers were *Business requirements*, *Internet strategy*, *User-oriented*, and *Web site maintenance*. In contrast, very few (only 1 or 2) of the redesigns were undertaken to take advantage of new *Technology*, in response to developers' suggestions (*Developers influence*), or to achieve a *Fit with peers/competition* (note: around half the interviewees identified more than one driver thus column 2 does not total 41).

These drivers were further explored to investigate whether different kinds of SMEs tended to redesign their web sites because of different drivers and Table 6-5 shows the detail of the relative frequency of occurrence of each driver broken down into business categories. The percentages highlighted in yellow indicate which categories of businesses differ most from the sample as a whole in terms of the most relevant drivers for web site redesign. For example, it can be seen that Service businesses were more likely to have Internet Strategy drivers than were other businesses, and that Computing/IT businesses were more likely to have Business requirements drivers, and less likely to have Internet strategy drivers.

**Table 6-5 Analysis of the frequency of drivers by business category**

Main categories of drivers	Whole sample		Services		Computing/IT		Retail/wholesale	
	Totals	% (out of 41)	Totals	% (out of 14)	Totals	% (out of 13)	Totals	% (out of 14)
<i>Business requirements</i>	31	76%	9	64%	13	100%	9	64%
<i>Internet strategy</i>	18	44%	10	71%	1	8%	7	50%
<i>User-oriented</i>	15	37%	6	43%	4	31%	5	36%
<i>Web site maintenance</i>	8	20%	2	14%	2	15%	4	29%
<i>Technology</i>	2	5%	0	0%	0	0%	2	14%
<i>Fit with peers/competition</i>	1	2%	0	0%	0	0%	1	7%
<i>Developers influence</i>	1	2%	0	0%	0	0%	1	7%

Table 6-6 shows the detail of the relative frequency of occurrence of each driver broken down into business sizes. As can be seen the percentages for Medium sized businesses were most different. However, there were only three cases in this category and thus, these observations are not significant.



Table 6-6 Analysis of the frequency of drivers by business size

Main categories of drivers	Whole sample		Micro		Small		Medium	
	Totals	% (out of 41)	Totals	% (out of 23)	Totals	% (out of 15)	Totals	% (out of 3)
<i>Business requirements</i>	31	76%	17	74%	11	73%	3	100%
<i>Internet strategy</i>	18	44%	12	52%	6	40%	0	0%
<i>User-oriented</i>	15	37%	10	43%	4	27%	1	33%
<i>Web site maintenance</i>	8	20%	6	26%	2	13%	0	0%
<i>Technology</i>	2	5%	2	9%	0	0%	0	0%
<i>Fit with peers/competition</i>	1	2%	1	4%	0	0%	0	0%
<i>Developers influence</i>	1	2%	1	4%	0	0%	0	0%

Table 6-7 shows the detail of the relative frequency of occurrence of each driver broken down into categories of web site lifespan. Although their frequencies are quite similar to the sample as a whole, it can be seen that the proportion of businesses citing Web site maintenance drivers seems to decrease the longer the web site lifespan.

Table 6-7 Analysis of the frequency of drivers by web site lifespan

Main categories of drivers	Whole sample		Short (1-3 years)		Middle (4-7 years)		Long (8-10 years)	
	Totals	% (out of 41)	Totals	% (out of 10)	Totals	% (out of 18)	Totals	% (out of 13)
<i>Business requirements</i>	31	76%	7	70%	14	78%	10	77%
<i>Internet strategy</i>	18	44%	5	50%	9	50%	4	31%
<i>User-oriented</i>	15	37%	4	40%	8	44%	3	23%
<i>Web site maintenance</i>	8	20%	4	40%	3	17%	1	8%
<i>Technology</i>	2	5%	1	10%	1	6%	0	0%
<i>Fit with peers/competition</i>	1	2%	0	0%	1	6%	0	0%
<i>Developers influence</i>	1	2%	1	10%	0	0%	0	0%

## 6.6. Discussion

This section describes the main categories of drivers developed in this study and discusses the results in the light of previous research findings. Given that no research appears to have been devoted to understanding web site redesign drivers in the context of SMEs it was decided to compare the results of the present study with other redesign studies in different contexts. Specifically redesign categories of drivers identified by Benbunan-Fich and Altschuller (2005) in the context of large companies and Ryan *et al* (2006) in the context of university web sites that were discussed in Chapter 2 (Section 2.5.3).

### 6.6.1. Business requirements drivers

It was not obvious in advance that the *Business requirements* category would dominate the others. The wisdom in IS research and practice is generally that justifications for systems development projects usually have to do with improving functionality and ease of use (Ryan *et al*, 2006). However, the results of this study suggest that the majority of SMEs in the sample evolved their web sites not to add e-retailing features or other advanced e-commerce facilities,



as suggested by e-commerce Stage Models (e.g. Daniel *et al*, 2002; Rao *et al*, 2003). Rather, it seems that most of these companies were refining their web presence to reflect fundamental internal business changes, such as changing focus, combining/dissolving divisions, applying a new business model, going through a re-branding process (sometimes described as creating, or refreshing, a new image), acquiring new capabilities or otherwise altering products and services. This category also includes the notion of better reflecting how an organisation has changed or evolved over time. As Ryan *et al* (2006) suggests, it might be that organisations are in competition for the attention of web users and may believe that their users will cease to find their web sites interesting if they go unchanged for too long. Indeed, it appears that commercial web sites are perceived to influence potential customers' impressions of firms' legitimacy, innovation and caring (Winter *et al*, 2003). Thus, customers may obtain a negative impression from an old, or unchanging web site.

The analysis by business category also revealed that respondents who tended to cite *Business requirements* tended to belong to the *Computing/IT* business sector. This may indicate that this type of company, at least in the sample, was particularly dynamic, with constant challenges and business changes, characteristic of the evolving and fast-moving IT sector. The importance of the *Business requirement* driver in this study is interesting because it was not expressly identified in the Benbunan-Fich and Altschuller (2005) classification nor in the Ryan *et al* (2006) study, although it might be argued that it could include the 'Marketing reasons' (e.g. to refresh an old and dated organisation's brand image) and 'Political reasons' (e.g. to reflect a new political regime in an organisation) that they found to be second and third in their order of relevance.

### 6.6.2. Internet strategy drivers

Shifts in *Internet strategy* were found to be second in importance. In order to better accomplish the organisation's strategic objectives or even to reflect new ones, a firm might shift the focus of its online operations strategy to align with this. Thus, the redesign of the web presence can be explained in terms of a modification in the organisation's purpose with the web site. For example, the organisation may decide to focus on the efficiency of internal processes, expanding or facilitating access to information content, supporting marketing promotions, incorporating online sales, providing better customer relations or support, etc. All of these changes may prompt a web site redesign in order to keep the firm's web presence in line with organisational strategic goals.

The analysis by business category indicates that informants who tended to cite *Internet strategy* drivers were more likely to belong to the *Services* sector and not to the *Computing/IT* sector. Especially relevant in this category were the desire to use the web site to increase customer



confidence, and to attract new customers by improving the rankings in search engines. The improvement or addition of e-retailing functionality was only found in five of the cases. This was the category that Ryan *et al* (2006) found as most relevant (i.e. 'rational reasons' to increase effectiveness or efficiency and better accomplish the organisation's goals and objectives). It was also included in Benbunan-Fich and Altschuller's study (2005) but there was no explicit indication of how relevant it was.

### 6.6.3. User-oriented drivers

The third driver in terms of importance was *User-oriented*; this is when the company aims to produce a better fit between the site and its audience (i.e. users or customers) by creating a better online experience and/or responding to user feedback/demand. Sometimes redesigns are driven by an expanding user base or the fact that the current site no longer addresses appropriately the different and changing needs of users. This kind of redesign can take several approaches. For example, taking into account user characteristics and preferences to improve overall usability of the site and make it better aligned with the way in which users wish to complete their goals. This might mean building more intuitive web site navigation and allowing users to get to the information they seek through different paths (e.g. navigation menus, search boxes, etc) or making the web site more user friendly, so that users can more easily complete their tasks (e.g. order multiple products). In addition, over time, a web site may attract different user audiences and the information content offered through the web site may need to be developed or rearranged based on these audiences. This can be implemented for example by providing different navigational paths to each type of customer or even different stakeholders such as investors, applicants, suppliers, etc. In this way, web sites are modified to reflect a deeper understanding of user segments and their specific needs.

These drivers usually result in improvements to navigability, usability, ease of use and accessibility of the site. This kind of driver was not identified by Ryan *et al* (2006) but it was included by Benbunan-Fich and Altschuller's (2005). In their content analysis of press releases concerning web site redesigns they found that the majority of companies redesigned their web presence to expand information, change navigation protocols, and improve the usability of their web sites, while very few added e-retailing features (e.g. online ordering). Similar issues have been reported by other authors, such as Piccoli *et al* (2004), who found a tendency for redesigned web sites to focus on information convenience, site navigation and customer confidence. The reported emphasis was on design, interface and usability issues to simplify customer's interactions with the web sites.



#### 6.6.4. Web site maintenance drivers

*Web site maintenance* drivers were fourth in terms of importance. The evolution and uncontrolled growth of the content of a web site may lead to a number of maintenance problems (e.g. outdated information, broken links, etc) that may well prompt a redesign of the web site in order to facilitate its management and maintenance. Frequently, this involves the implementation of a Content Management System (CMS) to make content maintenance easier. Such a system, allows the regular update of the content of a web site in-house, with no HTML or programming experience needed. In addition, a redesign of this kind also introduces more consistency through the use of templates, new or updated web publishing policies, procedures, and standards. Addressing other shortcomings of the web site design to keep it running smoothly may also prompt a redesign of this nature. For example, providing enough server power to cope with increasing traffic, making the site download faster, etc.

In the sample, these reasons were related mainly to improving the management and maintenance of the web site by implementing a CMS and improving the architecture of the web site. This driver was not expressly identified as a category in the previous literatures. The analysis by category of web site lifespan also revealed that informants who tended to cite *Web site maintenance* were more likely to be found in the companies with younger web sites (i.e. shorter lifespan). It seems that after a number of years and several redesigns a company is less likely to have issues with the maintenance of its web site, as might be expected.

The next three drivers were cited by only one or two interviewees and thus are only of minor significance and should be treated with appropriate caution. They are included here simply as indicating possible or potential drivers and are only briefly discussed. Two of them are mentioned by others in the previous redesign literature and one is a possible new driver. They could have been ignored or subsumed into other categories but it was decided not to do this so that they do not get lost. They thus have the potential to be included in future research to be substantiated or not.

#### 6.6.5. Technology drivers

*Technology* drivers were cited by only two companies, however, although they were not mentioned by Ryan *et al* (2006) they were identified by Benbunan-Fich and Altschuller (2005) as a category, with firms redesigning their web sites to take advantage of advances in internet-related technologies, such as back-end technologies (e.g. database-driven systems), web presentation technology and formats (e.g. HTML extensions, Flash, and other audio/video media plug-ins), server side platforms, security services, etc.



### 6.6.6. Developers influence drivers

This potential driver is the influence that internet consultants or web developers have on an organisation to redesign in some way. In the one case it was due to the skills of an outside developer and their suggestions for improvements. Although this driver was only cited once it has not previously been identified in the redesign literature. Other literature, for example, Frøkjær and Hornbæk (2004) have suggested that developers might have a special interest in minimising redesigns in order to meet time and cost-constraints and thus influence how problems on a web site are addressed or it might be because developers have a desire to mature and develop their own new skills.

### 6.6.7. Fit with peers/competitors drivers

This potential driver implies that organisations attempt to achieve a better fit between their web site and the web sites of other organisations to which they compare themselves. When enough peers and/or competitors incorporate particular functionalities or designs into their web sites then the organisation might decide to change in the same way. Thus, the organisation redesigns its web presence to achieve consistency and legitimacy and appear as expected, providing the same functionalities of its peer group of companies. Despite there being only one citation for this driver, Ryan *et al*, (2006) identify it as an important category and describe it as keeping up with competitors.

Figure 6-1 summarises the discussion above in relation to web site redesign drivers compared to the other redesign classifications from the literature. It can be seen that there is some degree of overlap, as would be expected, given that all three studies are about web site redesign. However, it also shows that of the significant drivers, *Web site maintenance* is new, and *Business requirements*, very significant in this study, overlaps only partly with Ryan *et al*, (2006) and not at all with Benbunan-Fich and Altschuller (2005).

Ryan et al., 2006 (Universities)	Present study (SMEs)	Benbunan-Fich and Altschuller, 2005 (Large companies)
	User-oriented	Accommodate the user
	Technology*	Technology available
Rational	Internet strategy	eMarketing strategy
Institutional	Fit with peers/competitors*	
Marketing	Business requirements	
Political		
		Website maintenance
	Developers influence*	

\* Possible driver



### Figure 6-1 Comparison of developed categorisation with the studies of Ryan *et al*, (2006) and Benbunan-Fich and Altschuller (2005)

These drivers are not mutually exclusive and often several of them work together to induce a web site redesign. Indeed, almost half the redesigns studied (20) corresponded to two or more drivers. Equally, a particular feature implemented in a web site may be seen as addressing more than one of these issues. For example, the implementation of an extranet or members-only area on a web site may have an *Internet strategy* aspect (e.g. trying to enhance the relationship with customers), a *Business requirements* aspect (e.g. providing new services to the registered users) and a *User-oriented* aspect (e.g. customising information content based on user type).

#### 6.7. Summary and conclusions

This Chapter 7 provides a detailed discussion of the application of the third research method (semi-structured interviews). The previous two exploratory methods provided some indications of how the sample of SME web sites evolved and what changes were implemented. However, a more interpretative approach was necessary to better understand why these changes took place. Based on the findings of the initial unobtrusive observation (*extent of change*), which identified 69 web sites that had been redesigned during the monitoring period, this third method consisted of a further analysis to investigate the reasons behind the redesigns (*drivers of change*) of a sub-sample of 41 SMEs.

Regarding the general Research Question (Why do SMEs redesign their web sites?), this chapter describes the development of a classification of seven main drivers for web site redesign based on interviews with SMEs that had recently undertaken them. A sequential mixed-methodological analysis (SMMA), as described by Onwuegbuzie and Teddlie (2003), was undertaken to analyse the responses concerning the reasons for the web site redesigns. The study found a range of drivers, mainly *Business requirements* (76%), *Internet strategy* (44%), *User-oriented* (37%) and *web site maintenance* (20%) drivers. The categorisation developed and the findings pointed to some key determinants not explicitly addressed by other work (e.g. *Business requirements*, *Web site maintenance* and *Developers influence drivers*). This further justifies the selection of a data-driven approach to the data analysis that allowed the researcher to be open to what the participants had to say, rather than possibly force-fitting the data into predefined categories drawn from previous studies. Furthermore, this is the first study undertaken on drivers for web site redesign in the context of SMEs. In addition, a number of possible relationships among the drivers and the characteristics of the businesses were found. For example, *Web site maintenance* drivers were more likely to be found in the businesses with younger web sites.



Regarding the more specific Research Question (Is there evidence of a staged development from the reasons for the redesign of SME web sites?), the findings presented here provide further support for the notion that the staged approach to e-commerce progression in SMEs does not hold true, as few of the SMEs investigated reported the implementation of sophisticated e-commerce technology features (e.g. e-retailing) as a main reason for their web site redesigns. Rather, combinations of *Business requirements*, *Internet strategy*, *User-oriented* considerations and *Web site maintenance* issues seem to be behind the redesigns, indicating that implementing transactional e-commerce web sites were not the primary e-commerce strategy of these SMEs. This empirically based classification of drivers of change in web site evolution provides a means by which the changes made to SME web sites can be studied without the necessity of assuming a staged implementation (i.e. it also shows developments within stages rather than progression from one stage to the next). This presents interesting implications for understanding the dynamics of web site transformations, especially in SMEs, and can help other researchers to undertake further case studies and subsequent non-quantitative analyses in a more insightful way.



## CHAPTER 7. CONCLUSIONS AND FURTHER DIRECTIONS

### 7.1. Introduction

This final chapter of the dissertation provides an overview to the results and discussions of the research. First, a summary of the research is presented. This is followed by a discussion of the various research contributions and implications of this research in terms of theory, policy and practice. Following that, the research limitations are listed. The chapter concludes by suggesting directions for future research.

### 7.2. Summary of the research

SMEs are typically of great importance to economies and governments have been very interested in anything which may help to stimulate and encourage their growth and competitiveness. At the outset of this research, the Department of Trade and Industry (DTI) in the UK was very keen to encourage SMEs in their e-commerce adoption and was using a Stage Model, known as the 'adoption ladder', to underpin their business support policy (DTI, 2002). In fact, the UK have spent more than any other country (£67 million) on a comprehensive 3-year programme from 2001 to help get UK businesses online and increase the e-business readiness of SMEs (Pavic et al, 2007).

One of the UK government's targets was to have one million SMEs trading online by the end of 2002. However, this was missed by more than 50 percent, which was a decline over previous years. Another objective was to reach parity with the best world practice expressed in terms of SMEs progressing up its five stage adoption ladder (i.e. email, web site, e-commerce, e-business, transformed organisation). This target was also not achieved and adoption rates of the more complex stages were too low to be reliably measured (Brown and Lockett, 2004). Thus, despite the various support initiatives that utilised Stage Models in the UK, its success as a model is questionable with the number of SMEs achieving advanced stages of e-commerce adoption being very low and lagging significantly behind larger companies. Indeed, several studies reported that SMEs, rather than progressing, as predicted by Stage Models, were actually regressing in their e-commerce stages (CBI and KPMG Consulting, 2002; DTI, 2003).

In addition, the appropriateness of Stage Models, and the assumptions underlying them, has been widely questioned in the context of SME e-commerce. The main criticism levelled is that they are over-prescriptive and do not reflect the actual behaviour of SMEs. In addition, they are thought to be too generic, fail to reflect the diverse nature and needs of SMEs, and are not borne out by empirical evidence.



Stage Models imply a progressive development of the use of the internet and web sites from the most basic to the most advanced level of sophistication and integration, via a series of specific stages. If SME web sites do not follow a staged development, how and why do they evolve? The above discussion shows that despite of the Stage Models proposed, there is still little research evidence to explain why and how SMEs evolve their web presence over time. Thus, this research aim was to establish an enhanced understanding of the dynamics of SME web site transformations over time to better support SME e-commerce progression. In order to inform research and policy of the actual practices of SMEs in relation to e-commerce development, a multi-dimensional research framework was developed by identifying appropriate dimensions from organisational change concepts and previous studies on web site evolution. Thus, the research framework combined three different dimensions of organisational change (extent, content and drivers) to capture the evolution and dynamics of SME web sites without implying a staged growth. Whilst the framework itself is new the contents of the dimensions and elements in the framework were partly, although not totally, derived from existing literature and studies. In order to demonstrate the relevance and applicability of the dimensions of the framework and refine the categories of *content of change* and *drivers of change*, a 24-month study of the types and characteristics of actual changes of a sample of SME web sites over time was undertaken. The framework also comprised the blueprint for this fieldwork, which consisted of three different methods applied sequentially in order to answer the following research questions:

- **How do SMEs change their web sites? And in particular, is there evidence of a staged development from the extent of the changes in SME web sites over time?**
- **What kind of changes do SMEs make when redesigning their web sites? And in particular, is there evidence of a staged development from the features implemented in SME web sites over time?**
- **Why do SMEs redesign their web sites? And in particular, is there evidence of a staged development from the reasons for the redesign of SME web sites?**

The first general research question was especially well suited to observational research because it involves the investigation of the state of web sites over time. Thus, the first phase of this research project was an unobtrusive observation of web sites that studied the *extent of change* of web sites over time. This refers to the extent or magnitude of the changes that occur on web sites over time and five categories of *extent of change* (or evolution strategies) were selected from previous literature: *web site redesigns*, *incremental changes*, *content updates*, *dormant sites* and *dead sites*. A range of studies have suggested that SMEs incorporate particular web site characteristics over time in sequential stages of e-commerce sophistication (e.g. Poon and

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Swatman, 1999; Chaston *et al*, 2001; Daniel *et al*, 2002; Rao *et al*, 2003; Burgess *et al*, 2005). These models imply a development of web sites in successive iterations or redesigns, typically starting with a simple web site through to more sophisticated and complex e-commerce features, over time. Thus, if the staged approach was to hold true, it would be expected to find that SME web sites are mainly redesigned, rather than incrementally enhanced, over time. This is because web site redesigns have been recognised in the literature as being often related with a revolution of functionalities and a change in stage in the evolution of a web site (Piccoli *et al*, 2004; Albert *et al*, 2004). In addition, it would be also expected to find few cases of dormant sites, which do not change over time. The results from the first phase of the research study (i.e. unobtrusive observation) showed that the main way the sample of SME web sites evolved during the 24-month study period was by updating their content (30%). Interestingly, web site redesigns were more frequent than incremental changes (27% and 21% respectively) and there were few cases of dead sites (13%) and dormant sites (9%). Thus, the findings regarding the *extent of change* dimension seemed to initially support the staged approach.

The second research question called for a content analysis approach because it involved the study of the differences experienced by web sites over time. Thus, the second phase was a content analysis of the web sites that were found to have been redesigned during the previous phase. Such analysis was applied before and after the redesigns to study the *content of change* to help identify the web features most commonly changed in the web sites, and in particular, determine if there was evidence of any staged development. Nine categories of *content of change* were selected from previous literature to study the differences in the content and design of SME web sites over time: *Navigability*, *Accessibility*, *Content for Identification & Image*, *Content for Promotion & Contract*, *Content for Relationship Enhancement*, *Relational Interactivity*, *Transactional Interactivity*, *Security & Confidentiality* and *Site Management & Maintenance*. If the staged approach was to hold true, it would be expected to find web sites mainly implementing *Transactional Interactivity* features. Moreover, it would be reasonable to assume that the study of a sample of web sites with a wide range of lifespans (i.e. from one to eight years) would find many SMEs advancing, or intending to advance, to higher stages. The results from the second phase of the research study (i.e. content analysis of web sites) showed that most of the changes had to do with improving web site navigation and ease of use, as well as improving the image and credibility of the businesses, rather than incorporating e-commerce transactional capabilities. *Transactional Interactivity* additions were found to be the least frequent category and were found only in ten out of the 69 redesigns studied, while two actually removed these features. Thus, the study of the *content of change* dimension provided little evidence that changes made to the SME web sites studied followed a staged approach from simple web sites to full e-commerce.

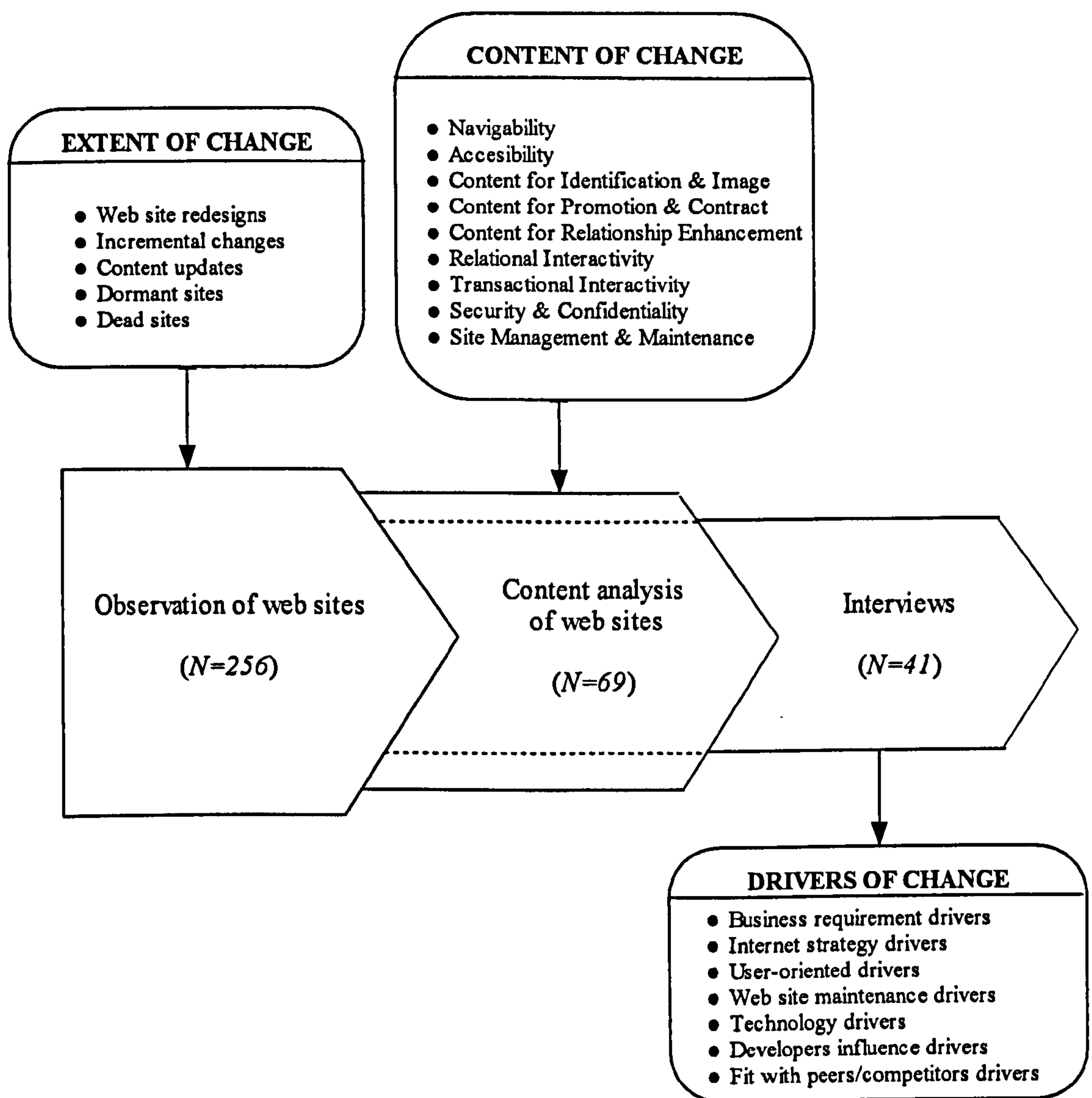


The third research question entailed not merely descriptive data but also the generation of explanatory insights. The previous two descriptive methods provided some indications of how the sample of SME web sites evolved and what changes were implemented. However, a more explanatory approach was necessary to better understand why these changes took place (*drivers of change*). Thus the third and final phase of the research consisted of follow-up semi-structured interviews with the persons responsible for the redesigns investigated in the previous phase. This was in order to identify the reasons behind the web site redesigns and in particular, whether these reasons implied a staged approach. No categories of drivers were adopted from the literature because of the lack of appropriate categories in previous studies. Thus, a classification of seven drivers emerged from the data collected, namely: *Business requirements drivers*, *Internet strategy drivers*, *User-oriented drivers*, *Technology drivers*, *Fit with peers/competitors drivers* and *Web site maintenance drivers*. If the staged approach were to hold true, it would be expected to find SMEs redesigning their web sites mainly with the intention of implementing more advanced e-commerce features. Moreover, it would be reasonable to assume that the study of a sample of web sites with a wide range of lifespans would find many SMEs advancing to higher stages, as discussed above. The results from the third phase of the research study (i.e. semi-structured interviews) showed that only five out of 41 SMEs reported the implementation of sophisticated e-commerce features (e.g. e-retailing) as one of the reasons for their web site redesigns. Rather, most of the SMEs interviewed redesigned their web sites due to *Business requirements drivers* such as refreshing the brand image or reflecting fundamental internal business changes. Thus, the study of the *drivers of change* dimension provided also little evidence that changes made to the SME web sites studied followed a staged approach.

Figure 7-1 illustrates the three phases of this study and the three dimensions of the refined research framework developed to study the evolution of SME web sites over time. Three different research methods were applied sequentially with the purposes of development and complementarity. The pointed shape of the three phases indicates that the results from each method were used as input for the next method. In particular, the results from the first observation of web sites were used for selecting a sample of companies where a web redesign had recently taken place so that further content analysis of changes and interviews could take place (development). In addition, the findings from the content analysis of redesigned sites were also combined with the findings of the interviews to obtain a better understanding of the evolution of these web sites (complementarity). The decreasing size of the phases indicates that the size of the samples also decreased each time. The direction of the arrows indicated that the specific categories for the *extent of change* and *content of change* dimensions were selected a priori while the categories for the *drivers of change* dimension were obtained from the data itself and not imposed a priori.



It should be noted that as opposed to the initial conceptual framework developed in Chapter 2 (Section 2.5) from organisational change and web site evolution literature, this refined version of the framework is specific to the SME context. This is because the categories of *drivers of change* were derived from interviews with SMEs. In addition, the web site features utilised to make the categories of *content of change* operational were initially derived from a review of web site evolution literature but then they were further refined while coding the sample of SME web sites. It is argued that a different set of categories of *drivers of change* and web site features would have populated the refined version should had the initial conceptual framework been applied to study different kind of businesses' web sites, for example larger companies.



**Figure 7-1 Research methods and refined research framework**

In conclusion, the framework developed in this study has been useful in depicting the evolution of a sample of SME web sites over time and have showed no conclusive support for the



assumption that SME web sites developed in stages. Web site redesigns are the most significant kind of changes that could occur in a web site and they might shift a web site forwards in the way that Stage Models suggest. However, it seems that most web sites in the sample furthered their development in different directions without implying a change of stage. That is, development within the same stage rather than progressing from one stage to the next.

### **7.3. Research contributions and implications**

The main contribution of this research is the development of a research framework for the study of SME web site evolution. An investigation of a sample of SME web sites showed the applicability of the research framework. Aiming to overcome limitations in the literature (e.g. Stage Models), this research contributed to theory, methodology and practice. The individual elements of the contribution made by this work stem from both the research framework developed as a whole and the different components of such framework. In the next sections the contributions of this thesis to theory, policy and practice are presented.

#### **7.3.1. Contributions to theory**

The main contribution of this research project is the development of a research framework by which the evolution of SME web sites can be studied. It integrates web site evolution literature and organisational change concepts in order to facilitate a better understanding of the dynamics of SME web site transformations over time. The framework consists of three dimensions of change (extent, content and drivers) that help in obtaining an understanding of SME web sites evolution from different perspectives. It is a pragmatic descriptive framework rather than a predictive deterministic one (e.g. Stage Model). Whilst the framework itself is new, the contents of the dimensions and elements in the framework are partly, although not totally, derived from existing literature and studies. However, previous studies that focused upon web site evolution contain the limitation of examining only one or two of the three dimensions that this framework considers.

Therefore, this study provides an incremental contribution towards theory development in the form of a set of novel instruments to characterise the dynamics and evolution of SME web sites. The research framework was first presented at the 9th IEEE European Conference on Software Maintenance and Reengineering (CSMR). Based on face-to-face feedback from that conference and other subsequent interactions with academic colleagues, it was determined that the research framework was a useful tool to guide web site evolution research. In addition, the framework has been subsequently used to study the changes in the content and design of web sites of micro businesses in Australia, Canada and the UK (Burgess *et al*, 2006), community based organisations (Burgess and Bingley, 2007) and accounting firms (Breen and Burgess, 2007). For example, Burgess *et al* (2006; p.11) found that the framework provided them with the capability



to present web site changes in a more effective manner than Stage Models, as some of the changes being made to the web sites would have been missed by them:

*We feel that the Alonso Mendo and Fitzgerald (2005) framework has provided us with a means by which we can classify the changes made to web sites by micro businesses in a simple manner, whilst still allowing us to conduct the analysis on the detailed features we introduced in Burgess, Bingley & Sellitto (2005). The framework provides us with the capability to present the web site changes in a more effective manner than we had previously. . . It also provided us with a new means to present the current content of micro business web sites in a simple manner and highlighted the differences between those businesses that had transactional interactivity features and those that did not.*

Thus, following the principles of Walsham (1995) for generalisation from interpretive research, this study can claim to offer generalisation to theory, as it has developed a research framework that can guide future studies in similar research areas. For example, the *content of change* dimension of the framework revealed that the design and content of SME web sites can be analysed by the nine distinct web evaluation categories developed. By offering a generic approach to measuring the components/functionality that a given web site addresses, the classification provides a tool to compare subsequent generations of a given firm's web site, as well as web site functionality across competing firms. According Piccoli *et al* (2004) the use of a standard coding tool simplifies comparison of results across studies as fosters the development of a cumulative research tradition.

In addition, the *drivers of change* dimension of the framework and the interviews reported in this research, as far as can be ascertained, are the first ever attempt to identify the reasons and drivers for SME web site redesigns. This study provides unique insights in contrast to previous studies because it utilised an empirical and inductive approach, where the drivers emerged from the interviews and were not imposed prior to data collection (i.e. data-driven or bottom-up method). Such classification of drivers of web site redesign can be used as a guide for future work studying evolution of web sites or internet strategies over time for other contexts. For example, Burgess and Bingley (2007) have used an early version of this framework to study community based organisations and plan to use the drivers of change dimension to make comparisons with SMEs.

### **7.3.2. Contributions to policy and practice**

Firstly, the insight that this study provides into the actual practices of SME web site development could assist policy makers for supporting better SMEs in their use of internet technologies, and specifically web sites. This is because this research supports the arguments



against the depiction of SME web sites evolution in stages and indicates that models that have been used by government policy, such as the DTI e-business ladder (DTI, 2002), do not reflect actual behaviour of SMEs. Consequently, government grants for SMEs to adopt e-commerce are likely to fail. Policy makers that are more aware of how and why SME web sites do actually evolve can design grant programs more focused on real needs. In this way, rather than helping SMEs to implement transactional features that may not be relevant for their particular circumstances, resources can be directed to support web development in other directions. For example, in this study many web sites were found to have been redesigned in order to attract more visitors through search engine optimisation techniques, involving design layout, expanding information (e.g. articles to download) and keywords. Other sites were redesigned to implement a content management system to facilitate the growth and maintenance of the site. Thus, government support programs could be directed to fund investments and/or provide training and advice in these areas. In addition the research framework could be utilised to monitor the evolution of more specific clusters of SMEs (e.g. businesses owned by women, ethnic minorities, located in rural areas, etc) in order to realise what kind of developments their more dynamic members are doing to then help the most stagnant ones to catch up.

Secondly, managers involved in internet investments decision-making could also use the research framework developed in this study. For example, the nine web site evaluation categories that form the *content of change* dimension of the framework could be used as a starting point to determine what functionality their web site will have in comparison with similar companies. For those with existing web sites, they can use the categories to review the completeness of their web presence and identify areas that could be improved. Chappell *et al* (2002) recommends that SMEs involved in e-commerce continually assess their own strengths and weaknesses using benchmarking to make comparisons with competitors. In line with that recommendation, SME managers could use the categories developed in this study to compare their site to those of their competitors and determine which functionalities or features may need to be added to their web sites. In fact, two of the business owners that participated in the interviews asked the researcher for aggregated data regarding the web site features of other similar companies in the sample so that they could benchmark their web sites with themselves along the nine web site evaluation categories developed in this study.

According to Piccoli *et al* (2004), considerable research is needed to develop instruments to evaluate web site functionality investments and especially focusing on providing specific managerial guidance to organisations for maximising the return from their web site investments. Although it has been argued by some that web site redesigns can dramatically increase sales many firms are not obtaining the desired results from their internet investments (Winter *et al*, 2003). In line with this, the classification of drivers for redesign and the unique reasons found in



this study (*drivers of change*) could provide assistance to SME managers to justify, plan and strategise internet investments. As discussed in Chapter 2 (Section 2.5.1), a redesign is a drastic investment which may result in negative consequences. Therefore, this study points to specific situations when it might be necessary for an SME to undertake a redesign rather than incremental upgrades. For example, when a business wants to reflect the changes made inside the company, such as focus of the business or services, or when the maintenance and management of a growing web site becomes too cumbersome. Investments in internet technologies typically form a significant part of the limited resources and skills of SMEs and therefore, it is of particular importance that these investments are carefully planned to minimise the risks and ensure the desired benefits, and it is argued that the findings from this study could help them to achieve this.

#### **7.4. Limitations of the research**

One of the limitations of this study relates to using a non-probabilistic sampling method. Therefore, the findings presented in the study refer exclusively to the sample of SMEs purposely selected and may not hold for the UK population of SMEs. However, it was considered to be varied enough for an exploratory study that shows the applicability of the framework. In addition, the SMEs interviewed were chosen according to specific selection criteria (i.e. having undertaken a recent web redesign), with the intention to investigate a number of typical cases without making any claim that they were representative of a population. Thus, statistical generalisation was not intended, rather the goal was analytic generalisation to gather detailed, particular data and generalise to theoretical concepts (e.g. classification of drivers) following the principles of Walsham (1993) and Klein and Myers (1999) for generalisation from interpretive research. In addition, because the resultant research framework is a deliberate simplification and is grounded in a limited number of observations, it cannot be expected to account for all possible cases that might be encountered.

The third phase of this study was focused upon utilising telephone interviews that were conducted with a single informant from each company. This could be argued to have limited or biased the findings of this research. However, although just one person was interviewed in each SME in order to examine the reasons for redesign, this person was in most cases the managing director or owner of the company and the researcher confirmed that this was the main person responsible for the redesign. This is to be expected given the small size of many SMEs where most often a single person, such as the owner or the managing director, is directly involved in all aspects of the decision-making processes relating to management and strategy.

The framework developed in this research took a limited account of the specific context of the SMEs studied. In particular, the web site evolution strategies and the drivers for redesign were



further explored to investigate whether different kinds of SMEs (regarding size, industry and length of experience with their web site) tended to evolve their websites differently or to redesign their web sites because of different drivers. However, the drivers of change dimension could be extended to take account of more variables that define the business and strategic context particular to each case studied. For example, Levy and Powell (2003) found that SME owner's attitudes to business growth and perceived business value from use of Internet technologies impact SMEs' decisions to invest in the Internet. In another example, SME's investment in IS was found to be a function of its strategy (i.e. cost reduction versus value added) and its market position (i.e. few versus many customers) (Levy et al, 2001). These and other variables that could be relevant to define further investments in redesigning their web sites could be elicited from interviews.

### **7.5. Suggestions for future research**

This study represents a first step in understanding change in SME web sites from a multi-dimensional organisational change perspective. Future studies could build on this work and expand it to address additional questions. For example, it would be interesting to follow up this study to investigate whether the businesses that mentioned certain drivers for redesign were more satisfied with their redesign than others. In addition, drivers for incremental change on web sites could be investigated and compared with the drivers for redesigns to identify situations where redesigns are more suitable than incremental enhancements in web sites.

The current study considered the issue of web site evolution purely in terms of the content, extent and drivers of change, without investigating in depth the influence of the redesigns on the overall company success or the implications of company satisfaction with its internet investments. Although this was deliberately done, as it was out of the scope of the research objectives, future research could consider these issues which have not only theoretical but also important practical implications. A case study enquiry employing a combination of data collection tools such as diaries, observations, interviews and questionnaires would allow an in-depth understanding of these issues.

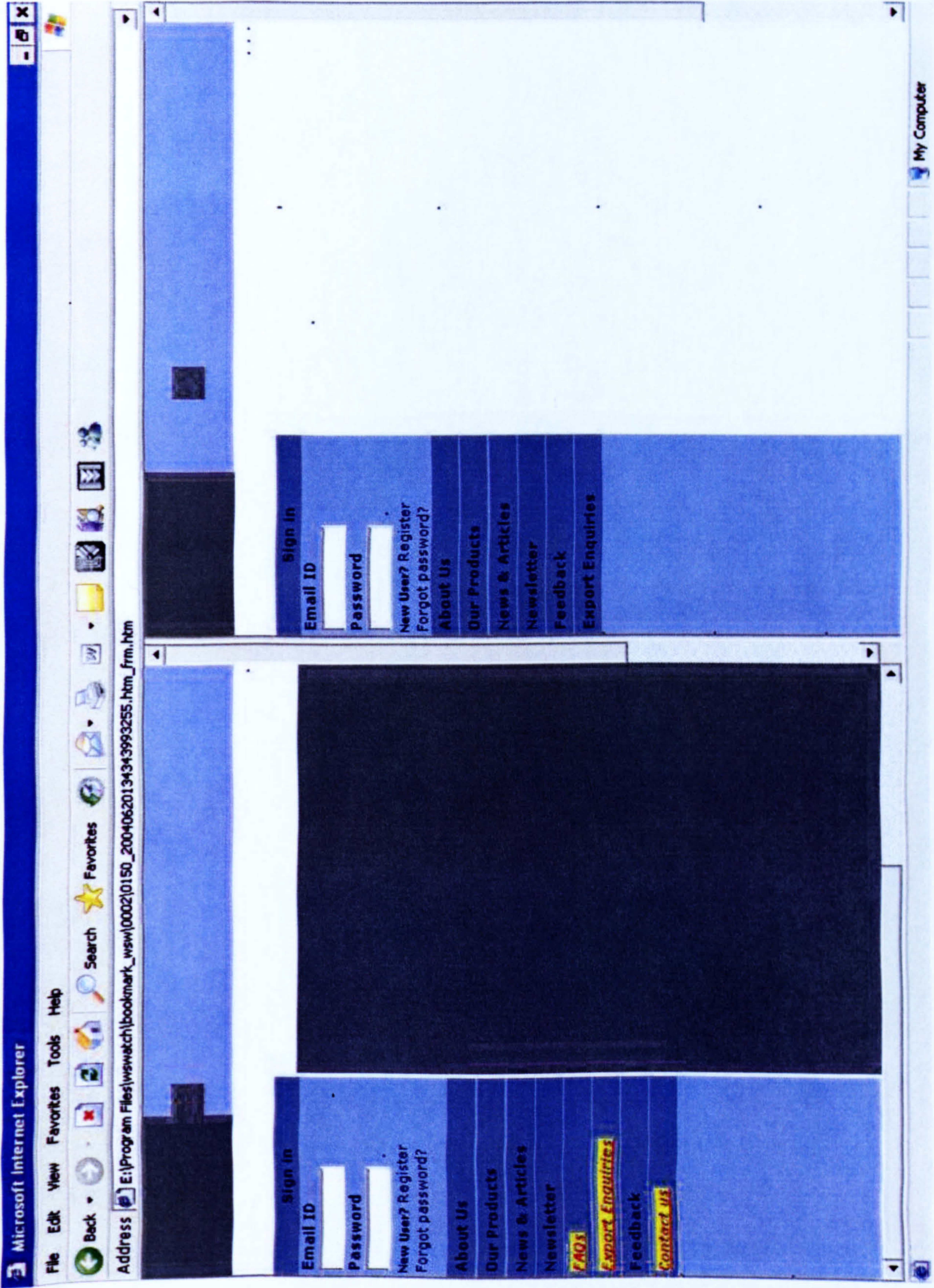
Finally, the study could be replicated with other samples of SMEs and it would be interesting to conduct comparisons of different SME segments. The developed research framework could be tested in order to be refined and to be proved reliable for evaluating web sites in other contexts. For example, this research could be further extended and adapted to study evolution of web sites in different kinds of organisations, such as not-for-profit organisations or governmental agencies, in order to examine whether similarities exist regarding their evolution. As discussed in Section 7.3.1, part of the framework (*content of change*) has been already successfully used by other researchers to study the features of web sites of different organisations: small wineries



(Burgess et al, 2006), community based organisations (Burgess and Bingley, 2007) and accounting firms (Breen and Burgess, 2007).

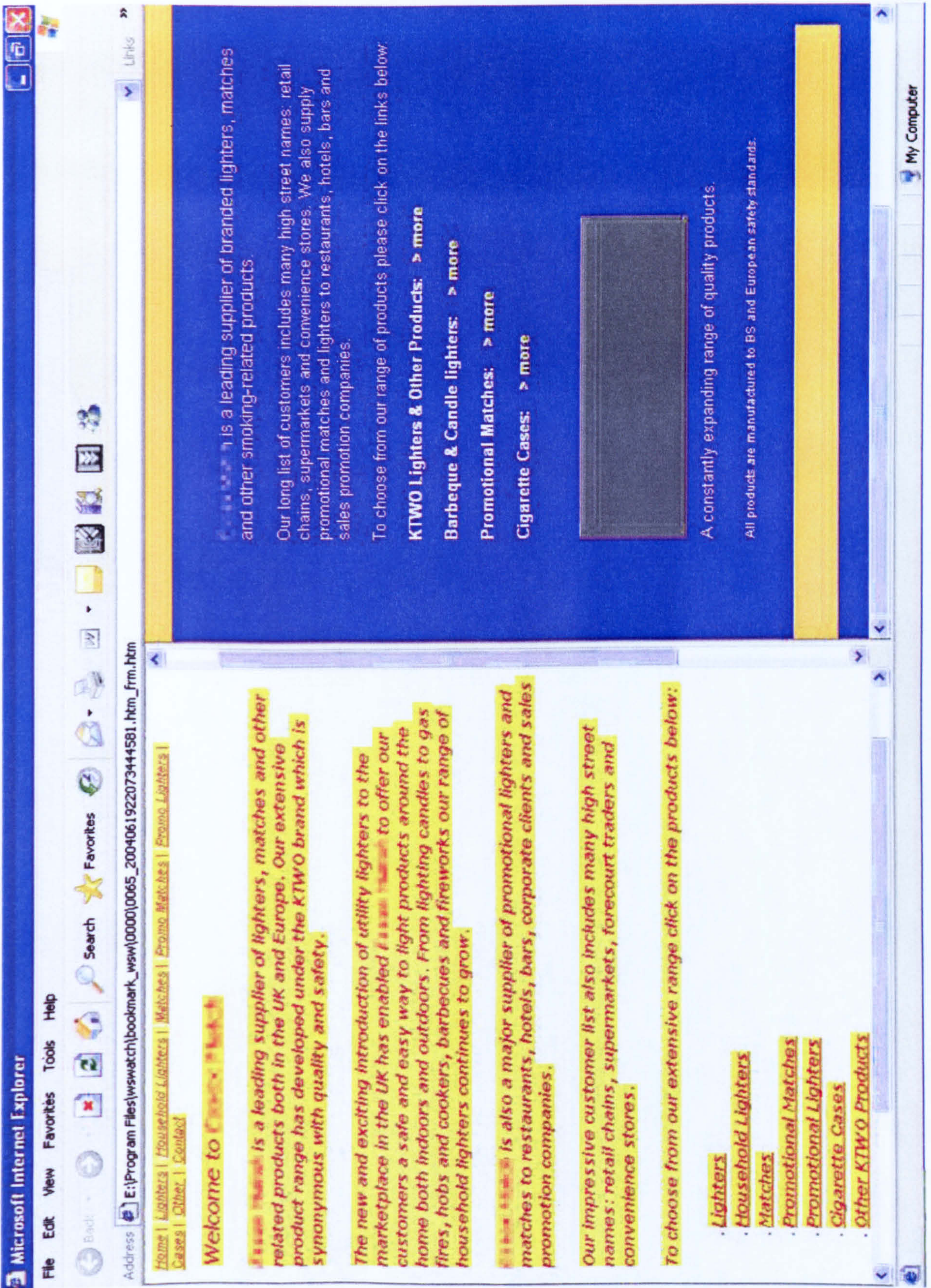


APPENDIX 4-1: Example of an incremental change.



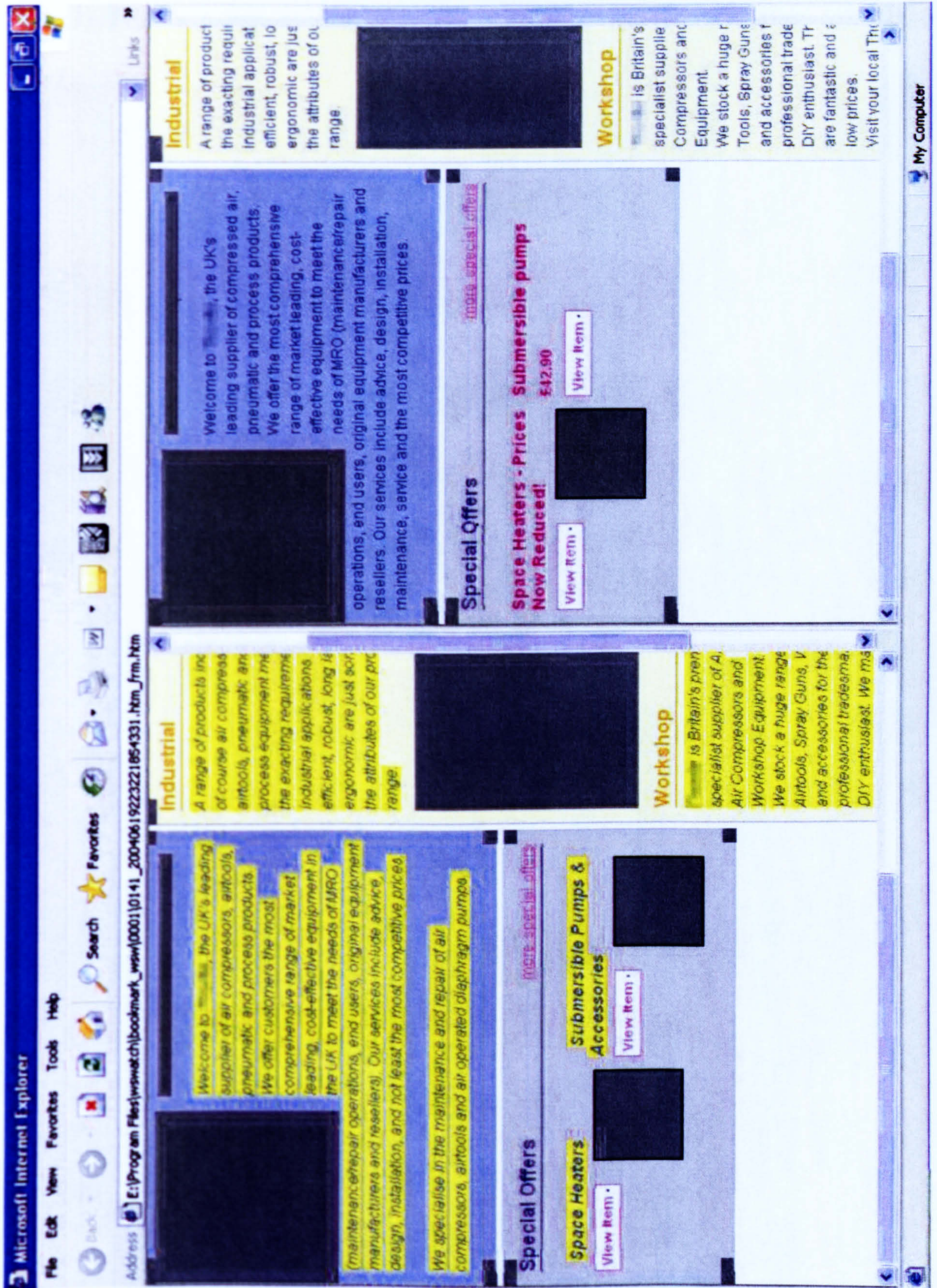


APPENDIX 4-2: Example of a redesign.





APPENDIX 4-3: Example of a content update.





## APPENDIX 5-1: Coding sheet for content analysis of web sites

Company: \_\_\_\_\_ Company ID: \_\_\_\_\_ URL: \_\_\_\_\_  
 Coder's name: \_\_\_\_\_ Date 1st analysis: \_\_\_\_\_ Date 2nd analysis: \_\_\_\_\_

Web feature	Explanation	Presence before redesign (1 or 0)	Presence after redesign (1 or 0)	Change (0 no change, 1 addition, -1 removal)
<b>Navigability (NAV)</b>				
Horizontal top navigation bar	Device with links that take users directly to another page on the site. This is situated across the top 1/3 of the screen.			
Vertical left-hand navigation bar	Device with links that take users directly to another page on the site. This is situated within the first 1/3 of the screen, reading from left to right			
Vertical right-hand navigation bar	Device with links that take users directly to another page on the site. This is situated within the last 1/3 of the screen, reading from left to right.			
Drop-down navigation bar	Do the links in the navigation bar scroll down sub-options?			
Footer Navigation Links	Links at the bottom of the pages that allow users to return to a part of the site after scrolling through the current page			
Quick links	Navigational device in home page that takes users to frequently accessed sections of the site (e.g. a navigational combo box). It should have less options than the main navigation bar.			
Site map	Feature that lets users view all the sections and subsections of the site in a single page			
Path followed	Feature that shows where users are on the site at all times, that is in which specific section and subsection.			
Frames	When the screen is divided into independent frames corresponding to different web pages. Some of the frames remain stationary while the other frames change.			
Target audience of site	Feature that sorts visitors to the site by category (e.g. customers, suppliers, shareholders, employees, etc.) and then directs them to the section of the site that concerns them.			
Intro/Splash page	A page a user sees before moving on to the web site. It usually consists of graphics, animation, and promotes the site.			
Search engine within the site	Box in which users can enter a subject and go directly to the appropriate section of the site. Links to external search engines such as Google or Yahoo are included in this component as long as they limit the search for content of the site.			
Search engine for products	Search engines that let you search for specific products on the site.			
<b>Accessibility (ACC)</b>				
Choose speed connection/version	Is there a choice of Flash, HTML or text-only version of the site?			
Print friendly version	Is there a link to or option to create a version of the page formatted to be printed?			
Change text size	Provide users the option of increasing or decreasing the size of text in the web site			
Accessibility statement or logos	Statement and/or logos that inform users, particularly disabled people, about the accessibility of the information and services provided by the web site. For example, showing that the pages reach a particular conformance level of the W3C Web Content Acces			
Plug-ins required	If the web site uses content that requires the use of plug-ins for the browser (e.g. PDF, Flash, Shockwave, etc), is there a link to the plug-in required for accessing such content?			
<b>Content for Identification &amp; Image (CI)</b>				
About us	General information about the company and/or the industry in which the company operates, its areas of activity, etc			
Company mission/values	A positioning statement reflecting the company's core values and/or outlining its competitive strength			
Company registration number / VAT number	Is any of this company identification information shown in the site?			
Postal address	The mailing address of the company.			
Company directions (map)	Is there a map or directions showing the location of the company?			
General email address	General email address of the company (e.g. general enquiries or info).			
Individual email addresses	Email addresses of individual company employees, positions or sections of the company (e.g. careers, support, accounts etc).			
Telephone number	Telephone number of the company.			
Fax number	Fax number of the company.			
Directors/Team profiles	Presentation of staff and/or executives (e.g. profiles, pictures, etc).			
Awards, certifications and memberships	List of awards, quality assurance certifications and memberships earned by the company.			
Business partners	Business partners are customers, suppliers and affiliated companies			
Portfolio of achievements	Companies use this feature mainly to highlight their expertise in a field by listing or describing projects carried out (e.g. case studies, sample work, etc).			
Customer testimonials	Testimonials or comments from customers			
Press releases / Company news	News and press releases issued by the company or newspaper articles about the company			



<b>Content for Promotion &amp; Contract (CPC)</b>				
New products announcements	Section with constantly changing content regarding new products or services.			
Catalogue of products	Fairly exhaustive listing of products or services offered, generally by category or line, together with technical descriptions, specifications, etc.			
Images of company products	Images of products (drawings, photos, etc.). It does not apply to services.			
Price of products/services	Are prices of products available online? Also applies to services.			
Product promotions	Products or services on special discount (e.g. promotion of the month, of the week, etc).			
Product samples	Promotion of products involving samples, information on how to obtain samples			
Services offered	Description of services offered			
Terms and conditions of sale	Conditions regarding payment, shipping, taxes, guarantees, cancellation of sale and exchange policy.			
Conditions regarding use of the site	Terms and conditions of using the site, getting membership, etc.			
Language selection	Are the pages available in different languages?			
<b>Content for Relationship Enhancement (CRE)</b>				
Careers (vacancies)	Job or career opportunities, vacant positions posted, description of work conditions, etc.			
FAQs	Answers to the most frequently asked questions.			
Financial data	Quarterly or annual financial results			
Company literature (downloads)	Company publications available to download, including user manuals			
Games, contests and drawings	Games available on the site and forms and participation conditions for contests and drawings			
Generic information (tips)	Generic information and general technical advice demonstrating the expertise of the company in a specific field (e.g. tips, guides, glossary, etc).			
Useful links	Links to external sites related to the company products or services			
<b>Relational Interactivity (RI)</b>				
Chat facility	Possibility of chatting online with other users or company representatives.			
Discussion forum	Electronic forum available on the web site for customers to post questions, offer answers, exchange experiences and ideas, offer help, etc.			
Contact form	Electronic form for users to request information of any kind (price, availability, location, etc.) or provide feedback/suggestions			
Members area	Access to a password-protected members area of the web sites for customers, suppliers and other external partners (e.g., trade accounts).			
Newsletter sign-in	Possibility of joining a mailing list or a periodic newsletter.			
News feeds (RSS/XML)	Facility four uses to download a RSS/XML feed to keep up to date with company information.			
Tell a friend	Possibility of referring the site to a friend through the site			
Bookmark this page	Link to add the company web address to the browser favorites			
<b>Transactional Interactivity (TI)</b>				
Print & fax order form	Form available that can be printed and faxed to the company to order products or services.			
Order by form	Online form to order products or book services.			
Online ordering	Possibility of filling a shopping basket by selecting products or services from an electronic catalogue			
Online payment	Possibility of paying online for the products/services ordered			
<b>Security &amp; Confidentiality (S&amp;C)</b>				
Privacy policy	Statement of policies concerning the company's use and disclosure of visitors' personal information, including the use of information acquired by means of cookies.			
Entry in secure zone (padlock)	Display of padlock symbol in the bottom right-hand corner of the web browser to indicate a secure connection.			
Other security certification	Certification of the site's security by an independent organization (e.g. Verisign or Thawte SSL certification or seal)			
<b>Site Management &amp; Maintenance (SMM)</b>				
Use of Flash technology	Use of Flash objects in splash screens/intros, navigational devices and user interface of embedded applications			
Hits/Visitors counter	Display of counter to track hits or unique visitors to the web sites.			
Last update	Display of the date when the content was last updated.			
Dynamic pages	Web site implemented with dynamic pages driven by databases (e.g. ASP, PHP, CGI, JSP, etc)			
Webmaster email address	Provision of email address to contact webmaster, usually in a small font at the bottom of the home page, in the event that information is incorrect or for some other reason.			
JavaScript	Use of JavaScript within HTML pages			
Java applets	Use of Java applets embedded within HTML pages			
Use of CSS	Use of Cascading Style Sheets to format web pages.			



## APPENDIX 5-2: Perreault and Leigh reliability index of content analysis of web sites

Variables (web features)	<i>k</i> (number of categories)	<i>N</i> (number of judgments)	<i>F<sub>o</sub></i> (frequency of agreement)	<i>F<sub>o</sub>/N</i> (percentage of agreement)	<i>I<sub>r</sub></i> (index of reliability)	Lower limit of <i>I<sub>r</sub></i> at 95% confidence	Upper limit of <i>I<sub>r</sub></i> at 95% confidence
<b>Navigability (NAV)</b>							
Horizontal top navigation bar	2	124	124	1.00	1.00	1.00	1.00
Vertical left-hand navigation bar	2	124	124	1.00	1.00	1.00	1.00
Vertical right-hand navigation bar	2	124	124	1.00	1.00	1.00	1.00
Drop-down navigation bar	2	124	124	1.00	1.00	1.00	1.00
Footer Navigation Links	2	124	124	1.00	1.00	1.00	1.00
Quick links	2	124	119	0.96	0.96	0.92	0.99
Site map	2	124	123	0.99	0.99	0.98	1.00
Path followed	2	124	122	0.98	0.98	0.96	1.00
Frames	2	124	118	0.95	0.95	0.91	0.99
Target audience of site	2	124	117	0.94	0.94	0.90	0.98
Intro/Splash page	2	124	124	1.00	1.00	1.00	1.00
Search engine within the site	2	124	119	0.96	0.96	0.92	0.99
Search engine for products	2	124	118	0.95	0.95	0.91	0.99
<b>Accessibility (ACC)</b>							
Choose speed connection/version	2	124	121	0.98	0.98	0.95	1.00
Print friendly version	2	124	123	0.99	0.99	0.98	1.00
Change text size	2	124	124	1.00	1.00	1.00	1.00
Accessability statement or logos	2	124	123	0.99	0.99	0.98	1.00
Plug-ins required	2	124	122	0.98	0.98	0.96	1.00
<b>Content for Identification &amp; Image (CI)</b>							
About us	2	124	124	1.00	1.00	1.00	1.00
Company mission/values	2	124	115	0.93	0.92	0.88	0.97
Company registration no. / VAT no.	2	124	120	0.97	0.97	0.94	1.00
Postal address	2	124	122	0.98	0.98	0.96	1.00
Company directions (map)	2	124	121	0.98	0.98	0.95	1.00
General email address	2	124	124	1.00	1.00	1.00	1.00
Individual email addresses	2	124	118	0.95	0.95	0.91	0.99
Telephone number	2	124	124	1.00	1.00	1.00	1.00
Fax number	2	124	124	1.00	1.00	1.00	1.00
Directors/Team profiles	2	124	117	0.94	0.94	0.90	0.98
Awards, certifications & memberships	2	124	122	0.98	0.98	0.96	1.00
Business partners	2	124	123	0.99	0.99	0.98	1.00
Portfolio of achievements	2	124	118	0.95	0.95	0.91	0.99
Customer testimonials	2	124	119	0.96	0.96	0.92	0.99
Press releases / Company news	2	124	119	0.96	0.96	0.92	0.99
<b>Content for Promotion &amp; Contract (CPC)</b>							
New products announcements	2	124	117	0.94	0.94	0.90	0.98
Catalogue of products	2	124	122	0.98	0.98	0.96	1.00
Images of company products	2	124	124	1.00	1.00	1.00	1.00
Price of products/services	2	124	123	0.99	0.99	0.98	1.00
Product promotions	2	124	118	0.95	0.95	0.91	0.99
Product samples	2	124	118	0.95	0.95	0.91	0.99
Services offered	2	124	122	0.98	0.98	0.96	1.00
Terms and conditions of sale	2	124	119	0.96	0.96	0.92	0.99
Conditions regarding use of the site	2	124	118	0.95	0.95	0.91	0.99
Language selection	2	124	124	1.00	1.00	1.00	1.00
<b>Content for Relationship Enhancement (CRE)</b>							
Careers (vacancies)	2	124	124	1.00	1.00	1.00	1.00
FAQs	2	124	123	0.99	0.99	0.98	1.00
Financial data	2	124	124	1.00	1.00	1.00	1.00
Company literature (downloads)	2	124	120	0.97	0.97	0.94	1.00
Games, contests and drawings	2	124	119	0.96	0.96	0.92	0.99
Generic information (tips)	2	124	117	0.94	0.94	0.90	0.98
Useful links	2	124	121	0.98	0.98	0.95	1.00
<b>Relational Interactivity (RI)</b>							
Chat facility	2	124	124	1.00	1.00	1.00	1.00
Discussion forum	2	124	124	1.00	1.00	1.00	1.00
Contact form	2	124	112	0.90	0.90	0.84	0.95
Members area	2	124	121	0.98	0.98	0.95	1.00
Newsletter sign-in	2	124	120	0.97	0.97	0.94	1.00
News feeds (RSS/XML)	2	124	124	1.00	1.00	1.00	1.00
Tell a friend	2	124	122	0.98	0.98	0.96	1.00
Bookmark this page	2	124	123	0.99	0.99	0.98	1.00



<b>Transactional Interactivity (TI)</b>							
Print & fax order form	2	124	121	0.98	0.98	0.95	1.00
Order by form	2	124	114	0.92	0.92	0.87	0.96
Online ordering	2	124	124	1.00	1.00	1.00	1.00
Online payment	2	124	124	1.00	1.00	1.00	1.00
<b>Security &amp; Confidentiality (S&amp;C)</b>							
Privacy policy	2	124	122	0.98	0.98	0.96	1.00
Entry in secure zone (padlock)	2	124	124	1.00	1.00	1.00	1.00
Other security certification	2	124	121	0.98	0.98	0.95	1.00
<b>Site Management &amp; Maintenance (SMM)</b>							
Use of Flash technology	2	124	124	1.00	1.00	1.00	1.00
Hits/Visitors counter	2	124	121	0.98	0.98	0.95	1.00
Last update	2	124	122	0.98	0.98	0.96	1.00
Dynamic pages	2	124	124	1.00	1.00	1.00	1.00
Webmaster email address	2	124	119	0.96	0.96	0.92	0.99
JavaScript	2	124	124	1.00	1.00	1.00	1.00
Java applets	2	124	124	1.00	1.00	1.00	1.00
Use of CSS	2	124	124	1.00	1.00	1.00	1.00



**APPENDIX 5-3: Matrix of binary codes for content of change categories**

Web site ID	CII	NAV	SMM	RI	CRE	CPC	SC	ACC	TI
3	1	1	0	1	0	1	0	0	0
4	1	1	1	1	0	0	0	0	0
8	1	1	0	1	0	1	0	0	0
10	0	0	0	0	0	0	0	0	0
11	1	1	1	1	0	1	0	1	0
12	1	1	1	1	1	0	1	0	0
13	1	1	1	0	0	0	0	0	1
16	1	1	1	1	1	1	0	0	0
33	1	0	1	1	0	0	0	0	0
39	1	1	1	1	0	1	1	0	0
41	1	1	0	0	0	0	0	0	0
42	1	1	1	1	1	1	1	0	0
44	1	1	1	0	1	0	1	1	0
45	1	1	1	1	0	1	0	1	0
46	1	1	0	1	1	1	0	0	1
49	1	1	1	1	0	0	0	1	0
53	0	0	1	1	0	0	0	0	0
55	1	1	1	0	1	1	0	0	0
57	1	1	1	1	1	0	1	0	0
63	1	1	1	1	0	0	0	0	1
64	1	1	1	0	1	0	0	0	0
65	1	1	1	0	1	0	1	0	1
68	1	1	1	1	1	1	0	0	0
74	0	1	0	1	0	1	1	0	1
85	1	1	1	1	0	1	0	0	0
93	1	1	1	1	1	0	0	0	0
94	1	1	1	0	0	0	0	0	0
98	1	1	0	1	0	1	0	0	0
99	1	1	0	0	1	0	0	0	1
102	0	1	1	1	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0
107	1	1	1	1	0	1	1	1	1
108	1	1	1	0	1	0	1	0	0
116	1	1	1	1	1	0	0	0	0
126	1	1	1	1	0	0	0	0	0
128	1	1	0	1	1	0	0	0	0
129	1	1	0	0	1	1	0	0	0
130	1	1	1	0	0	0	0	0	0
131	1	1	1	1	1	1	1	0	0
132	1	1	1	1	1	0	0	1	0
134	1	0	1	1	1	1	0	0	0
135	1	1	0	1	0	1	1	1	0
139	1	1	1	1	0	1	0	0	0
140	1	1	1	1	1	1	1	0	1
146	1	1	1	1	1	1	0	0	0
149	1	1	1	1	1	0	0	1	0
152	1	1	1	1	1	1	1	1	0
155	1	1	1	1	1	1	0	0	0
156	1	1	1	0	1	1	0	0	0
157	1	1	1	1	1	1	0	0	0
158	1	1	1	1	1	0	0	1	0
159	1	1	0	1	0	1	0	0	0
161	1	1	1	1	0	1	0	1	0
171	1	0	1	0	1	0	0	0	0
175	1	1	1	1	1	0	1	0	0
177	1	1	0	1	0	0	0	0	0
178	1	1	1	1	1	1	0	0	1
182	1	1	1	0	1	0	0	0	0
192	1	1	0	1	1	1	0	0	0
194	1	1	1	0	1	1	0	1	0
197	1	1	0	1	0	1	0	0	0
200	0	1	0	0	0	0	0	0	0
203	1	1	1	1	1	1	0	0	0
204	0	1	1	1	0	1	1	1	0
211	1	0	1	1	0	0	0	1	0
226	1	1	0	0	1	0	0	0	1
234	1	1	0	1	1	0	1	1	1
248	0	1	0	0	0	1	0	0	1
252	1	1	1	1	1	0	0	0	0



## **APPENDIX 6-1: Semi-structured interviews questionnaire**

- **Section 1: Business background**

What is your position within the company?

Can you describe the current business activities of your company?

- **Section 2: Web site maintenance**

Did you develop your web site in-house or by outsourcing to external web developers?

How long have your business got a web site for?

What were the main reasons for your last redesign?

How often do you update your web site?

- **Section 3: Web site strategy and planning**

What are the main objectives of your web site?

How do you measure the effectiveness/performance of your web presence?

How do you plan the changes on your web site?

Do you experience any barrier/problem to improve your web presence?



## APPENDIX 6-2: Pre-notice letter

**Brunel**  
UNIVERSITY  
WEST LONDON

School of Information Systems, Computing and Mathematics  
Brunel University  
Uxbridge, Middlesex UB8 3PH

Fernando Alonso Mendo, MSc(Hons)  
Research Student  
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Fax No: 01895 251 686  
Email: [Fernando.Alonso@brunel.ac.uk](mailto:Fernando.Alonso@brunel.ac.uk)

<<contact name>>  
<<company name>>  
<<company address>>

<<date>>

Dear <<contact name>>:

I am a research student in the School of Information Systems, Computing and Mathematics at Brunel University (London). Under the supervision of Professor Guy Fitzgerald, I am undertaking a research project studying evolution over time of web sites of small and medium-sized enterprises in the UK. The ultimate objective of the research as a whole is to better understand the web evolution process to help organisations to conduct web maintenance and management in a more effective way.

At the moment, I am studying changes over time of a sample of web sites. During the monitoring of the progress of the sample, I have noticed that the site of your company (<<company URL>>) underwent a redesign recently. As part of the research, it would be interesting to find out the particular reasons for undertaking such redesign. For example, to enhance the image of the company, to strength the relationships with customers, to take advantage of new web technologies etc.

I hope I have addressed a company that is concerned with the importance of web sites in relations between organizations and customers. Web sites influence potential customers' impressions of firms' legitimacy, innovation and caring. Moreover, these inferences have previously been found to influence purchasing behaviour. I assume that your company is aware of the need for continuous innovation and investment for developing and maintaining your web presence. If this is the case, I would kindly invite you to participate in the research project. This ideally would entail that a person closely responsible for the planning and development of your web site could explain by phone the reasons for your last web site redesign.

The data obtained from your participation will be analysed and the findings will be published in both academic and practitioner journals. The findings produced will be anonymous and confidential, and will be of great benefit to the research and hopefully to your organisation. Neither individuals nor organisations will be named in any published findings.

With your participation, you will be contributing to developments and improvements in this important area. It is an area in which much is written but very little is empirically researched, and you will be helping to change this. It is not a commercial venture but an academic study, seeking to help improve practice. Should you require confirmation as to the validity of this research, you may reach Prof. Fitzgerald at the following address:

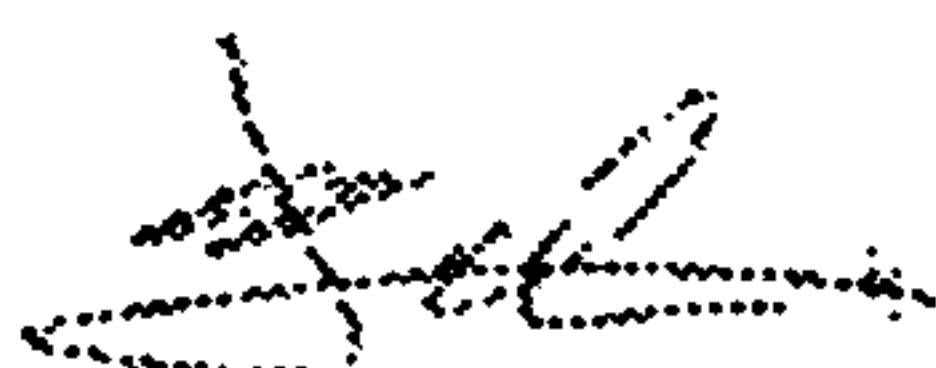
Professor Guy Fitzgerald  
School of Information Systems, Computing and Mathematics, Brunel University, Uxbridge, Middlesex UB8 3PH  
Email: [guy.fitzgerald@brunel.ac.uk](mailto:guy.fitzgerald@brunel.ac.uk) Phone: 018952 66019

In return for your valued contribution I will be pleased to send you an overview of the findings from the study.

I appreciate your time is at a premium and thank you in advance. A copy of this letter has also been sent to your company email address (<<company email>>) and I will contact you soon by phone to enquire about your interest in the project. Should you, however, require any clarification or desire to manifest your interest to participate, then please do not hesitate to contact me ([Fernando.alonso@brunel.ac.uk](mailto:Fernando.alonso@brunel.ac.uk)).

In the meantime, thank you in anticipation for your help and I look forward to hearing from you soon.

Yours sincerely,



Fernando Alonso Mendo



## APPENDIX 6-3: Example of interview transcript

- Section 1: Business background

- What is your position within the company?

*I am the owner of the business.*

- Can you describe the current business activities of your company?

*We are a London-based wine events company. We host corporate wine tasting events, evenings and weekend courses.*

- Section 2: Web site maintenance

- Did you develop your web site in-house or by outsourcing to external web developers?

*It was developed by a web developer.*

- How long have your business got a web site for?

*For around five years.*

- What were the main reasons for your last redesign?

*We offered some new services, so we had to update the web site to offer new services, that was the first thing. And the second reason was to increase the functionality of the web site.*

*[In which aspect?] For example, I wanted to be able to add some news features, that required some content management system to be added to the back-end of the web site so that I could add up and update the web site with new articles and information without having to go back to the web designer to get these pages developed. So basically now I have more, because I am not an HTML writer. My web developer developed the content management system with more functionality so that I can add quite a bit of content for the web site without having to go back to the web developer.*

- How often do you update your web site?

*Well, I can answer in two levels. In terms of minor revisions, using the content management system, probably every two weeks or so. For example, if we create a new event, I add that into the web site and I will be doing it at least every two weeks, that*



*kind of thing. On a macro level, a major revision, we've only done one. And that was around January last year. But in terms of actual change, it is due for another one, probably I will do another within the next three months.*

*[Are you thinking doing that frequently? I mean these major changes every year or something like that?] Yes, probably.*

- **Section 3: Web site strategy and planning**

- What are the main objectives of your web site?

*The first objective is to generate leads for wine taste events so the main objective is to gain customers. The second objective is to inform customers (new or existing) of our current services. Because we are an events company we update events that we provide on a frequent basis. So I want to inform customers about our new events, supply information to them. So the second objective is to provide information to our customers about wine, to encourage them to do more business with us. The third objective is to improve the image of our brand.*

*That's three objectives. The first one is definitely to generate new business, and so the way we do that is to.., we design the web site so that we get good results from the search engines, Google and all the others. So someone type some wine tasting London, for example, we want to be fairly high in the results. And a lot of the other information, someone put something a little about wine it is possible that we will come in the results. So that is the main objective, to generate sales enquiries that we can convert to sales. The second objective is to provide information to new and existing customers about our services. And the third one is to enhance our brand image.*

- How do you measure the effectiveness/performance of your web presence?

*For the first objective we ask people that telephone us or email us to enquiry about something they want us to organize, we ask them where they found us. Our measure of success is the number of people that say "we found your web site", or "we found you on the Internet". For the second objective, I guess we don't measure it, to be honest. So as long as the information is there then a number of our customers use us then is useful, not a concern. For the third objective, is really measured informally through feedback. For example, I am meeting a new customer or a new supplier and I direct them to my web site, something that I found, it is a really nice web site then I am happy with that. But my main measure really, for the effectiveness of the web site, is the number of sales that we get from it.*



[What about server logs, do you use this kind of stats?] *No, occasionally, I know about them. I should be using them more and the people who do my web development occasionally send me a report but to be honest I haven't really looked at them recently. So I knew how effective it was but I don't know how effective it is now, at that level. And also I look at Alexa from time to time and I saw that we improved. I haven't actually in the last three months.*

[You mentioned your position in Google before, did you notice any difference in your position after your redesign?] *Yes, it has improved.*

- How do you plan the changes on your web site?

*I would say, it's not ad-hoc planning and it's not particularly long term plan either. I would say is somewhere in between. I would probably review our web site and then I have specific changes that I want to make and I would submit a kind of full change request or statement of work required document to my web developer and he would come back with some suggestions. They may have their own ideas too, and then we would decide an statement of work. And from then, the web developers would do the work. So it is formal, but it's probably not. If you would say to me what will my web site be in five years time I couldn't tell you. But there is planning involve.*

- Do you experience any barrier/problem to improve your web presence?

*Yes, definitely cost. We wouldn't just do anything we wanted to, that's why I get the feedback proposal back from my web developer and he will say it will cost this much to do that, based on estimated hours. And then I will be making a decision about what to spend the money on. So definitely, to start with the cost, because we don't know how long or how much will take the work, because of the programming involved. I trust the web designer when he says this will take a long time or can't be done easily and I work out what to do based on that.*



**APPENDIX 6-4: Matrix of binary codes for drivers of change categories**

Web site ID	Business requirements drivers	Internet strategy drivers	User-oriented drivers	Web site maintenance drivers	Technology drivers	Fit with peers/competition drivers	Developers influence drivers
3	0	1	1	0	0	0	0
10	1	1	1	1	0	0	0
11	1	0	1	0	0	0	0
13	0	1	0	0	0	0	0
16	1	0	0	0	0	0	0
33	1	0	0	0	0	0	0
44	1	0	0	1	0	0	0
45	1	0	0	0	0	0	0
46	1	0	0	1	0	0	0
49	1	0	0	0	0	0	0
53	0	1	1	1	1	0	1
55	1	0	0	0	0	0	0
64	1	1	0	0	0	0	0
65	0	1	1	0	0	0	0
74	1	1	1	0	0	0	0
85	0	1	0	0	0	0	0
94	0	0	0	1	0	0	0
98	1	1	1	0	1	1	0
99	1	1	0	0	0	0	0
102	1	0	0	0	0	0	0
105	1	0	0	0	0	0	0
107	1	1	1	0	0	0	0
116	1	0	1	0	0	0	0
126	1	1	1	1	0	0	0
128	1	1	1	0	0	0	0
129	1	0	0	1	0	0	0
130	1	0	1	1	0	0	0
131	1	1	1	0	0	0	0
132	1	0	0	0	0	0	0
134	0	1	0	0	0	0	0
135	1	0	1	0	0	0	0
139	1	0	0	0	0	0	0
140	0	1	0	0	0	0	0
146	1	0	0	0	0	0	0
156	1	0	0	0	0	0	0
159	0	1	0	0	0	0	0
171	1	0	0	0	0	0	0
175	0	1	0	0	0	0	0
192	1	0	1	0	0	0	0
197	1	0	0	0	0	0	0
203	1	0	0	0	0	0	0



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