The impact of interactions between factors influencing Information Communication Technology use on a company’s performance: Application of systems theory and case study research methods

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A thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy (Ph.D) at Charles Sturt University.

November, 2009
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List of Acronyms

GST – General Systems Theory
ICT – Information Communication Technology
IT – Information Technology
RBV – Resource Based View
Certificate of authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma at Charles Sturt University or any other educational institution, except where due acknowledgement is made in the thesis. Any contribution made to the research by colleagues with whom I have worked at Charles Sturt University or elsewhere during my candidature is fully acknowledged.

I agree that this thesis be accessible for the purpose of study and research in accordance with the normal conditions established by the Executive Director, Library Services or nominee, for the care, loan and reproduction of theses.

__________________________________
Arnela Ceric
Acknowledgments

I have had the benefit of valuable advice and information from many sources. I recognise all those people who believed in me and provided support when I needed most.

I would like to recognise the kind contributions of Prof. Leo Buerki, Visiting Fellow at Charles Sturt University who provided me with software that I used in this study and guided me through the exciting developments of the systems theory approach and holistic thinking. Prof Eva Mitleton-Kelly, LSC, who helped me through the EPSRC Taught Course for Researchers on Complex Social Systems (29th - 28th March, 2007) at London School of Economics, and was acting as supervisor at the early stage of my work.

My sincere thanks go to all the people at the Faculty of Business, School of Business who have supported me over these years. In particular my gratitude goes to Prof Greg Walker who sets resources to support me to undertake this work, together with my supervisor.

I am deeply indebted to my supervisor A/Prof Hazbo Skoko whose help, stimulating suggestions, and encouragement helped me through this journey. His patience, wisdom, and support were remarkable.

In sum, in this thesis I have attempted to convey the guiding spirit of all of the truly remarkable teachers I have been so privileged to be associated with.

There are other individuals who have made the completion of the thesis possible. I would like to thank Dr Robin Wills, whose enthusiasm and help with my writing was inspirational. In addition, I want to acknowledge the generous assistance of Gerard Daniel, Lynnette D’Arcy-Evans and Pauline Graf in editing and proof reading the thesis. My thanks and appreciation also go to Ms Jennifer Hamilton, my flatmate, for her understanding and great friendship.
I am most obliged to my family for their understanding, encouragement and love. In particular I am grateful to my parents, who although on another side of the world, have been precious source of inspiration.

Finally I acknowledge the support by the Charles Sturt University Postgraduate Research Scholarship (CSUPRS).
Abstract

Companies invest millions of dollars each year into Information Communication Technology (ICT) with the purpose of achieving a range of ICT benefits such as, data sharing, organisational transformation and raising the level of efficiency in business processes. However, ICT investments alone cannot bring any of these ICT benefits. The reason for this is that ICT value is not a result of hardware and software components only, no matter what features they have, what really matters is how people actually use ICT in relation to company goals.

This study reveals that ICT utilisation is of critical importance for the realisation of ICT value. In this account of the research ICT is conceptualised as a system, in which users, ICT, organisational and environmental contexts interact, and it is this network of interactions that accounts for the complexity of ICT utilisation. Thus, ICT value, in this study, is considered to be a result of interactions between personnel and the technological, organisational and environmental contexts. Consequently, factors from each of those contexts, previously identified in the literature, have been considered in relation to their impact on company performance. It has been found in this research that their impact occurs with a time lag, in the use stage of ICT diffusion. Most specifically, the research objective of the study has been to establish how the interactions between factors influencing ICT use impact on a company’s performance.

In order to effect this research, case study and systems theory research methods have been applied in order to allow an in-depth investigation of each ICT system. Data have been collected from semi-structured interviews with employees, managers, Board of Directors and IT employees. Ultimately, this study has identified 23 factors influencing each ICT system in the use stage of ICT diffusion. Thus, systems theory research methods enabled the analysis of interactions between factors influencing ICT use and four groups of ICT effects.
As an outcome of being able to explain how interactions between factors influenced ICT use and its impact on a company’s performance, factors relevant for realisation of each group of ICT effects were identified. The following factors have been identified as determining informational and strategic ICT effects: ICT integration and compatibility, ICT utilisation, managers’ ICT knowledge, organisational strategies and alignment between ICT and organisational strategies. In addition, organisational cultural influences, informational ICT effects have been found to be influential. Furthermore, informational ICT effects have been identified as foundational to the realisation of other groups of ICT effects. Factors which influenced the realisation of transactional ICT effects were ICT integration, ICT utilisation, managers’ support, and alignment between ICT and organisational strategies. It was also found that a range of different factors influenced the realisation of the transformational ICT effects in each company.

This research has demonstrated that ICT value creation is a complex phenomenon which occurs on multiple levels of analysis and is determined by a number of factors from various contexts.
Prologue

On my 13th birthday my parents bought me a brand new personal computer (PC). Although I liked the idea of having it, I did not really need it. At that time a computer had no relevance to me, as far as my needs were concerned. I did not require it for my school work, and my friends were not interested in computers. The only experience, that I had ever really enjoyed, regarding computers, was playing games on them during Information Technology (IT) class at school.

So, at that time, my birthday gift seemed both intimidating and alien. Although my new PC had numerous features, I realise even then, that, they did not motivate me to do anything with the computer. All of this made me think seriously about how I could use my new computer to enrich my life. It is this question that guided my choice to research the value of ICT.

Although I did not appreciate or understand the potential impact of that single computer on my life at that time, it was a gift which would increasingly become immensely valuable to me, and for which I shall forever be grateful. That single PC enabled me to open a doorway into the future, so to speak, through which I could safely travel in pursuit of many of my goals, particularly those regarding my education. It is my hope to now convey to the business community some of what I have learned along the way, regarding the enormous potential value of ICT to any company which truly utilises it properly.
Chapter 1

Introduction
1.1 Introduction

The purpose of this research project is to explain the creation of Information Communication Technology (ICT) value as deriving from the interactions between factors from technological, individual, organisational and environmental contexts. These interactions occur at the use stage of ICT diffusion and this perception will be explained in more detail in this chapter. Unfortunately, there has been some confusion in the ICT value literature, particularly regarding methodologies, the processes of analysis and the contexts in which they were applied. All too frequently, the relationship between company performance and ICT has proved to be inconsistent. This study takes a different approach to understanding ICT value, because it is based on the argument that ICT value occurs as a result of ICT utilisation, rather than simply because of ICT investments.

The outline of the thesis is presented in this chapter. In addition, there is explanation of how the research objective would be achieved: from conceptualising ICT as a system, based on systems theory, to analysing interactions in three different ICT systems in Croatian companies. In addition, the terms used throughout the thesis, such as ICT, ICT system and ICT value, have been defined at the end of this chapter.

1.2 Background to the research

Companies throughout the world are investing enormous amounts of money in Information Communication Technology (ICT) in order to obtain and sustain a competitive advantage in the market. For example, more than 316 billion dollars is spent annually on information technology (IT) in the USA alone (Ryan & Harrison, 2000), with global IT spending exceeding two trillion dollars each year (Ryan, Harrison & Schkade 2002). However, a global study, involving 659 Chief Executive Officers (CEOs), conducted by the London School of Economics (Tallon, Kraemer & Gurbaxani, 2000), found that only 25 percent of CEOs expressed satisfaction with the performance of their IT investments. Furthermore, researchers and practitioners have been unable to conclude that investing in ICT produces

The link between technology and organisational performance came to the attention of management and IT researchers during the 1970s when the use of IT rapidly increased, and productivity growth slowed down in the USA (Brynjolfsson & Yang, 1996). This raised concern that huge investments in IT had been counterproductive. A number of researchers have tried to produce hard evidence of productivity gains, and consequent increases in company performance, as a result of IT/ICT investments (Chan, 2000). But, in many of those studies, findings have been both inconsistent, contradictory and conflicting (Brynjolfsson & Hitt, 2000; Sircar et al., 2000; Davern & Kauffman, 2000; Dos Santos & Sussman, 2000; Tam, 1998; Weill & Olson, 1989).

The relationship between information technology and productivity has been widely discussed, and it is generally thought that this relationship has produced “the biggest technological revolution men have known” (Brynjolfsson, 1993, p. 67). However, investment in IT/ICT has resulted in disillusionment, which is becoming increasingly evident in statements such as: “No, computers do not boost productivity, at least not most of the time” (Brynjolfsson, 1993, p. 67). Brynjolfsson (1993) has noted that many studies, in attempting to establish a relationship between productivity and IT, have only “deepened the mystery” (Brynjolfsson, 1993, p.67). That mystery, known as the productivity paradox, suggests that IT investment does not produce increased output (Sircar, Turnbow and Bordoloi, 2000, Brynjolfsson, 1993). That is, concrete benefits from the use of IT/ICT have not materialised, in terms of output statistics or productivity measurements (Farhoomand, 2005). Robert Solow explains the productivity paradox in these terms: “we see computers everywhere except in the productivity statistics” (cited in Brynjolfsson, 1993, p.67).

The productivity paradox was originally conceptualised as an economy level phenomenon (Brynjolfsson, 1993), and therefore many studies have been focused at national and industrial levels. The majority of studies, however,
have addressed the productivity paradox at the level of the organisation, whilst only a few have taken into account analysis at an individual level (Chan, 2000). Apart from analysis being directed at these different levels, poor IT performance is due to deficiencies regarding the use of measurement, as well as methodologies, so that: “the closer one examines the data behind the studies of IT performance, the more it looks like mismeasurement is at the core of the “productivity paradox” (Brynjolfsson, 1993, p. 74).

The reason for the paradox is that each research project, instead of building onto conclusions from earlier studies, went into researching different aspects of the productivity paradox, using different levels of analysis, research methods, and conceptualisations of ICT as well as measures of the effect of IT investments on company performance (Devaraj & Kohli, 2003; Chan, 2000; Weill & Olson, 1989).

There is a trend in that literature to use objective measures of performance which are financial in nature. However, this type of measure does not capture all of the effects and values brought about by ICT investment. Most authors (e.g. Brynjolfsson & Hitt, 1993; Ryan & Harrison, 2000; Love et al., 2006) agree that ICT cannot be evaluated by using only financial measures. Subjective measures of performance must also be taken into account, in order to capture intangible effects caused by ICT applications. The effects of ICT on company performance are separated by time, and therefore, influence performance directly and indirectly. For example, a direct impact of ICT on performance occurs when an ICT investment replaces a less productive piece of equipment; and an indirect impact occurs when ICT brings about a redesign of production because of management practices.

Simply measuring the tangible effects of ICT, only, does not capture all of the effects and values brought about by ICT investment. Previous studies have mainly used statistical methods to establish the correlation between investment in ICT and productivity, or profit level, in order to determine the value of ICT. However, correlations between IT/ICT investment, and organisational performance and productivity, do not necessarily imply
causation, according to Mahmood and Mann (2000). The reason for this is the time lag between ICT costs and benefits (Brynjolfsson, 1993). Thus, cross-sectional data analysis limits the ability to examine the lag ICT effects which consequently limits establishing the causal connections between ICT and company performance (Devaraj & Kohli, 2003). As a result, the development of a complete theory, as well as aggregate measures of potential benefits, resulting from the adoption of IT/ICT, remain sluggish, despite an abundance of research having been done on IT/ICT over the past decade.

The final two explanations for the productivity paradox, namely, redistribution and dissipation of profits, and mismanagement of information and technology, propose that there are no ICT benefits. ICT benefits are either redistributed to the customers and the industry, or they do not take place due to various ICT issues. For example, ICT can become old, users can underutilise ICT in their work, or ICT can simply not be aligned with organisational strategies which all results in ICT not supporting the business objectives. This is known as the legacy issue (Mitleton-Kelly, 2004). Therefore, the mismanagement of ICT can diminish the ICT effects and the organisational performance. By applying qualitative research methods, as it is done in this study, these issues and their effects on organisational performance are better understood.

1.3 Justification for the study

There is a need, in relation to the literature and management practice, for a better understanding of how ICT impacts company performance, which could enable a company to better utilise its resources. This need is further exacerbated by the limited number of studies looking into the post-adoption stage. It is argued in this study that simply adopting ICT is not sufficient in itself for the realisation of ICT benefits. Instead, ICT value depends on ICT adaptations, complementary investments, and interactions between ICT and users and an organisational context. Thus, ICT value not only occurs in the post-implementation stage, that is, the use stage, but it should also be evaluated there. Therefore, the focus of this research is on the creation of ICT value which occurs in the use stage of ICT diffusion.
It is considered in this study that ICT is not separated from the outside world and static; on the contrary, it is inextricably linked to the individual and organisational contexts with which ICT interacts in a dynamic way (Tedre, Sutinen, Kähkönen & Komsers, 2006). Thus, it is necessary to understand ICT and its effects in interaction with the socio-technical (human, organisational and technical) dimensions (Ryan & Harrison, 2000). Taking into account financial and technological contexts only, leads to problems with measurement of ICT effects. Lack of social dimension and not taking into account intangible ICT effects is, according to Love et al. (2006), the reason for the productivity paradox.

In order to assess the multidimensional value of ICT in a complex organisational environment with so many different factors that influence the company and consequently ICT value, more complete assessment with several levels of analysis is needed (Sircar, Turnbow & Bordoloi, 2000). Therefore, in this study, technological, individual, organisational and environmental factors are taken into account and their interaction is established for each case study. This is the reason why an evaluation of ICT value that relies on a few key numbers at a single point in time is incomplete and possibly misleading.

Furthermore, in order to develop a better understanding of ICT value, systems theory has been applied in this study. The main contribution of systems theory to an understanding of ICT value is in emphasising that everything happens in interactions. This means that ICT value is the result of interaction between ICT, its users and an organisational context. In addition, ICT value is in this study conceptualised as sum of realised informational, strategic, transactional and transformational ICT effects. Therefore, interactions between ICT, users and an organisational context have to be taken into account when assessing ICT value. That is done in this study.

Because of the nature of interdependencies between the elements identified above, improvement in one part of the system will not necessarily lead to an improvement of the entire system. Systems theory emphasises integrated
and harmonious functioning of all parts of a system. In addition, integrated functioning of all parts is much more important than the optimal functioning of a single component of a system. Taking into account factors influencing ICT use, which are part of four different contexts, will hopefully provides a holistic view regarding ICT value creation, and identify factors which inhibit and support realisation of ICT effects. Thus the findings in this research project will hopefully result in specific and unique contributions regarding theory and practice.

This research project contributes to methodology as well. This is achieved by applying case study and systems theory research methods. The combination of these methods is unusual, and it is not often seen in the literature (Anaf, Drummond & Sheppard, 2007). The reason, for choosing a combination of case study and systems theory research methods, is that the combination enables one to consider the influence of organisational and environmental factors on the ICT system, as well as enabling an in-depth exploration of factors which influence ICT use in a specific organisational setting.

1.4 Research objective

As one can observe from the discussion above, the focus of this research is on the realised ICT value which is created during the process of interactions between technological, individual, organisational and environmental contexts. Therefore, the objective of this study is to answer the following research question:

**How the interactions between factors influencing ICT use impact on a company’s performance?**

The objective of this research project is to provide an understanding of the ICT value realisation process; by analysing the interactions between factors influencing ICT use and establishing their impact on a company’s performance.
Factors influencing ICT use are interdependent in an ICT system. It is their fit that brings about the overall results, that is, ICT value. This means that ICT value can be understood only when the interactions between the factors is considered. Systems theory, with its focus on the interactions, provides understating how these contexts work together to produce the overall ICT value. Factors that encourage change and improvement are referred to as the driving factors. Factors which work in opposition and discourage the improvements of ICT system are called inhibiting factors. Terms such as inhibiting and driving factors are commonly used in the ICT literature, for example (e.g. Khoumbati et al., 2006; Peansupap & Walker, 2006, 2005; Messerli, 2000; Premkumar & Roberts, 1999; Iacovou et al., 1995). For additional explanation of these terms, see Lewin (1951). These terms will not be further discussed and justified in the present thesis.

The main research objective can be further divided into several sub-objectives. Firstly, factors influencing ICT use have to be identified; as do ICT effects. They are established based on the review of the literature, and collecting data in the field. After that, interactions between factors influencing ICT use and ICT effects can be established by applying the systems theory research method. The procedure, in achieving the research objective, is to explain how these interactions influence company performance. Therefore, this research will achieve several purposes. These are:

- Identification of factors influencing ICT use from technological, individual, organisational and environmental contexts
- Identification of ICT effects
• Establishment and description of the interactions between factors influencing ICT use and ICT effects
• Explanation of how the interactions between factors influencing ICT use impact a company’s performance

In order to explain how the aims of this research project, identified above, are achieved, the outline of the thesis is discussed in the following section.

1.5 Outline of the thesis

The thesis is comprised of eight chapters, and each of these has a specific purpose regarding the research objective. The purpose of each chapter is stated in this section.

The structure of the thesis follows Perry’s (1998) suggested structure: introduction, literature review, methodology, analysis and conclusion. More specifically, introduction to the research project is provided in Chapter 1; review of the literature on systems theory, ICT value and factors influencing ICT use is presented in Chapters 2 and 3; methodology is discussed in two chapters (Chapters 4 & 5); as well as data analysis (Chapters 7 & 8); and conclusion is reached in Chapter 8. The reason for such structure is qualitative nature of the present research project as well as a combination of case study and systems theory research methods.

Based on a precedent set by a number of academic authors, the use of first person pronoun is justified in a thesis document for the purpose of explaining the what and why of the research process (Starfield & Ravelli, 2006; Harwood, 2005; Hyland, 2002; Tang & John, 1999). Additionally, based on American Psychological Association (2001), the use of first person is preferred.

Chapter 1: Introduction

The introduction to the research project is provided in Chapter 1. The research background regarding the impact of ICT on company performance is presented first. Based on the limitations of the previous studies in terms of mismeasurement of ICT effects and their time lags provide the justification
for this research project. The research objective for this research project is identified in Chapter 1: how the interactions between factors influencing ICT use impacts on a company’s performance. The focus in this study is on an ICT system in the use stage of ICT diffusion in which technological, individual, organisational and environmental contexts interact with each other and create ICT value. The outline of the thesis is also provided in Chapter 1, as well as the definitions of the key terms in this research project.

Chapter 2: Systems theory
Systems theory is discussed in Chapter 2 of this thesis. Apart from introducing development of systems theory and its relation to the traditional paradigm, it is used for conceptualising ICT as a system which is embedded in a larger organisational system. Furthermore, ICT is considered as an artificial system - the function of which is determined by the organisation to which it is applied. This means that ICT goals are determined by the organisational strategy. The accomplishment of ICT goals is dependent on users, the organisational context and the ICT characteristics. The key feature of a systems world view is seeing everything in terms of interaction. Such view emphasises that the interaction between ICT, users and an organisational context is crucial in relation to achieving ICT goals.

Chapter 3: Literature review
The process of ICT value creation is further developed in the literature review (Chapter 3). Identified stages of ICT diffusion explain the transformation of ICT value from that which is intended to that which is realised. In the adoption and implementation stages, the focus is on the intended ICT value, while in the use stage of ICT diffusion ICT value realises. The realised ICT value is a combination of realised ICT goals. In addition, ICT effects are identified in the literature review and grouped into informational, strategic, transactional and transformational ICT effects.

It has been established in the literature review that the creation of an ICT value occurs as a result of the process of interactions between technological, individual, organisational and environmental factors. This process is known as ‘conversion effectiveness’, and is different in every company. For this
reason, each company achieves different levels of ICT utilisation and ICT effects. Factors regarding the technological, individual, organisational and environmental contexts have been identified in the literature review. Based on the ICT value creation process and factors which influence it, a theoretical framework for this study has been developed.

Chapter 4: Methodology
In order to discover factors which influence ICT use and establish their impact on a company’s performance, case study research method has been complemented with systems theory research method. Case study research method involves studying a case, whilst systems theory focuses on a system. For the purposes of this research, an ICT system is regarded as both the case and a system. So the research methods of case study research and systems theory are compatible. In addition, case study research method uses several different sources of data, that is, triangulation. On the other hand, a systems theory approach enables analysing complex interactions between ICT, users and an organisation. Thus, the combination of the two research methods enables achieving the research objective of this study.

Chapter 5: Research design
Research design is a plan for applying the research in a company’s setting, with a purpose to achieve the research objective. It is presented, validated and described in Chapter 5. In order to achieve the research objective, data collection strategies chosen for this study are semi-structured interviews and focus-group meetings with members of Board of Directors, middle managers, IT employees and users. The interviewees are chosen based on the snowballing sample strategy, which is justified in Chapter 5. Factors influencing ICT use in each company are identified by applying the content analysis. The interactions between factors influencing ICT use and ICT effects are established and analysed by applying the systems theory tools, named cross-link analysis.

Chapter 6: Factors influencing ICT use
Based on the content analysis of the transcribed interviews, factors influencing ICT use are identified for each company where this research
was applied. The factors influencing ICT use are presented in Chapter 6, in a way to describe each ICT system. That is, they are organised in a way that organisational and technological factors describe the enabling environment, ICT adaptations, while each, individual and environmental group of factors are organised in a way to describe the co-evolution between ICT development and users, ICT development and external environment. By doing so, a complete picture of each ICT system is provided, which serves as a foundation for the findings presented in Chapter 7. Furthermore, factors influencing ICT use, identified in each company are organised in a framework which serves as a blueprint for understanding ICT systems in other organisations.

Chapter 7: Analysis of interactions in ICT systems
The interactions between factors influencing ICT and ICT effects, in each ICT system, is analysed and discussed in Chapter 7. The analysis provides deep insights into each ICT system and its functioning in relation to users and organisational context. By comparing factors which influence ICT effects in each company (cross-case analysis), a general framework is developed, which identifies the key factors influencing achievement of each group of ICT effects. As a result of the analysis, a dynamic and holistic understanding of an ICT system is provided, and the research objective is achieved.

Chapter 8: Conclusion
The last chapter of this thesis is Chapter 8. The findings of this research project are identified and discussed in this chapter. Based on these findings, contributions to the theory and practice are identified and discussed. Furthermore, limitations of this research project are outlined and recommendations are made for the future research.

1.5 Definitions of key terms
The key concepts in this research project have been defined in this section. Information communication technology (ICT) is the central focus of this study, together with ICT value, company performance and systems theory. Therefore, these concepts are defined in this section.
Information and Communication Technologies (ICT) emerged in the late 1980s and early 1990s as computer-based technologies, used to support communication of information. ICT is a digital technology designed to collect, store, organise, process and share information within the company, and with the external environment (Ritchie & Brindley, 2005). The criteria for defining ICT is that it encompass hardware, software and most importantly, the ability to share data. ICT enables users to communicate with other users, and share information by using ICT. In addition, ICT is used for a variety of purposes, due to its computing power, compact size at affordable prices; convergence of IT and ICT in the form of Internet, and user-friendly softwares advances (The Productivity Commission, 2004). As a result of using ICT, companies acquire access to more accurate, timely and useful information, which they then use for faster and more effective information-related tasks, as well as for developing value-adding innovations (The Productivity Commission, 2004).

The communication component of ICT is what distinguishes ICT from Information Technology (IT). While IT is designed to collect, store, organise and process data, ICT is upgraded with the possibility to share and communicate data with other computers. The communication component of ICT is a new trend in technology (Prakken, 2000). Today, each computer is made with a built-in modem that enables quick connection to the Internet and consequently, communicating information. Subsequently, IT and ICT are actually two sides of the same ‘coin’ (Prakken, 2000). Therefore, these terms are interchangeably used throughout the thesis.

In addition, ICT, for the purposes of this study, is considered not to be simply a combination of hardware and software. It is conceptualised as a system. Such a conceptualisation of ICT will shape the findings of this research, in terms of the impact of ICT on company performance (Melville, Kraemer & Gurbaxani, 2004).

A system, for the purposes of this study, is defined as being a group of components which work together in order to achieve a common purpose.
Thus, each component of a system can be understood in terms of its contribution to the functioning of the whole system. The system takes on the properties of its components, which, in turn, makes the system more than the sum of its parts (Salisbury, 1996). An ICT system is composed of ICT applications, users and an organisational context. All of these components of ICT system are interrelated, interdependent, and work together in the larger environment (e.g. industry) to achieve certain organisational objectives.

ICT is regarded as being embedded in an organisational system, and used by individuals, who share that particular organisational culture. Those individuals are company employees, and are referred to as being ICT users, for the purposes of this study. In other words, ICT users are individuals who use ICT in order to communicate and share information in a specific social and professional context. Interaction with ICT can occur to a lesser or to a larger extent, depending on the users’ characteristics and abilities, as well as the task needs (Klamer, Mante-Meijer, Heres, Pierson, Petterson, Thrane & Turk, 2005).

Influence of ICT use on a company’s performance is determined by realised ICT effects. They are the outcomes of interactions between ICT applications, users and organisational context in an ICT system. More specifically, ICT effects are realised ICT goals and benefits which influence following areas of company’s performance: informational, strategic, transactional and transformational area. Based on these areas of company’s performance, ICT effects have been organised into four groups: informational, strategic, transactional and transformational ICT effects. The concept of company’s performance is, for the purpose of this study, defined as realisation of four groups of ICT effects. Realisation of each group of ICT effects determines the impact of ICT use on a specific area of a company’s performance.

The sum of all ICT effects determines the ICT value. Thus, ICT value refers to how ICT impacts on a company’s performance. In addition, ICT value takes place in the use stage of ICT diffusion.
The **ICT diffusion** is a process which requires time in order that users and organisations can accept ICT, adapt it to their business process, and thus, fully utilise ICT for their needs. Therefore, **ICT use** is a stage of the ICT diffusion process whereby ICT and a company have been adapted to each other, and ICT users have learned how to utilise ICT. It is in this stage that ICT goals are achieved, and where ICT effects can be evaluated. On the other hand, **ICT utilisation** is a term which refers to how ICT users and organisations make use of ICT for their everyday needs.

The conceptualisation of an ICT system is based on **systems theory**, which is abbreviation for **General System Theory (GST)**. It was developed in 1950s by Ludwig von Bertalanffy, as an interdisciplinary field which studies systems as a whole. Systems theory regards everything as a system, from a cell to the universe (Brown, 2008). Furthermore, every system is comprised of sub-systems whilst, at the same time, it is part of a larger system (Bertalanffy, 1972; Cascio & Aguinis, 2005). Systems theory was founded on principles of physics, biology and engineering. It has been incorporated into numerous fields including philosophy, sociology, organisational theory, management, psychotherapy and economics (Schwaninger, 2005; Mitleton-Kelly 2003a, Skyttner, 1996; Bothamley, 1993).

### 1.6 Conclusion

It has been established in this chapter that confusion in the ICT value literature has resulted in a productivity paradox, which means that ICT investments do not produce improvements in terms of organisational performance. Possible explanations for the productivity paradox include, firstly, mismeasurement; secondly, time lags of ICT effects; thirdly, a redistribution and dissipation of profits; and fourthly, mismanagement of ICT (Brynjolfsson, 1993). These explanations for the productivity paradox have been carefully considered in relation to this thesis, thereby shaping the research project. More specifically, ICT value, in this study, is considered to emerge as a result of interactions between factors from technological, individual, organisational and environmental contexts during the use stage of ICT diffusion. Based on this, the research objective in this study is to
establish how interactions between factors influencing ICT use impact on a company’s performance.

In the following chapter, ICT is conceptualised as a system, characterised by interactions between technological, individual, organisational and environmental contexts. These interactions result in ICT value being achieved. ICT conceptualisation is based on systems theory, which will be discussed in more details in Chapter 2.
Chapter 2

Systems theory
2.1 Introduction

The purpose of this chapter is to introduce the concept of systems theory in relation to the research objective and this has been done because of the critical impact of systems theory on the position of this study. Systems theory is, in the first section, discussed in relation to the larger historical and organisational context. The purpose of the section is to explain the position of this study, to unpack the assumptions of systems theory and reveal the usefulness of its application to this research.

The main contribution of General Systems Theory (GST) is its emphasis on the integrated and harmonious functioning of all parts of a system, and it stresses the point that this is more critical than the optimal functioning of a single component to a system. In relation to the purpose of this study, this analysis means that the functioning of ICT itself is not enough in considering its impact on organisational performance. Instead, systems theory explains the interactions between ICT users and the organisational context in which the technology is used. Furthermore, the theory reveals the shape and impact of the technology on a company’s performance. Thus, systems theory is used as the theoretical background in this study. Consequently, the application of systems theory should provide answers to the research question and avoid the shortcomings identified in the IT value literature discussed in the first chapter (Brynjolfsson, 1993).

In systems theory, the world is seen as a series of interactions between various systems. Therefore, interactions and interdependencies are fundamental concepts in systems theory, which are used to explain a phenomenon. Indeed, systems theory recognises that complex interactions between systems have the potential to influence and change these systems (Sawah, Abbass & Sarker, 2006). The reason why systems theory was taken as the theoretical framework for this study is its capacity to allow a comprehensive study of the complex and dynamic interactions between organisational context, users, ICT and the environment (Farhoomand, 2005; Grover & Goslar, 1993). It is through the clarity of understanding these interactions that ICT value is created, and this is an issue that is discussed further in this chapter.
The systems theorist views each phenomenon as a system. Therefore, in the second section of this chapter, a system in general is defined, as well as an ICT system which is the focus of this study. Such a system is composed of the ICT, its users, and the organisational and environmental contexts in which the ICT and users are embedded. Following this, an ICT system is described in terms of its components, its nature and characteristics. The third section provides an explanation of the way in which systems theory can provide a perspective of the performance of a system. This section also places emphasis on the interaction between the components of an ICT system and the external environment, thus creating ICT value.

2.2 Systems theory

Systems theory, which is an abbreviation of the term General Systems Theory (GST), was established by the Austrian-Canadian biologist, Ludwig von Bertalanffy (Bothamley, 1993). Systems theory was founded on principles of physics, biology and engineering. GST is a theoretical science which is directed at researching the general laws of systems (Skyttner, 1996). Bertalanffy (1972, p. 17) defined a system as being a “set of dynamic elements maintaining integrity via mutual interactions”. That is, the most important characteristic of any system is the interaction between its components.

Bertalanffy (1972) has explained that GST is a model of certain general aspects of reality, with many approaches and trends. Since all systems have the same general characteristics, GST can be applied to any system, which makes it an interdisciplinary perspective (Patton, 2002). As such it has been used in numerous fields, including philosophy, sociology, organisational theory, management, psychotherapy (within family systems therapy) and economics (Schwaninger, 2005; Mitleton-Kelly 2003a, Skyttner, 1996; Bothamley, 1993).

There have been some studies which have made use of GST in the IT field. For example, Porra, Hirschheim and Parks (2005) have used GST to evaluate the IT function in Texaco’s corporate case study. Takahara, Liu and Yano (2003) have used GST in relation to the design and
implementation of a problem-solving component of a management information system. By applying systems approach, Ahn and Grudnitski (1985) captured technical, behavioural and organisational aspects of decision support system (DSS) development, in a conceptual model.

It is important to emphasise that the focus of these studies is different from the one in this research project. Therefore, the above studies are not concerned with ICT impact on company performance, which is the objective of this thesis. Another distinction between this study and those mentioned above is that systems theory is not used in this thesis solely from a theoretical perspective. Systems theory is also applied in this study as a research method. This is explained further in the Research Design chapter of this thesis (Chapter 5).

Development of systems theory had important implications on our view of the world.

An 18th century scientific view of the world recognised it as a clockwork mechanism, characterised by rationalism, empiricism and determinism, this was a view established by Newton, Descartes and Galileo (Regine & Lewin, 2001). In this world view cause and effect are interrelated, linear and predictable, and could be calculated (Skyttner, 1996). The process of understanding everyday phenomenon in this mechanistic world came from understanding the individual parts of the system (Ackoff, 1993). That is, each problem was decomposed to its elements which were then investigated separately.

Such a mechanistic world view resulted in some challenging interpretations of different social systems such as education, health and economics; interpretations that are now regarded with some scepticism (Ackoff & Gharajedaghi, 1996). Sterman (2001) observes that today’s leaders increasingly realise that the traditional tools they have been using are failing to solve the persistent problems they face, and may in fact be causing them. All too often, efforts to solve pressing problems lead to unanticipated side effects. A number of authors have suggested that humanity is faced with the
reality that the old ways of thinking and acting are, all too often, insufficient (Sterman, 2001; Regine & Lewin, 2001; Ackoff & Gharajedaghi, 1996; Senge, 1992). The use of the old paradigm was characterised by “static, narrow and reductionist” mental models, and it is these that have helped to create problems in today’s “dynamic, evolving and interconnected” world (Sterman, 2001, p. 11). In short, yesterday’s solutions become today’s problems. The systems view emerged as the answer to the pitfalls of the mechanistic world view.

Table 2.1: Comparison between classical and systems science

<table>
<thead>
<tr>
<th>Perspectives of classical science</th>
<th>Perspectives of systems science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Variables, Parts, Linear relationships</td>
<td>FOCUS ON</td>
</tr>
<tr>
<td>Analysis, Reductionism, Entity</td>
<td>MODE OF INQUIRY</td>
</tr>
<tr>
<td>Cause-effect, Determinism</td>
<td>REASONING</td>
</tr>
<tr>
<td>Objectivity, Observer detachment</td>
<td>RULE</td>
</tr>
<tr>
<td>Prediction identity</td>
<td>GOAL</td>
</tr>
<tr>
<td>Goal-driven, Negative feedback, Adjust for error</td>
<td>CONTROL</td>
</tr>
</tbody>
</table>

Source: Adopted from Banathy, (www.isss.org/taste.html) p. 3

The systems theory differs from the more traditional analytic approach, in that the former combines both analysis and synthesis. Analysis, a common method in science, is used to reduce a problem to its basic parts in order to understand, for example, what each part does. But Ackoff (1993) warns that when one reduces a system to its individual parts, both the system and the parts lose their properties. For example, when the engine, as part of the system, is removed from the car, that is, a system, the vehicle is no longer a car (Ackoff, 1993). It cannot perform its function as a vehicle. The same is true of the engine, in that it loses its function when is not a part of the overall system which makes up a car.
From a systems theory perspective, an ICT system would lose its essential properties if that system was taken apart. Moreover, that system would lose its ability to carry out its function within an organisation. Any such dismembered ICT system could not carry out the function that defines an organisational system. That is, organisational performance might not be augmented when one improves the performance of just one part of an ICT system.

In contrast to analysis, synthesis considers the object of research to be part of a larger system. By applying synthesis to the example of a car system, stated above, the engine is understood and considered as a part of the system, namely that of the car. In a case of this research project, ICT is part of the organisational system, which is discussed later in more details. There is always a larger system, of which the research object is a part (Ackoff, 1993). For example, an organisation is part of industry, which is part of economy and so on. The same is true with regard to analysis. The object of research can usually be reduced to smaller parts. An organisation can be reduced to departments, which can be reduced to the capital, equipment, and employees, and so on.

Each system is comprised of sub-systems. But, at the same time, that same system is also part of a larger system (Bertalanffy, 1972; Cascio & Aguinis, 2005). That which constitutes either a system or a subsystem is purely relative. It depends largely on the level of abstraction, or the complexity on which one focuses analysis. By combining both analysis and synthesis, a systems theory takes into account not only the larger system, of which the object of research is a part, but also the subsystems of the object of research. Thus, the function of a system is understood in terms of the larger system, together with its components which influence it, and make it what it is. By doing so, systems theory is not a rejection of traditional scientific views, on the contrary, it encompasses and includes reductionism and builds on the paradigm as foundational to new understandings (Trochim, Cabrera, Milstein, Gallagher & Leischow, 2006).
A systems theory regards each element, of which a system is comprised, as being connected to every other element in that system, either directly or indirectly (Ackoff, 1971). Thus, the emphasis in a systems approach is on the dynamic interactions and connectedness of the different components of a system (Patton, 2002; Mockler, 1968). By applying systems theory to this research, ICT is considered in connection to other parts of an organisation.

Since most disciplines focus on narrow aspects of reality by taking into account only a few variables they tend not to provide sufficient understanding of the complex interactions between parts of the system. Therefore, an analysis of ICT value by the traditional reductionist methods of the natural sciences is of limited use, since these methods assume that full knowledge of the parts gives full knowledge of the whole. In contrast a systems theory approach sees the world as a complex system in which everything is connected to everything else.

### 2.2.1 System

Systems theory views everything as a system, from the simplest cell to the universe as a whole (Brown, 2008). Thus, when one uses systems theory, everything being examined is regarded as a system. In order to conceptualise ICT as a system, which is the focus of this study, the general concept of a system is defined in this section.

A system is defined as being a set of two or more interrelated elements that satisfy the following conditions (Ackoff, 1973; 1971):

- The behaviour of each element has an effect on the behaviour of the whole;
- The behaviour of the elements, and their effects on the whole, are interdependent, as determined by the state or type of activity in at least one other part of the system;
- All subsystems have an effect on the behaviour of the whole, but none has a solely independent effect on it

When one makes use of the above concept, the characteristics of a system can be identified. A system is a collection of interrelated and interdependent
parts that work together in a particular environment, performing whatever functions are required in order to achieve one or more of the system’s objectives (Patton 2002; Skyttner; 1996, Bertalanffy, 1972). This definition implies that every system has a purpose which is dependent on its parts. It further implies that a system is the product of interaction between its parts. As such, a system is more than the sum of its parts. Therefore, it has properties that none of its parts has. This understanding is emphasised by Brown (2008, p. 4):

Each system depends on another system for its functioning and survival, with each level adding new complexity to the macro-organisation of higher levels of systems. ... For this reason it is inevitable that we would seek to use a language that helps us describe our systems in a manner that lends itself well to analysis.

The system at the centre of this study is the ICT system. When one uses the definition of a system which has been stated above, an ICT system can be conceptualised in a particular way. That is, it is a collection of ICT applications, users and an organisational context which are interrelated and interdependent. These work together in the larger environment (e.g. industry) so that certain organisational objectives can be achieved. The main organisational objective is to survive and thrive in an environmental context. This is usually well understood by employees. Moreover, that main organisational objective is structured into the specific way that each organisation utilises ICT.

The importance of systems theory for the development of organisational theory and considering an organisation as a complex adaptive system is discussed in more detail in the following section.

2.2.2 Systems theory and organisational perspective

An important characteristic of systems theory is that it allows a view of the world as an integrated whole, one in which everything is interdependent and even a minor incident can have a great impact on everything else. Such a holistic view of complex phenomena is achieved by approaching and studying the relationships “as a distinct and legitimate form of inquiry” (Trochim et al., 2006, p. 540). Holism allows a world view that is nonlinear
and organic, one that is characterised by uncertainty and unpredictability (Regine & Lewin, 2001). Thus, the logic supporting many modern business systems that have adopted a systems approach shifts from the causal, linear logic of Newtonian science to the highly reflexive, context dependent, circular logic of complex systems (Mitleton-Kelly, 2003a). Consequently, a systems approach is now considered more appropriate for changing times since it addresses the complex and interdependent elements and relations of a system as they function within the whole (Cilliers, 1998).

Systems theory is particularly relevant for providing an integrative framework for organisation theory and management practice (Cascio & Aguinis, 2005). This is especially true today when increased awareness of the interdependent dynamics across levels, within the same system, and among different systems (characterised by emergent properties and inherent unpredictability), requires a paradigm shift in our thinking about the role of the company and the practice of management.

Systems theory classifies systems into those systems which are affected by external forces, and those which are not (Bothamley, 1993). According to Ackoff and Gharajedaghi’s (1996) classification of systems, the main characteristic of a deterministic system (e.g. a machine) is that it and its parts have no ability to make a choice. Such a system operates only in the way that it has been designed to do so, in a suitable environment. By contrast, a social system and its parts have the ability to make choices. An organisation, as an example of a social system, can make choices, and its parts (i.e. people) can also make choices.

According to this concept, organisational theory evolved, from viewing an organisation as a closed system, to the modern view that it is an open system, in constant interaction with its environment through the exchange of energy, material, and information (Farhoomand, 2005, pp. 14-15). Mechanistic model of a company as a closed system, predicated on linear thinking, control, and predictability is no longer adequate (Senge, 1992). Closed systems have limited and highly controlled interaction with their environment (Salisbury, 1996). In addition, problems in a closed
organisational system are solved inside the organisation, whilst ignoring the outside environment.

An open organisational system requires that managers make decisions based on multiple perspectives of both the organisation and its environment (Cascio & Aguinis, 2005). Since an organisation is an open system, interaction with the environment in which it operates is considered to be of great importance for organisational success. An open system has to be able to adapt to changes in the environment which influence its operation. Therefore, the key to business success lies in building better relationships, not only with shareholders, but also with the stakeholders. This change in paradigm, regarding management theory, has influenced change regarding the measurement of company performance, namely, from financial to non-financial performance indicators (Clarke & Clegg, 1998). The application and definition of company performance in this study is discussed in more detail in Chapter 3.

Conceptualisation of an organisation did not stop there. It further evolved with development of the theoretical offshoot of GST, known as Complexity (Dann & Barclay, 2006). It is complementary to systems theory. That is, it takes the concepts of connectivity, interdependence, feedback and emergence from systems theory, and extends them further (Mitleton-Kelly & Land, 2005). Complexity refers to those complex theories which arise from various natural sciences that study complex systems. Based on it, understanding a complex system requires knowing not only how its parts behave separately, but also how they interact together to form a whole (Bar-Yam, 1997).
Table 2.2: Development of General Systems Theory

<table>
<thead>
<tr>
<th>Year</th>
<th>Theory</th>
<th>Founder(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>General Systems Theory</td>
<td>Ludwig von Bertalanffy</td>
<td>Interdisciplinary field which studies systems as a whole</td>
</tr>
<tr>
<td>1960</td>
<td>Cybernetics</td>
<td>W. Ross Ashby, Norbert Wiene</td>
<td>Mathematical theory of the communication and control of systems through regulatory feedback</td>
</tr>
<tr>
<td>1970</td>
<td>Catastrophe theory</td>
<td>René Thom, E.C. Zeeman</td>
<td>Branch of mathematics that deals with bifurcations in dynamical systems</td>
</tr>
<tr>
<td>1990</td>
<td>Complexity</td>
<td>John H. Holland, Murray Gell-Mann, Harold Morowitz, W. Brian Arthur</td>
<td>Theories from various disciplines studying complex systems i.e. complex adaptive systems (CAS)</td>
</tr>
</tbody>
</table>

Source: Adopted from http://www.biocrawler.com/encyclopedia/Systems_theory#Overview#Overview

As a result of development of complexity, organisations today are considered not only to be open, but complex systems as well (Allen, 2001; Regine & Lewin, 2001), since “...many interdependent agents are interacting with each other in a great many ways”, which leads to unintended or emergent properties (Waldrop, 1992, p. 11). Authors who study organisations as complex adaptive systems refer to them as being not only Complex Evolving Systems (CES) (Mitleton-Kelly, 2003), but also as being Dynamic Open Complex Adaptive Systems (DOCAS) (Holbrook, 2003).

Many authors agree that ICT does not have a value per se (Bauwman et al., 2005; Pilat & Wyckoff, 2005; Mitleton-Kelly, 1993). Indeed, they emphasise that ICT value emerges in interactions with people, and organisational needs. Each organisation differs in its interactions amongst its employees, goals and ways of accomplishing them, ICT value is different for every organisation. Furthermore, an ICT system has many layers, hierarchies and feedback and communication features (Tedre et al., 2006) which interact with users, informational needs and the organisation. Additionally, as an outcome of the complexities of the interactions involved
in the ICT system, a multidisciplinary approach to ICT is critical and should incorporate a systems theory approach (Grover & Goslar, 1993).

In relation to the field of information technology (IT) in the corporate environment, the research indicates a need to address the interdependent elements and relations of business structures (Ryan, Harrison & Schkade, 2002). This understanding resulted in a focus on the technological aspects such as the tools, techniques and knowledge systems, and also on the human processes which are an important part of the whole system (Pasmore, 1988). That is, the ICT system is both a technological and social phenomenon (Checkland & Holwell, 1998).

The outcome of considering every organisation as a combination of social and technical systems results in a socio-technical systems perspective. Such a view emphasises the importance of designing the social and technical systems with respect to one another and with respect to the external environment (Ryan & Harrison, 2000). In truth, the fit between them determines how effective the organisation is, a point established by Ryan, Harrison and Schkade (2002). Furthermore, these authors found a level of interdependency between the social and technological subsystems, and they emphasised that both have to be taken into account when considering organisational success.

The importance of socio-technical systems perspective for this study is that both social and technological systems are interrelated and influence each other. It means that ICT interacts with the social organisational system, a process through which they both change and influence organisational performance. As Melville et al., (2004, p. 303) explained, organisational culture and workplace practice “all interact with IT in the process of value generation”. Therefore, ICT has to be taken into account with its social environment in order to fully understand its value. In addition, this seems to be what Prakken (2000, p. 67) had in mind when he stated that a socio-technical systems approach was a “very powerful instrument for solving information problems at their root”.


Therefore, it is possible to recognise that social, technical and environmental subsystems are richly interconnected, and organisational effectiveness depends more on their harmonious interrelationships than upon their individual optimisation (Pasmore, 1988). As Pasmore eloquently explains:

Improving technology of the organisation without improving human capabilities to operate the technology or the market’s ability to absorb the increased output is tantamount to force-fitting a Corvette crankshaft into a Chevrolet engine and expecting it to produce more horsepower (1988, p. 67).

In other words, ICT is interdependent and in constant interaction with the users and the organisational processes that are equally important features of the ICT system.

### 2.3 Conceptualising ICT system

Different conceptualisations of ICT lead to different views regarding ICT value, as it can be observed in the ICT value literature. That literature reveals differences as to how IT/ICT has been conceptualised, which, in turn, shapes the accumulated knowledge regarding the impact which ICT has on organisational performance (Melville et al., 2004; Weill, 1992). According to Orlikowski and Iacono (2001, p. 130) “IT artifacts are either absent, black-boxed, abstracted from social life, or reduced to surrogate measures” in the literature. In addition, Weill (1992) has noted that IT research has adopted conflicting or unclear definitions of IT. This creates confusion in the literature, regarding any understanding not only of ICT effects, but also of the impact of ICT on organisational performance.

This confusion in the literature is addressed in this research project by conceptualising ICT as a system, using a systems theory perspective. Instead of regarding ICT as being combination of hardware and software, ICT is conceptualised, for the purposes of this research, as being part of the organisational system. It was already discussed that ICT is interdependent with human system and organisational context. These interdependencies are further developed by understanding that the function and purpose of ICT is determined in relation to the organisational goals. For this reason, ICT has to be considered together with the organisation, which it is part of.
Therefore, the spheres of interest in this study are ICT, users and an organisational context.

In order to identify the criteria for defining an ICT system, the general definition of the term ‘system’ is analysed first. After having done this, one can begin to conceptualise an ICT system, and then describe it in more detail.

2.3.2 ICT as an artificial system

Technology has the potential for dual classification. It can be classified as being either deterministic or social, depending on how it is conceptualised. For the purposes of this study, conceptualising ICT as a social system has enormous significance in determining the nature of research as well as a choice of research methods. For example, considering ICT as a deterministic system (i.e. combination of hardware and software) leads to the view that it is yet another form of capital. Thus, in order to evaluate its impact on a company’s performance, the common indicator used is return on investment (ROI). However, such approach leads to technological determinism and fails to account for intangible ICT benefits (Tedre et al., 2006). This will be discussed in more detail in Chapter 3.

In addition, Ackoff and Gharajedaghi (1996) have warned that a deterministic model of a social system considers either the system, or each one of its parts, in isolation. But, in relation to an ICT system, problems can arise when one attempts to improve the performance of one or more of its parts. As a consequence, the overall performance of the ICT system can be reduced. This explains why the mechanistic concept of management, namely command and control, is becoming increasingly inappropriate, and why an organisation should be regarded as being a complex social system. In other words, if ICT is considered in isolation from the organisation of which it is a part, its impact on that organisation can not only be misunderstood, but also ineffective. Therefore, several authors have argued that ICT is a social system which is designed, used and influenced by people (Orlikowski & Iacono, 2001; Checkland & Howell, 1998).
The specific nature of technology was a basis for Simon’s (1990) conceptualisation of ICT as an artificial system. By comparison to a natural system, an artificial system such as ICT is designed by humans to have certain characteristics in order that organisational goals can be achieved. Simon (1990) has argued that artificial systems should be studied differently from other systems. In order that an artificial system such as ICT be described or explained, the following aspects should be considered (Simon, 1990):

- The purpose or goal of ICT
- The ICT structure
- The environment in which ICT performs

The purpose of ICT can best be assessed and understood when ICT is viewed in relation to the organisational system of which it is a part. The purpose and structure of ICT depend on the organisational goals. Different organisations have different goals, which determine different functions and use of ICT. For this reason, the functions and use of ICT vary from one organisation to the next. Therefore, only by taking ICT in relation to the organisation in which it is embedded, can the characteristics of ICT be regarded as being relevant or not to the company’s goals.

When there is a mismatch between the organisational goals and the capabilities of ICT, then an ICT system may become a legacy system (Mitleton-Kelly & Land, 2005; Mitleton-Kelly, 2004). Such ICT systems cannot enable organisations to achieve its goals. ICT applications, regardless of whether they are old or new, can become legacy systems if they do not support the current business objectives, or if they inhibit future developments in some way. The reason that legacy systems exist is not a purely technical one. A social factor is involved as well.

A key factor for reducing occurrence of legacy systems, according to Mitleton-Kelly (2004), is that business process and IT development have to co-evolve. This advice is based on the understanding that business processes and IT development are interdependent. When one of these factors changes, the other has to be able to adapt to this change, in order that both the ICT
system and organisational system can function in harmony. There has to be both understanding and communication between IT managers and business managers, in order that both the ICT system and organisational strategies can co-evolve.

In order for the ICT system to serve its purpose, apart from organisational context, external environment has to be taken into account as well (Simon, 1990). That is, changes in an organisational context, which influence changes in ICT system, occur as the organisation response to changes in external environments. This is depicted in Figure 2.1. It is due to interdependency and interactions between ICT, organisation and external environment that changes in the external environment bring about modifications to both ICT and the organisational context.

**Figure 2.1:** Organisational and external environments of ICT system

![Organisational and external environments of ICT system](image)

*Source:* Adapted from Simon (1990)

The organisational environment is defined by organisational goals and the capabilities of the ICT system to adapt to organisational requirements and needs. Simon (1990, p. x) comments that ICT is so interconnected with the organisational environment that the effectiveness of its performance depends on the effectiveness of both the organisation and employees. The organisational factor has an enormous impact on ICT value. Therefore, it is crucial that the organisational aspect be taken into account.

Thus, ICT utilisation is determined by organisational goals which ICT is set to achieve. ICT is bound up with the historical and cultural aspects of its ongoing development and use in an organisation (Orlikowski & Iacono, 2001). When considered in this context, ICT utilisation is the result of
ongoing social, managerial and economic practices within an organisation. ICT is not fixed and independent from the organisational context. Instead, it emerges from that organisational context.

The external environment, in which an organisation performs, determines the conditions for ICT goal attainment, and consequently, functions and utilisation of ICT. The external environment is defined by the available technologies, market trends, and behaviour of other economic actors and/or markets (Simon, 1990). It influences ICT directly and indirectly, by influencing, for example, organisational culture (Davis, 1985). For example, complex environments give rise to weak cultures, while stable, undifferentiated environments support the formation of strong cultures (Davis, 1985).

Both external and organisational environments influence ICT characteristics, mainly openness and adaptation. An ICT designer usually builds ICT applications without prior knowledge of a company’s specifics, and therefore, leaves ICT open for adjustments. ICT is designed to be open, which enables it to adapt to an organisation’s specific requirements. Bertalanffy (1972) has explained that the behaviour of open systems is oriented towards achieving a desired outcome as a response to changes in environment.

ICT system adapts to variations in the organisational system, through feedback. A feedback mechanism is virtually an automatic process which continually adapts the system and its parts to environmental changes. It is used to respond to discrepancies between a system’s actual state and its desired state. This means that organisations and ICT systems constantly undergo development, evolution, and realignment in order to ensure the success of the organisational system.

It can be concluded that an ICT system is comprised of both ICT and users, situated in, and interacting with, organisational and environmental contexts. The implications of this definition on its impact on company performance, is considered in the next section.
2.3.2 Complexity of an ICT system

Based on the argument that complex behaviour arises from the connectivity and interactions between a system’s elements, an ICT system is itself complex. The complexity of an ICT system arises from interactions between the social and technical components; local and global levels of the phenomena; and the system and infrastructure characteristics (Jacucci, et al., 2006). In addition, interdependence in the organisational system includes not only the human social system, but also the ICT system (Mitleton-Kelly & Land, 2005). Since ICT is part of an organisational complex system, it is interdependent with the human social system, which gives rise to the complexity of an ICT system. In their study, Prain and Hand (2003) emphasise that the relationship between the adoption and use of ICT and its effects is very complex.

In addition, a complex systems perspective helps to explain how an organisational context affects users’ responses to the use of ICT. That same perspective regards ICT users as agents, who interact and react to other agents’ views and opinions regarding the use of ICT. ICT users learn to make use of ICT when they are exposed to new information; which in turn, changes their attitudes toward ICT, and the way in which they use it (Frank & Fahrbach, 1999). That is, agents are continuously receiving and processing a flow of information, as well as scanning their environment. This creates group dynamics, and influences the effectiveness of the ICT system. Agents act according to the way in which they interpret reality (Sterman, 2001; Dooley, 1996).

Therefore, interactions between users influence their attitudes toward ICT, in terms of value, knowledge, and beliefs. Consequently, the success of utilising ICT is affected by these various elements (Frank & Fahrbach, 1999).

Mitleton-Kelly (2004) has described the organisational context as being an enabling environment. That enabling environment takes into account not only technology, but also the organisation and the organisational environment. In other words, an enabling environment, for the purposes of
this study, refers to the social and technological conditions that influence ICT utilisation. For example, users’ attitudes towards ICT can have a great impact on ICT utilisation, and consequently, the impact of ICT on company performance. The organisational arrangements, as part of the enabling environment, can have a major role in influencing users’ attitudes, simply by making seminars available to users, regarding the use of ICT.

The interactions between users and ICT are illustrated in Figure 2.1.

**Figure 2.2:** Interactions between employees and ICT

![Diagram of interactions between employees and ICT](image)

It is important to emphasise that interactions between ICT users define not only the organisational context, but also the level of ICT use, and consequently, the efficiency of organisational processes. In addition, the causes and consequences of employees’ interactions define the core elements of the organisational culture. According to Frank and Fahrbach (1999), these elements are the essence of a complex adaptive system. On the other hand, organisational culture sets the constraints as to what changes are acceptable, and thus, plays an important role in the process of creating ICT value. Organisational culture, as a combination of both organisational knowledge and values, is essentially the input and the output of the ICT system (Pasmore, 1988). Therefore, the organisational context has an effect as to how ICT is used. Consequently, that same organisational context influences how ICT affects organisational performance.

It is due to these interactions that ICT is a complex system, that both self-organises and self-evolves, in such a way as to be utterly sensitive to events
which are important, regarding its survival (Dann & Barclay, 2006, p. 23). An ICT system organises itself as a result of its interactions with users and the organisational context in which it operates. It also evolves by being used for different purposes; being upgraded and having novel functions. For example, a new organisational strategy may create a gap between the organisational requirements and the users’ ability to fulfil those needs. That may create tension (Lichtenstein, 2004). In order for an organisation to reduce such tension, it has to change, and therefore, it has to create new order. This change is explained by Salisbury (1996) as having characteristics of both adaptation and transformation.

A need for adaptation arises when a system needs to be adjusted to small changes which take place in the environment. For example, users adapt ICT to suit their needs, and also to achieve organisational goals. Thus, adaptation refers to correcting small errors and making minor modifications in the system. Changes in the environment can be drastic, resulting in a major gap between the system’s capabilities and the environment. In order for the system to continue successfully operating in such an environment, it has to transform itself. Transformation requires rethinking the purposes, goals, processes and outputs of the system (Salisbury, 1996).

Discussion on adaptation and transformation of an ICT system explains that the ICT system in constantly changing in response to changes in the environment in which it functions. It is not a static system, but dynamic one, due to human intervention and adaptations (Orlikowski & Iacono, 2001). That is, ICT is: “used in different ways, and adapted, enhanced, and expanded to accommodate a diversity of evolving interests, values, assumptions, cultures, and other new technologies (Orlikowski and Iacono, 2001, p. 131).

As a result of interaction with users and an organisational context, different ICT features are developed, and some of the existing functions fail and/or are corrected whilst new standards are set. ICT undergoes various transitions over a period of time; whilst coexisting and coevolving with multiple generations of ICT.
In other words, systems theory not only takes ICT into account, but also the larger system affecting ICT, namely the organisation. Furthermore, the company is made up of other subsystems, which interact with ICT as well. It is only by taking all of these elements into account that the ICT phenomenon can be understood and properly conceptualised. That is, ICT by itself has no relevance. It is only relevant when it is studied in interaction with the subsystems, as well as the organisational system in which it operates. Therefore, ICT is considered to be a complex system, which interacts with both the organisation and its parts in order to create value for the company. It is through this interaction that ICT influences company performance.

Discussion on the complexity of an ICT system, arising from interactions between ICT users, and ICT is illustrated in Figure 2.2. It can be seen in the figure above that an ICT system is characterised with feedback (Mitleton-Kelly, 2004). Change in one part of the system influences changes in another part of the system. It is because of this that systems theory views every phenomenon in interaction with both its larger system and subsystems.

**Figure 2.3:** Complexity of an ICT system

![Complexity of an ICT system](image)

**Source:** Developed from Frank and Fahrbach (1999)
As illustrated in Figure 2.3, users make choices and take action, based on their perception and attitudes towards ICT; which in turn may influence an organisational choice, behaviour and the outcome of the use of ICT (Dooley, 1994). On the other hand, organisational context influences interactions between users, their actions and determines potential behaviour in an ICT system. It is through these interactions that the outcome of an ICT system, that is, ICT value is created. Therefore, an ICT value is greatly influenced by users’ perceptions, attitudes and an organisational context. The requirements for achieving and enhancing an ICT value are that users not only be committed to using the full capacity of ICT, but that they also adapt to new circumstances, and take advantage of the ICT functions (Peansupap & Walker, 2005; Devaraj & Kohli, 2003; Venkatesh et al., 2003). In sum, an ICT value depends on how users actually make use of ICT in their everyday work.

It is on the basis of the various elements regarding ICT value, which have been presented in this section, that ICT can be conceptualised as a complex system. That conceptualisation not only adds originality to this study, but it also contributes to the overall knowledge regarding ICT value, as well as to a greater understanding of how that value is derived.

2.4 Systems’ performance

ICT has been conceptualised in the previous section as being a system made up of technological and individual contexts, operating in an organisational environment. More specifically, it has been established that ICT is part of an organisational system. In this section, it is discussed how ICT, as part of that organisational system, impacts on the performance of an organisation. Systems theory is used in order to explain this.

Systems theory suggests that when the performance of any part of a system is improved, but is not properly assessed regarding its interaction with the whole system, then the performance of the whole system may not only be reduced, but it usually is. For the purpose of this study, ICT has to be considered in relation to its interaction with both the individual user and an organisational context, in order to determine the impact of ICT on company
performance. In other words, the performance of an organisational system is not the sum of the independent effects of its parts. Instead, it is the product of their interactions (Ackoff & Gharajedaghi, 1996). Therefore, effective management of a system requires managing the interactions of its parts, rather than attempting to manage and control separate actions (Ackoff & Gharajedaghi, 1996).

A systems theory approach facilitates an understanding that changes in one part of an ICT system (ICT application, users or organisational context) may lead to changes occurring not only to all of the parts, but also to the overall system itself (Mitleton-Kelly, 2004). Because the effects of the behaviour of parts of a system are interdependent, it can be demonstrated that even if each part, taken separately, is made to perform as efficiently as possible, then the system as a whole will not necessarily function as effectively as it possibly could.

Furthermore, technological, individual and organisational contexts are interdependent. Their interdependencies can be intended or non-intended (Mitleton-Kelly & Land, 2005). Changes in ICT, because of non-intended interdependencies, can lead to unexpected consequences in other parts of an ICT system (Mitleton-Kelly & Land, 2005). Changes in ICT system result in an unpredictable ICT value, which can often be different from what was intended. Thus, a change in one component of an ICT system may have no influence, or alternatively, it may have a drastic influence on ICT value. For this reason, ICT value is regarded as being non-deterministic. This sort of unpredictable effect is known as the non-linearity principle (Mitleton-Kelly, 2004). In addition, ICT value is considered to be an emergent outcome of complex interactions in an ICT system (Regine & Lewin, 2001). Thus, ICT value can be established only by taking into account ICT interactions with other parts of an ICT system.

Whitworth and Fjermestad’s (2006) model suggests that a genuine performance advance, in one dimension, may not succeed if the advance also significantly reduces other performance dimensions. In the practice of design, dimensions interact, as all system goals do, because the system must
meet all demands. Each dimension depends on the previous one, as software depends on hardware. In addition, each dimension also “emerges” with both greater demands and greater potential. The interaction of performance goals explains the existence of a strange paradox, namely that later version of successful products, after much effort has been implemented, and many additional features have been added, might perform less well than the original. The model which has been presented addresses a system’s performance properties, not outside influences (such as marketing, politics, distribution, and system cost), regarding system performance.

Furthermore, a system's performance depends on how that system relates to its environment, the larger system of which it is a part, and to other systems in that environment (Ackoff, 1973). Therefore, in a systems approach, the performance of a system is evaluated by assessing its functioning as a part of the larger system that conditions it. In other words, the impact of ICT on company performance can be established only when ICT is regarded together with the organisational system of which it is a part. In addition, in order for organisations and ICT systems to perform optimally, their components have to function in harmony. In an imperfectly organised system, the total system will often not perform as well as possible relative to its objectives, even if every part performs as best it can relative to its own objectives (Ackoff, 1971).

Therefore, a systems theory approach focuses on a system regarded as being a whole entity, not on its parts taken separately. Such an approach is concerned with total-system performance, even when a change in only one or a few of its parts occurs, because there are some properties of systems that can only be considered adequately from a holistic point of view (Ackoff, 1971). These properties determine the relationships between parts of systems, namely how those parts interact and fit together (Ackoff, 1971).

The problem regarding ICT value is that ICT effects can either be immediate and intended, or indirect and unintended (Pasmore, 1988). Causes and effects, regarding ICT, can be separated by time and space, which could be one of the possible reasons for the productivity paradox
(Brynjolfsson, 1993). In terms of complexity language, an ICT system is counterintuitive. It is important to understand all of these effects, because together they determine the character of an ICT system, as well as the reactions which it subsequently produces.

In addition, our mental models of reality contribute to the confusion regarding the ICT literature. That is, our attention is often drawn to the symptoms of the problem rather than to the underlying causes. A symptom can often surface at a different time from when the cause has occurred (Sterman, 2001). Therefore, systems theory can be used to investigate the production of an ICT value, as an outcome of interactions in an ICT system (Farhoomand, 2005).

2.5 Conclusion

Creating high performance ICT systems, by using systems theory, requires investigating interdependencies among the social, technical, organisational and environmental systems that make each organisation unique. The emphasis, regarding systems theory, is on the interdependences among components or functions, rather than on isolated problems (Pasmore, 1988).

The starting point in this thesis, when taking a systems theory view of an ICT system, is that an ICT value is not simply a collection of hardware and software. The interaction of that hardware and software with users and organisational specifics has to be considered. The focus of this study, therefore, is to investigate ICT value by taking into account its human, technological and organisational components. An ICT value is a systems’ outcome and interactions between those components. Further, an ICT value is not only determined by some sort of causes, it is also determined by the context and history of the system.

Because various forms of interaction between ICT and an organisational context occur, an ICT value cannot be predicted or established just by assessing any one part of an ICT system separately, without taking into account those interactions. When the performance of one part of a system, investigated separately, is improved, then the performance of the whole may
be reduced. Moreover, it usually is. Therefore the combination, of an ICT system with its interactions and interdependence with users and an organisation, has to be regarded as an entirely separate system. This is where systems theory, as a theoretical foundation, adds to the current study.

In the next chapter, a theoretical model of this study will be presented, based on the literature review. The argument that ICT value occurs in the use stage of ICT diffusion, adopted in the present research project, will be discussed. Furthermore, ICT value will be discussed in more detail, and factors from technological, individual, organisational and environmental contexts, which influence realisation of ICT value, will be identified.
Chapter 3

Literature Review
3.1 Introduction

The purpose of this literature review is to inform the reader about trends in the literature; and to establish the theoretical foundations for this research project. The research objective, as has been outlined in Chapter 1 of this thesis, is to provide an understanding as to how the interaction between factors, which influence the use of ICT, has an impact on company performance. Therefore, the focus of this literature review will be on the process involving the creation of an ICT value, namely the use stage of ICT diffusion, and factors relevant to the use stage of ICT diffusion. More specifically, the purpose of this literature review is to:

- establish the argument that the use stage of ICT diffusion is critical for creating an ICT value; in contrast to previous studies which have used adoption and implementation stages of ICT diffusion in order to evaluate ICT investment
- explain the ICT value creation process
- conceptualise the impact of ICT on company performance, by identifying ICT effects
- identify factors from individual, organisational, environmental and technological contexts, which influence ICT value creation in the use stage of ICT diffusion

By doing so, the literature review will shape this research project in a way that goes beyond the limitations of previous studies. This literature review also has a practical role regarding the application of this research in a Croatian context.

This research project is built on the findings of the prior studies, but diverges from them to follow its own path in reaching its goal. In this literature review, an argument will be presented that the ICT value arises from the use stage of the ICT diffusion process. The use stage has been identified as crucial for assessing the ICT impact on the performance of a company since ICT value realises in this stage of the ICT diffusion. In addition, it has been emphasised that ICT utilisation is the missing link in the ICT value creation (Zhu & Kraemer, 2005). This means that the
utilisation of ICT is the driver for creating ICT value, resulting in different levels and outcomes of ICT utilisation. The outcomes of ICT utilisation are ICT effects, which have subsequent performance implications, which will also be discussed in this literature review.

The outline of this chapter is presented in the figure below.

**Figure 3.1: Outline of the literature review**

Based on the outline of this chapter illustrated in the figure above, the literature review starts with discussion on the process of ICT diffusion and its stages. This discussion will contribute to the general understanding of how ICT is adopted, implemented, used in a company as well as how it affects the performance of a company.

In the next section, the process of ICT value creation, from intended ICT value into a realised one, is explained. The main contribution of this discussion is identifying the use stage of ICT diffusion as being the critical stage for the creation of an ICT value.

After that, factors influencing the use stage of ICT diffusion will be identified and grouped into technological, individual, organisational and environmental contexts. The importance of identifying the factors influencing ICT use arises from the argument that the interaction between
these factors determines the transformation of intended into a realised ICT value. This argument implies that the interactions between factors influencing ICT use, determine ICT impact on company performance; which will be established in this research project.

As a result of analysing the literature concerning the impact of ICT on company performance, the use stage of ICT diffusion and factors influencing ICT use, a theoretical model will be constructed and presented. That model will explain how utilisation of an ICT application can impact the company’s performance. Finally, on the basis of the discussion in the literature review, a conclusion will be drawn in regards to trends in the literature and achieving the research objective of this study.

### 3.2 ICT diffusion

The ICT diffusion process is described in this section, together with the stages of ICT diffusion. The ICT diffusion process is a reflection of the life-cycle of ICT in a company’s context: from ICT adoption to the realisation of ICT value. By distinguishing between the various stages of ICT diffusion, it is clearly identified that ICT value is achieved and in the use stage of the ICT diffusion process. Thus, the focus of this research project is on the use stage of ICT diffusion where an ICT value is created and determined. This is a key differentiation between this thesis and other studies. While the majority of studies have focused on evaluating ICT value in the adoption and implementation stages of ICT diffusion (see Baskerville & Pries-Heje, 2001; Geroski, 2000), this research project focuses on the use stage of ICT diffusion.

When ICT is introduced to a company, it is perceived by the members of the organisation as being an innovation. Therefore, it is important to explain the connection between innovation and ICT. An innovation is: “an idea, practice or object that is perceived new by an individual or by another unit of adoption” (Rogers, 2003, p. 12). The condition for classifying technology as an innovation is that ICT users have to perceive the technology as being new. Thus, innovation is considered to be a subjective matter (Rogers, 2003). On the basis of this definition, new technology which is introduced
into an organisation can also be considered to be an innovation. In addition, innovation and technology are synonyms, according to Rogers (2003) and a number of studies on technological innovations.

ICT applications are adopted in an organisation based on authority innovation-decision (Rogers, 2003). This means that the company authorities make the decision to adopt an ICT application, while users generally do not have any choice regarding ICT they would want to use (Lamb & Kling, 2003). ICT innovations adopted based on the authority innovation-decision lead to the fastest rate of adoption (Rogers, 2003). On the other hand, there is a danger that such ICT innovations might be circumvented by members of a company during the implementation period.

Every innovation has certain characteristics which help to explain the rates of its adoption. This has been well explained by Rogers (2003) who identified characteristics of each innovation. These characteristics are relative advantage, compatibility, complexity, trialability, and observability. Relative advantage of an innovation refers to the degree to which an innovation is “perceived better that the idea it supersedes” (Rogers, 2003, p. 15). In addition, innovation needs to be compatible “with the existing values, past experiences and needs of potential adopters” (Rogers, 2003, p. 15). The “degree to which an innovation is perceived as difficult to understand and use” is known as complexity (Rogers, 2003, p. 16). Trialability refers to the “degree to which an innovation may be experimented with”, and observability is the degree to which the results of an innovation are visible to others” (Rogers, 2003, p. 16). Based on these characteristics of an innovation, Rogers (2003) concluded that innovations that have a higher relative advantage, in terms of compatibility, trialability and observability, as well as less complexity, are adopted more rapidly.

Every innovation has a cycle that it goes through, during the process of diffusion. In this study, ICT diffusion is regarded as being a “multistage process that starts at adoption and extends to usage and value creation” (Zhu & Kraemer, 2005, p. 62). A more general definition has been provided by
Rogers (2003, p. 11): “Diffusion is the process by which (1) an innovation (2) is communicated through certain channels (3) over time (4) among the members of a social system”.

The critical component of the diffusion process, emphasised by Rogers (2003), is time needed for the members of an organisation to accept the ICT innovation, and utilise its possibilities. In other words, every person adopts ICT with different speed. Based on this, Rogers (2003) classified members of a social system into adopter categories: innovators, early adopters, early majority adopters, late majority adopters and laggards. This factor will not be discussed in any more detail than this in this thesis, because the focus of this study is on the use stage, whereby it is assumed that all users have adopted and use ICT.

Based on the time component, a diffusion process can be divided into different stages. Each stage of ICT diffusion, which is depicted in Figure 3.2, will be discussed in the next few sections.

**Figure 3.2: Stages of ICT diffusion process**

Source: Bouwman et al. (2005, pp. 11-13)

An ICT diffusion process can be divided into pre-adoption and post-adoption stages, according to Rogers (2003). In pre-adoption stages, an organisation gathers data based on which it chooses which ICT application which would best suit organisational needs, and planning how that ICT application would best the fit into the organisation. It is based on the pre-adoption stages that an organisation makes a decision to adopt a specific ICT application. This is described in more detail in the next section.

### 3.2.1 Adoption stage

The ICT diffusion process starts with an organisational decision to adopt a specific ICT application, which is perceived by a company’s authorities to
have the capability of enabling the organisation to achieve its goals. This is known as the adoption stage of ICT diffusion.

There are many ICT applications which differ from one another in regards to their functions. These range from organising and controlling a business process to improving communication with customers. Furthermore, each company has different needs based on which it adopts a specific ICT applications: “Different management objectives for IT investments enable different bases for competition” (Weill, 1992, p. 310). According to a survey done by Brynjolfsson and Hitt (1996), managers invest in ICT due to a variety of reasons: improving customer service, cost savings, timeliness and quality. Therefore, the adoption of a specific ICT application depends on a company’s specific way of competing and responding to the changes in the environment, that is, organisational strategy (Gibcus & Kemp, 2003; Porter & Millar, 1985; Miles & Snow, 1978).

Thus, each company has to make a decision, regarding the adoption of an ICT application which will enable achieving organisational goals (Fichman, 2004). In order to make the best decision about which ICT application to adopt, companies have to take into account the available information on ICT characteristics, organisational needs and expectations of ICT benefits (Bouwman et al., 2005). In addition, Hollenstein (2002) explained that organisations make a decision to adopt ICT on the basis of anticipated ICT benefits (i.e. improvement of product quality, reduction of capital needs, and reduction of transaction costs), as well as anticipated limitations such as financial conditions, human capital restrictions; information and knowledge barriers. He found that a positive correlation exists between anticipated benefits and the adoption decision. In other words, as companies anticipate higher benefits from ICT, they will adopt ICT early and use it intensively.

This means that in the adoption stage of ICT diffusion, companies develop specific ICT objectives. These expected payoffs from ICT are collectively referred to as the intended or potential ICT value (Davern & Kauffman, 2000). Organisations that have developed intended ICT strategies are more likely to maximise ICT benefits according to Brown (1992).
The success of ICT adoption depends on how well ICT goals and ICT characteristics relate to each other; which eventually becomes evident in the later stages of ICT diffusion. The Australian manufacturing company, MHI Fittings, provides a good example as to how ICT supports organisational strategy (D’Apprix, 2005). Because of substantial changes in the environment, MHI Fittings found itself teetering on the brink of financial disaster. However, instead of collapsing, the company started using ICT strategically, which enabled it to enter new markets, and to create better quality products and services. As a result, the company not only survived, but it thrived in the changing environment. ICT, once it has been adopted, supports organisational strategy and enables a company to respond quickly and efficiently to different challenges and opportunities in the environment (Prahalad & Krishnan, 2002).

Managers make the adoption decision, and therefore, they have a substantial amount of influence regarding the adoption stage. This has been emphasised by Ungan (2005) in a study on management support, in relation to using ICT to developing best manufacturing practices. By applying multiple regression analysis, Ungan (2005) found positive significant relationship between management support and organisational resource availability, external pressures, perceived operational benefits, and compatibility. This means that when managers are satisfied with the existing ICT, they are less likely to adopt new ICT. On the other hand, when a manager expects that ICT will improve their company’s performance, then the more the more likely it is that the manager will support ICT adoption.

Apart from the perceived ICT characteristics and company needs, ICT adoption depends on the strategic, technological and organisational context. These contexts are described by Knol and Stroeken (2001) in the scenario model of six phases of IT adoption, which is presented in the table below. The phase zero is not presented in this table since it is the phase where company has no IT, and therefore it is not within the scope of this study.
Table 3.1: Adoption context of IT

<table>
<thead>
<tr>
<th>Phase</th>
<th>Strategy</th>
<th>Contexts</th>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>- Raising the efficiency; IT plan not in tune with the business strategy</td>
<td>- Hardly any or no data links between the computer applications&lt;br&gt;- Computerisation related to the internal data structure</td>
<td>- Structure of the organisation changes - authorities and responsibilities have to be organised regarding regular activities and activities related to the use of computers</td>
</tr>
<tr>
<td></td>
<td>- Effectiveness of the enterprise through the use of IT</td>
<td>- Use of IT is related to nearly all the business processes&lt;br&gt;- New business processes are added and some processes are extended or renewed regarding the use of IT</td>
<td>- Tasks, authorities and responsibilities concerning the IT must be adapted to the new situation.&lt;br&gt;- IT management often is in the hands of the entrepreneur&lt;br&gt;- Training becomes increasingly important</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>- Creation of an advantage with the present product-market combination and raising the effectiveness of the external communication with customers and suppliers</td>
<td>- Computerisation intensified&lt;br&gt;- Some business processes are extended or undergo renewal&lt;br&gt;- External data structure</td>
<td>- Adapted to the use of IT; tasks, authorities and responsibilities are organised&lt;br&gt;- IT management is mainly in the hands of the entrepreneur&lt;br&gt;- Training is strongly oriented towards IT application of an external nature</td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>- Creation of extensions to the product/market combination (marketing)</td>
<td>- IT aimed at all business processes and further extended</td>
<td>- Adapted to the use of IT&lt;br&gt;- Training important</td>
</tr>
<tr>
<td><strong>5</strong></td>
<td>- Creation of new product/market combinations by using IT</td>
<td>- Supports the integration of the business processes</td>
<td>- Completely tuned to IT since IT is the enabler for the business strategy</td>
</tr>
</tbody>
</table>

Source: Developed from Knol and Stroeken (2001, pp. 235-242)

It can be seen, in the table above, not only that an ICT application has to be adapted to an organisation, but that that organisation has to adapt to ICT as well. The process of adaptation takes time, and it influences organisational strategy. Therefore, ICT has to be part of the organisational strategy (Prahalad & Krishnan, 2002). Weill (1992, p. 310) argues that analysing the size and objective of an ICT investment is: “a strategic decision which
affects the organisation as a whole and its position in the environment”. Thus, ICT supports the development of a competitive advantage when business strategy and ICT use are linked (Porter & Millar, 1985).

The most important goal of each company is to respond to a variety of environmental and internal pressures, in order to survive and grow in a complex and changing environment (Khalifa & Davison, 2006; Grover & Goslar, 1993). Thus, ICT goals are organised toward supporting those business activities that have additional value to the environment, so that the company can achieve its strategic goals (Gibcus & Kemp, 2003). This means that an organisational environment influences the decision of the organisation to adopt an ICT application (Attewell, 1992). In addition, managers feel a considerable amount of pressure to adopt ICT, as a response to changes in the external environment (Ungan, 2005). This is explained by the argument that every strategy, including an ICT strategy, is oriented towards differentiating a company from its competitors (Porter, 1996) and creating competitive uniqueness (Seth & Thomas, 1994).

The key factors facilitating a company’s decision to adopt ICT can be summarised based on the discussion above, namely ICT characteristics, organisational needs and goals, and environmental influences. Furthermore, it is important to note that, in this stage, a company has only an intended and expected vision of ICT benefits. This vision does not have to become a reality. Whether or not it will come true depends on the adaptations of both, an ICT application and an organisation to each other. This is the focus of the implementation stage of ICT diffusion, which is described in the next section.

### 3.2.2 Implementation stage

After having made a decision to adopt ICT, the next step for the company is to put it into use (Rogers, 2003). This requires time, good leadership and IT experts. The implementation stage is characterised with including employees in discussions on how to adapt ICT to the organisation concerned, and adapting organisational and business processes to the possibilities which ICT offers. Thus, the implementation stage can be
defined as being a set of activities which are needed to adjust and to adapt ICT to a company’s needs. As such, it “determines the extent and way in which the ICT will be used” in the company (Bouwman et al., 2005, p. 12).

Furthermore, in the implementation stage, a company needs to invest some money into complementary ICT investments, which enable an easier and more successful realisation of ICT benefits. This is the point at which organisations can fail to realise an ICT value by missing to invest enough money into complementary investments.

Complete success, regarding an ICT application, is strongly related to complementary investments or “adjustment costs”, such as an organisational transformation or acquiring highly skilled employees (Brynjolfsson & Hitt, 2000, p. 34). In other words, the greatest benefits from IT investments will be directed to those companies which have undertaken complementary investments, such as organisational reengineering, restructuring and redesign.

Moreover, it is crucial that a company invest money to train its employees, regarding their ICT knowledge and skills, so that they can use ICT in their daily work activities. In the implementation stage of ICT diffusion, employees should be provided with an ICT education in order to both familiarise and stimulate them to use ICT (Bouwman et al., 2005). If employees of a company do not accept the adopted ICT, then they will resist using it, which might result in achieving insignificant ICT benefits for the company.

These intangible complementary investments are unaccounted for on a company balance sheet, and therefore, they are omitted from conventional calculations of productivity (Brynjolfsson & Hitt, 2000). The importance of taking intangible investments into account is emphasised by Brynjolfsson and Hitt’s (2000) finding that for every dollar spent on IT, a company spends another nine dollars on additional intangible assets: “Thus, the $167 billion in computer capital recorded in the U.S. national accounts in 1996 may have actually been only the tip of an iceberg of $1.67 trillion of...
information technology-related complementary assets in the United States” (Brynjolfsson & Hitt, 2000, p. 40). The fact that complementarities, in any measurement of business value, have been largely ignored is sufficient evidence that the impact of IT has been seriously underestimated (Zhu, 2004).

Although companies invest in ICT, they often fail to take advantage of the full potential and opportunities offered by IT, after having made such investments. Companies may build inefficient information systems, or perhaps use outdated criteria for decision-making, which results in a loss of IT benefits (Brynjolfsson, 1993). The reason for this, according to Dos Santos and Sussman (2000), is that companies fail to redesign and restructure their business, in ways that best utilise their adopted IT. Furthermore, this might be the evidence of a failure in strategic thinking and a failure of senior management to overcome resistance to change (Dos Santos & Sussman, 2000). That is, companies use new IT application to do what they were previously doing; only faster and cheaper. Instead, Dos Santos and Sussman (2000) suggest, authorities in organisations should think about the opportunities which IT potentially provides. Indeed, the ability of managers to invent new processes, procedures and organisational structures that leverage IT, determines the business value of IT (Brynjolfsson & Hitt, 2000).

Furthermore, Kling and Lamb (1999) warn that many organisations have trouble readily changing their practices and structures in order to effectively take advantage of IT. This is concisely illustrated by a case study of MacroMed (Brynjolfsson & Hitt, 2000). After having adopted new IT, an organisation’s main concern was that employees used IT for doing their activities in the old way. The new IT was sufficiently flexible to support the old work practices, although this delayed the transition to new practices. Employees need good reasons to change their organisational practices, as well as the time and training in order to make those changes. After having realised what has been happening, management solved the problem by employing new staff who was unaware of the old work style. Consequently,
IT in the company was used to support new work practices. This resulted in a great success of IT as well as success of MacroMed in the market.

The implementation of an ICT application is an important stage for successful use of ICT. The purpose of this stage of ICT diffusion is to organise and adapt ICT and business processes in such a way as to achieve the expected ICT benefits. These depend on various factors, among which the most important are good leadership, IT expertise and complementary ICT assets. ICT success depends on the actual utilisation of ICT in which users play an important role. They use ICT for their work related activities, and by doing so, they determine the level of ICT utilisation. The use stage of ICT diffusion is described in more detail in the next section.

3.2.3 Use stage

After ICT has been implemented, it is put into full and regular use, with a clear relationship to organisational needs. An ICT application then becomes part of the organisation, and loses its separate identity (Rogers, 2003). This occurs in the use stage of ICT diffusion (Bouwman, et al., 2005). It is a stable stage which is characterised by ICT users exploring different features and possibilities offered by ICT. While utilising ICT in daily operations, users are modifying it to their needs. As a result, ICT provides opportunities for new developments in work procedures, as well as innovation regarding products and business processes (Brender, 2006). Indeed, the efficient use of ICT is crucial for retaining customers, motivating employees, collaborating effectively with partners, and communicating with investors (Prahalad & Krishnan, 1999).

The use stage of ICT diffusion is critical for establishing the ICT impact on a company’s performance (Brender, 2006; Bouwman, et al., 2005; Zhu & Kraemer, 2005; Devaraj & Kohli, 2003). This argument is opposite from the majority of existing studies which have focused on the adoption decision (Fichman, 2000). Consequently, there is extensive body of knowledge on adoption and implementation stages of ICT diffusion, but a lack of research on ICT use and its impact on company performance (Zhu & Kraemer, 2005). This is evident in the Jasperson et al. (2005) statement:
In summary, despite more than 20 years of research examining IT adoption and use, we believe our collective understanding of post-adoptive behaviour is at an early stage of development. (p. 531)

For this reason, Zhu and Kraemer (2005) emphasise the need to extend the view of ICT diffusion to incorporate ICT use and ICT value creation: “the key activities in post-adoption is value creation through use rather than simply adoption and penetration” (p. 67). In other words, the post-adoption stages and ICT value creation processes cannot be explained simply by considering the adoption decision and the amount of money invested in ICT (Zhu & Kraemer, 2005; Devaraj & Kohli, 2003; Soh & Markus, 1995; Barua et al., 1995). Following this argument, the focus of this study is on the use and effects stages of ICT diffusion where an ICT value is created through a multistage process. This point will be discussed more fully, later in this chapter.

The connection between the use stage and effects stage of ICT diffusion is explained by Zhu and Kraemer (2005). On the basis of their findings, companies which have a higher degree of e-business use, achieve greater ICT value. The significant positive relationship between ICT use and ICT value suggests that ICT use is the missing link to ICT value, according to Devaraj and Kohli (2003). In addition, DeLone and McLean (1992) noted that there is a strong relationship between system use and system impact. Therefore, by using ICT to a greater extent, companies are more likely to develop rare, inimitable and valuable ICT capabilities which contribute to value creation and provide a competitive advantage (Zhu & Kraemer, 2005). This outcome, then, depends on the adaptability of ICT applications. The more that ICT is adaptable and flexible, then the greater will be the asset specificity and ICT value (Zhu & Kraemer, 2005).

In their study, Zhu and Kraemer (2005) developed an integrative research model for assessing the diffusion and consequences of e-business at the organisational level. They focused on two post-adoption stages, namely use and value, which they explained by identifying six factors from technological, organisational and environmental contexts, which are
relevant for e-business use and value. In addition, Zhu and Kraemer tested their model using structural equation modelling. Their test was based on cross-sectional data from 624 companies in the retail industry across 10 different countries. Based on their findings, factors which were identified as being antecedents of e-business use, are: technology competence (as the strongest factor), followed by firm size, financial commitment, competitive pressure, and regulatory support.

In addition, Zhu and Kraemer’s (2005) model took into account only six factors, of which IT competence was measured by the number of IT employees. That is, they did not take into account users, their ICT knowledge and their attitudes. In contrast to that study, this research project considers a range of additional factors which have been grouped into four contexts.

Devaraj and Kohli (2003) established strong statistical support for a link between technology usage and performance, based on time-series analysis. They collected financial and non-financial data on performance and ICT usage from eight hospitals; these data were collected each month over a period of three years. Their findings were that ICT usage was positively and significantly associated with measures of hospital revenue, and quality of service.

In addition, Devaraj and Kohli (2003) discovered the importance of task-technology fit in relation to realisation of ICT effects. In other words, technology, the targeted application and users’ qualifications have to be compatible for ICT effects to occur. The use stage may provide a significant insight as to how ICT impacts on company performance. In other words, this impact during the use stage may provide results “that constitute an improvement over traditional measures of IT investment” (Devaraj & Kohli, 2003, p. 285). It seems that the most significant factor, regarding ICT impact, is not the investment in technology, but the actual usage of that technology. This point is reflected in the statement:

Merely examining the dollars invested in IT may not be an accurate reflection of the effectiveness of IT because the
extent of its usage may vary across industries, firms, or processes. (Devaraj & Kohli, 2003, p. 274)

Devaraj and Kohli’s study is important not only because it argues that ICT use is the most significant factor regarding ICT impact, but also because it established a statistical relationship between these concepts. The relationship between ICT and company performance has been recognised in previous studies, although it was then tested in “simulated laboratory settings” (Devaraj & Kohli, 2003, p. 276). None the less, this research project uses those findings as a foundation on which to build. This study also focuses on various contexts which influence ICT use, and consequently, company performance.

Another study which strengthens the argument that ICT use is the driver of ICT impact on company performance is provided by Tallon, Kraemer and Gurbaxani (2000). They found that companies which use post-implementation evaluation techniques have higher perceived payoffs from IT. This means that such companies make a comparison between their intended ICT goals and their achieved ICT effects, and then subsequently modify their actions in order to achieve better ICT effects. Unfortunately, however, it appears that only a handful of organisations observe IT investment in the post-implementation period (Tallon et al., 2000). Most companies invest in IT on the basis of an initial IT evaluation or plan. But they are then unlikely to subsequently revisit those plans, in order to determine whether or not the IT investment is actually performing according to plan (Tallon, et al., 2000).

Identifying the use stage of ICT diffusion as being the missing link, regarding ICT value, is consistent with the argument, identified in the literature, that financial returns on IT/ICT investments occur over a period of time (Devaraj & Kohli, 2003; Dos Santos & Sussman, 2000). For example, Peffers and Dos Santos (1996) stated that it may need several years for IT benefits to be realised, because of the learning period within an organisation. ICT users and companies need time to learn to fully utilise ICT and to adjust ICT to their business processes (Brynjolfsson, 1993;
Attewell, 1992). More precisely, the time needed for IT benefits to realise might be two to three years according to Brynjolfsson (1993).

Brynjolfsson and Hitt (2000) explored the effects of IT on productivity and output growth, based on the data collected from 527 large companies between 1987 and 1994. They found that, over a period of one year, computerisation makes a contribution to measured productivity and output growth that is consistent with normal returns, regarding IT investments. However, these contributions which are associated with computerisation are up to five times greater over longer periods of time, such as five to seven years.

A time lag presents a problem regarding the measuring of an IT value, because there are no quantitative measures which incorporate time lags. For this reason, the results of studies focusing on IT investments and IT adoption may yield short term results regarding IT effects. According to Brynjolfsson and Hitt (2003), short run results are actually direct effects of IT investment, whilst long-run results represent ICT effects, when ICT is combined with complementary investments. In other words, a company will achieve higher results in terms of ICT investment, when is combined with complementary investments.

This is consistent with the Resource Based View (RBV) approach to ICT value. ICT provides a company with a distinct competitive advantage when it is combined with other resources in a way that is difficult for competitors to imitate (Gibcus & Kemp, 2003; Barney, 1991). This happens in the use stage of ICT diffusion, when an ICT application becomes part of the organisation.

It can be concluded that the use stage of the ICT diffusion process is crucial for the creation and evaluation of an ICT value. Furthermore, it has also been established that it is necessary to carefully find the most appropriate method of evaluating an ICT value, by taking into account the aforementioned specifics; namely time lag, complementary investments, ICT and organisational adaptations. In sum, ICT effects should be assessed during the period after ICT has been implemented and institutionalised,
since that is when the time lag will gradually disappear, according to Tam (1998). Thus, the focus of this research project is on ICT in the use stage of ICT diffusion.

ICT effects are discussed and conceptualised in the next section.

### 3.2.4 ICT effects stage

The ICT effects stage of ICT diffusion is characterised by the manifestation of ICT effects, which are the consequences of ICT use (Bouwman et al, 2005). The ICT effects determine ICT value for an organisation. Thus, the focus of this section is on ICT effects.

Levels and outcomes of ICT utilisation determine the effects of ICT and its impact on the performance of a company. ICT effects are created through the interaction between ICT and company/users in the ICT use stage. Furthermore, ICT effects have subsequent performance implications on several levels of analysis, namely individual, organisational, and a company’s relationship to its environment (Bouwman, et al., 2005). In this study, a company’s (ex post) performance is conceptualised as an indication of how well a company has reached its ICT objectives (Mintzberg, 1979). An ICT value is realised when ICT utilisation is aligned with the company’s strategies and goals (Tillquist & Rodgers, 2005).

Using ICT with a purpose of achieving a specific goal, results in ICT effects being connected to that goal (Tallon, et al., 2000). The measures of a company’s performance should be logically linked to the performance objective of each step of an ICT investment, according to Weill and Olson (1989). That is, performance measures of each type of IT investment should match the objective of that investment.

ICT goals as envisaged by managers are a key place to start in order to establish how ICT impacts on company performance. That is, every goal can be assessed by means of a specific measure. In order to know which performance measure to use, an ICT goal has to be established first. Otherwise, as Brynjolfsson (1993) warned, inconsistency in the literature
will be replicated by further mismeasurement. As Weill (1992) has argued, no significant association has been found between total ICT investment and any measure of performance, since ICT is not a homogeneous entity. That is, in order to understand the impact of ICT on company performance, it is necessary to categorise ICT according to the management objective for which it is used.

Because ICT provides a number of benefits, not only for the company which utilizes it, but also for the others, Brynjolfsson and Hitt (2000, p. 24) stated that IT is better described as being ‘a general purpose technology’, rather than a traditional capital investment. For example, in Australia, the Productivity Commission (2004) discovered whilst conducting its research into the impact of ICT on the performance of Australian companies, that organisations use ICT in order to achieve different goals, such as:

- productivity increases by reducing costs (e.g. reduction of labour and facilities, outsourcing)
- Improving production and distribution processes (e.g. by increasing output quality)
- Improving management practices (e.g. by producing timely and accurate information)
- improving product characteristics and assortment/mix (regarding convenience, timeliness, quality, and variety increase, and product development)
- improving relationships with customers and suppliers

Companies have different ICT goals. Therefore, they use ICT differently, depending on organisational strategies (Sabherwal & Chan, 2001; Gupta, Karimi & Somers, 1997; Miles & Snow, 1978). On the basis of findings by Tallon, et al. (2000), IT payoffs are consistent with organisational IT strategies. In addition, they developed a process oriented model which incorporated four types of corporate goals for IT and management practices, as being the key determinants of realised IT payoffs.

According to their findings, the majority of companies are operations-focused, and use IT to reduce operating costs, improve quality, and increase
productivity. Market-focus companies make up 25% of the population, and extend their use of IT to create or enhance a value proposition for their customers. The dual-focus group of companies, according to Tallon, et al (2000) findings, use IT for both operational and strategic benefits. Finally, 16% of companies have no clear goals regarding IT. These unfocused companies are likely to either mismanage or not sufficiently manage their IT investments. Consequently, those companies fail to acquire the potential benefits offered by IT (Tallon, et al., 2000).

Furthermore, it is important to bear in mind that although ICT can be used for a range of functions, not all of those functions generate value (Tillquist & Rodgers, 2005). This might be the reason for the problems associated with measuring ICT value by “multiplying the quantity of capital investment devoted to them by a normal rate of return” (Brynjolfsson & Hitt, 2000, p. 24). In order to account for various ICT effects, that occur at different levels of analysis, those ICT effects are classified here into four groups. This will enable assessing ICT effects and comparing them across different companies.

Weill and Olson (1989) made distinction between strategic, informational, and transactional IT types of IT investments, based on their purpose. However, ICT effects do not only imply increased efficiency and strategic advantages. IT has an impact on organisational processes as well (Ahn & Grudnitski, 1985; Bakos, 1987). For example, IT provides new ways of doing business, organisational learning and making changes to management practices.

Thus, ICT is used in companies with a purpose to achieve informational, strategic, transactional and transformational ICT effects. The study done by Gregor, Fernandez, Holtham, Martin, Stern, Vitale and Pratt (2004) identifies and discusses these ICT effects in more detail. They investigated ICT value in 1,050 Australian companies, after having collected data from the managers of those organisations by using telephone surveys. Contrary to expectations, Gregor et al found that ICT had contributed mostly to companies’ performances by providing informational ICT effects, while
transactional ICT effects influenced companies’ performances the least. They discovered that this applied to companies of all sizes and across all industries. That is, according to Gregor et al (2004), organisational size did not influence the perceived benefits of ICT use.

It can be seen in Table 3.2 that each ICT effect has a different impact on company performance. Weill (1992, p. 310) commented that: “there are different management objectives for IT which often influences quite different measures of performance”. The differences between all four groups of ICT effects, whilst still being statistically significant, are not large in aggregate terms.
Table 3.2: ICT effects- measures of company’s performance

<table>
<thead>
<tr>
<th>Type of ICT effects</th>
<th>ICT goal (strategy)</th>
<th>Effects</th>
<th>Measure of performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Informational ICT</td>
<td>Informational infrastructure (Survival)</td>
<td>Indirect and long-term effects: faster and easier access to internal and external information, more useful, accurate and reliable information and increased flexibility in the manipulation of content and format of information</td>
<td>Return on assets</td>
</tr>
<tr>
<td>Strategic ICT</td>
<td>Expansion</td>
<td>Ability to create competitive advantage, align business strategies to directly support organisational goals, provide new products or services, and improve relationships with customers.</td>
<td>Sales growth, market share, increased profitability, improved competitiveness</td>
</tr>
<tr>
<td>Transactional ICT</td>
<td>Efficiency</td>
<td>Operational and cost savings, supply chain management savings, staff cost savings, and improved business efficiency of employees, business processes, and financial resources</td>
<td>Profitability and labour productivity</td>
</tr>
<tr>
<td>Transformational ICT</td>
<td>Organisational transformation</td>
<td>Improved skill levels, new business plans and business models, expanded capabilities, and improved structure and processes. a culture conducive to change and innovation</td>
<td>N/A</td>
</tr>
<tr>
<td>ICT business value</td>
<td></td>
<td>An overarching indicator of the value of ICT to the organisation, which combines informational, strategic, transactional and transformation ICT effects.</td>
<td></td>
</tr>
</tbody>
</table>


Furthermore, Gregor et al. (2004) emphasised that effective management and strategies are crucial for achieving ICT value, rather than simply the amount of money spent on ICT. More specifically, companies which are ICT aware, persistent in realising ICT benefits, and recognise the
importance of organisational transformation have achieved the highest ICT value.

Unfortunately, the study was conducted over a period of six weeks, which means that it did not consider economic changes. Furthermore, that study took into account organisational level influences, industry and the external environment. It did not consider the individual level of analysis, or the ICT impact on users.

Informational ICT is the “informational backbone of the company” according to Weill (1992, p. 313). It provides informational infrastructure, thereby enabling a company to carry out “control, budgeting, planning, communications, accounting and analysis” (Weill, 1992, p. 313). Thus, informational ICT effects appear to be necessary for the running of a company nowadays. Gregor et al. (2004) found three different types of informational benefits, namely information sharing within organisation, improved business intelligence through better understanding of customer needs and wants, and improved information for managing the organisation.

Weill (1992) did not find any association between informational ICT and organisational performance. He explained that this type of ICT brings about indirect and long-term benefits to a company, in the form of better and more informed decisions. Such ICT effects are probably the reason for measurement errors in both IT capital and outputs as well as for significant time lags between ICT investment and productivity gains (Brynjolfsson, 1993).

Strategic ICT is used in order to provide a competitive advantage and to increase market share, via sales growth. Gregor et al. (2004) have found that, in the long run, the individual organisations which are using strategic ICT do not experience increased business profitability. This is in line with another study conducted by Weill (1992). He established a negative correlation between strategic ICT and company performance. He also found that there is no correlation between the two in the longer time period.
Possible reasons that strategic ICT does not lead to increased business profitability in the long run were provided by Weill (1992) and Carr (2003). Adopted strategic ICT brings benefits to a company only when it first uses strategic ICT in the market (Weill, 1992). However, as soon as other companies adopt the same, or similar, strategic ICT, then the early adopter company looses its competitive advantage (Weill, 1992). In addition, Carr (2003, p.44) views ICT as “a transport mechanism- it carries digital information just as railroads carry goods and power grids carry electricity”. Based on such view he argues that IT does not create strategic value, since it is broadly accessible, affordable and replicable. Furthermore, ICT use is becoming standardised, and the best practices are quickly being built into softwares. This understanding is known as a new IT value paradox, according to Zhu and Kraemer (2005).

Thus, it can be concluded that ICT can enhance productivity at a company level in the short run, at the expense of competitors in the industry concerned. In the long run, ICT effect is diffused at the macroeconomic level since other companies adopt new ICT application. In other words, the industry as a whole ‘raises its game’ as a result of companies using strategic ICT. Thus, the overall result of utilising strategic ICT across an industry is an improved market as well as sophistication of ICT standards in that industry. Brynjolfsson (1993) explained that this is one of the reasons for the lack of a unified conclusion in the IT literature regarding the impact of ICT on the performance of a company.

Transactional ICT is used to cut costs, by automating organisational transactions, for example, accounts receivable and order entry (Weill, 1992). In addition, Weill (1992) found that transactional ICT has been significantly and positively associated with return on investment (ROA) and non-production labour adjusted for sales. That is, transactional ICT is associated with improved company performance, as measured by profitability and labour productivity.

Transformational ICT effect are associated with organisational transformation and consequently, vital in understanding successful use of
ICT (Gregor et al., 2004). This means that ICT brings about organisational change as a consequence of ICT utilisation. For example, transformational ICT effects can bring about an increase in ICT skill levels. Furthermore, Gregor et al. (2004) report that employees in some organisations become more productive through the use of ICT.

On the other hand, Salisbury (1996) argues that simply doing things faster and more efficiently is not necessarily changing the nature of the work being done. Instead, the greatest benefit of ICT use occurs when users rethink and overhaul the business process.

In summary, ICT use is inextricably linked with organisational change. Organisational change is regarded not only as being input, but it is also considered to be output of ICT use, especially in those companies that have a high ICT value. The use of ICT leads to organisational change, which in turn leads to better ICT use, and so on. Such interaction helps companies not only to grow but to increase market share as well (Oh & Pinsonneault, 2007).

ICT value is an overarching indicator which includes the ICT benefits discussed above, namely informational, strategic, transactional and transformational ICT benefits. In addition, measuring ICT effects, that is, the impact of ICT on company performance is a controversial procedure according to the literature. For example, Brynjolfsson (1993, p. 76) warns that “our tools are still blunt” which results in the difficulties in measuring the benefits of ICT. This point was further explained by Tillquist and Rodgers (2005), who argue that there is “a lack of a systematic, objective methodology specifically designed to separate and identify the contribution of IT” (p. 76). In sum, the measures of performance, indicating how ICT influences company performance, have not been defined in the ICT value literature.

According to Brynjolfsson (1993), the mismeasurement of outputs and inputs is the reason for the productivity paradox. However, in the literature, objective measures of performance are preferred to subjective ones (Beal,
ICT effects are tangible as well as intangible, and they require a multidimensional performance construct (Postma & Zwart, 2001).

Thus, in this research project, the identified groups of ICT effects are considered to be performance constructs. Furthermore, the ICT effects, identified and grouped above, are actually corresponding to business process measures. Such measures are used for evaluating how ICT influences the performance of both business processes and activities (Tallon & Kraemer, 2006). IT impacts are first identified as being intermediate performance measures which reveal how ICT interacts with business processes. This enables IT impacts to be connected with the goals, for which IT is used. In turn, this provides managers with a meaningful and plausible interpretation of IT impacts.

Thus, process-oriented measures of ICT value clearly show in which part of the business process the ICT value is being created, as well as where it is being hindered. For example:

- Informational ICT effects → customer service, quality, efficiency;
- Strategic ICT effects → competitive advantage, market share, quality;
- Transactional ICT effects → efficiency and cost savings;
- Transformational ICT effects → positive organisational changes, new product introduction.

Using process-oriented measures of IT value has been discussed and justified by Tallon and Kraemer (2006). They have developed process-oriented measures of IT value, which they have grouped by using exploratory factor analysis, according to where they materialise within the value chain, namely planning and support; supplier relations; production and operations; product and service enhancement; sales and marketing support; customer relationship; and competitive dynamics. These process-oriented measures are encompassed in the Gregor et al. (2004) classification of ICT effects.

In addition, Tallon and Kraemer (2006) recognise the difficulty of obtaining objective data regarding ICT impacts. Thus, they have considered
perceptual measures, which are based on managers’ views of ICT impacts. There is evidence in the existing literature that perceptual measures of company performance correlate with objective measures (Venkatraman & Ramanujam, 1987). Except for encompassing both tangible and intangible ICT effects, these measures offer valuable insights into the impact of IT in the value chain. The benefit of a process-oriented approach, toward assessing ICT value, is that it provides insights that surpass financial and objective approaches (Tallon & Kraemer, 2006).

In addition, a process-oriented approach complements the objective measures, rather than replaces them. Thus, Tallon and Kraemer (2006) have collected data based on surveys directed at managers of 257 companies based in USA. They have established that the managers’ views of IT impacts were influenced by organisational size, strategy and industry.

In addition, by using discriminant analysis, Tallon and Kramer (2006) classified companies according to IT impacts as being operationally excellent, customer intimate or product leaders. They found that manufacturing companies perceive higher IT impacts regarding operational excellence, whilst services companies reported higher IT impacts in relation to customer intimacy and product leadership. These findings provide evidence that companies differ in how they gain IT value, as well as for what they use IT.

ICT effects, which have been identified earlier, take into account decreased costs as a result of ICT use, as well as quality and customer service; all of which improve a company’s competitive advantage. That is, low cost is no longer the most important factor for competing in markets generally (Ghalayini & Noble, 1996). In addition, as a result of considering the four groups of ICT effects as business process measures, they provide an integrated and dynamic performance measurement system. Such performance measures are related to company strategy and objectives, ICT characteristics, users’ acceptance of ICT, and the external environment. Thus, they identify areas for improvement in any of these contexts, which helps companies to achieve its objectives (Ghalayini & Noble, 1996). It has
been suggested that the design of a performance measurement system is a dynamic process (Courty et al., 2003), because the only way to know if a measure is accurate is to observe its effect.

Therefore, by referring to the proposed groups of ICT effects, organisations can compare ICT applications, regarding each relative contribution to different areas of company performance. As a result, organisations can also make ICT investment and development decisions on the basis of objectively defined criteria. Identified groups of ICT effects can be further compared against organisational goals for appropriateness. In that way an organisation’s strategies can be realigned in order to capitalise on new competencies offered by ICT applications. Finally, the information provided by making such comparisons, between ICT goals and organisational goals, can be used to reengineer business processes for both efficiency and effectiveness (Tillquist & Rodgers, 2005).

### 3.2.5 Mismeasurement of ICT value

In this section, mainstream approaches, regarding the measuring of ICT impact on company performance, are analysed in terms of their limitations. The range of measures considered in the existing literature can be organised into three groups, namely market-based, accounting based and output based methods (Tallon & Kraemer, 2006). As a result, one can regard those ICT effects, which were identified in the previous section, as constituting a different approach towards measuring the impact of ICT on company performance. That different approach offers a new perspective and understanding as to how ICT influences different components of a company’s performance.

<table>
<thead>
<tr>
<th>Measures</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market measures (Tobin’s question; market capitalisation)</td>
<td>Bharadway et al. (1999); Dos Santos et al. (1993); Hitt and Brynjolfsson (1996); Tam (1998)</td>
</tr>
<tr>
<td>Profitability (Return on assets, return on equity, profit margin)</td>
<td>Barua et al. (1995); Hitt and Brynjolfsson (1996); Tam (1998)</td>
</tr>
<tr>
<td>Productivity/ Output (Revenue, value-added)</td>
<td>Brynjolfsson and Hitt (1995); Hitt and Brynjolfsson (1996); Brynjolfsson and</td>
</tr>
</tbody>
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Traditional measures of the relationship between inputs and outputs fail to account for intangible sources of IT value. This is the main finding of Brynjolfsson and Hitt’s (2000) study, in which they used large sample statistical analyses, to discover how IT contributes to business performance. They concluded that IT may be associated with increases in the intangible component of output, including variety, customer convenience, and service:

Because it appears that the amount of unmeasured output value is increasing with computerization, this measurement problem not only creates an underestimate of output level, but also errors in measurement of output and productivity growth when compared with earlier time periods which had a smaller bias due to intangible outputs (Brynjolfsson & Hitt, 2000, p. 43).

That is, the benefits of investing in IT may lead to an increase in product quality, which is overlooked in aggregate statistics (Brynjolfsson & Hitt, 1996). This point was emphasised by Brynjolfsson (1993, p.74): “Increased variety, improved timeliness of delivery and personalised customer service are additional benefits that are poorly represented in productivity statistics”. 

Source: Developed from Tallon and Kraemer (2006, p. 1003)
From a traditional economist’s point of view, IT is considered to be an investment (Chan, 2000), and thus, the focus of that stream of research is to evaluate the return on this investment. Assessment used by traditional economists encompasses both productivity and performance measures. The evaluation of these two aspects of IT impact is based on different theories. The focus on the productivity is based on the theory of production, while the evaluation of the business performance is based on the theories of competitive advantage (Hitt & Brynjolfsson, 1996).

In another study, Hitt and Brynjolfsson (1994) found that IT capital correlates with firm-level productivity, but that it has little correlation with business performance. This means that improvements in productivity do not necessarily translate into gains in profit measures or cause the stock market value of a company to increase (Tam, 1998). On the other hand, Hitt and Brynjolfsson (1996) have focused on finding out how IT influences three different measures of IT value separately. They found that IT has increased productivity, and created substantial value for consumers. However, they did not found any influence of IT on business profitability.

This means that the apparent contradiction, regarding findings in the IT literature, may in fact not be a contradiction after all, but could possibly be traced back to inconsistency regarding performance measures. That is, each measure of IT value focuses on a different aspect of the same issue, which consequently, leads to different conclusions. In addition, these measures have limitations, which are discussed below.

Productivity as a measure of performance has limitations. A productivity measure deals with the input from one system, but neglects others, which is in disharmony with systems theory (Ghalayini & Noble, 1996). An additional limitation of productivity, as a measure of ICT impact on performance, is that it does not take into account intangible ICT effects. Brynjolfsson (1993) presents a similar view regarding the inappropriateness of the productivity measure in IT value research: “The business transformation literature highlights how difficult and perhaps inappropriate
it would be to try to translate the benefits of IT usage into quantifiable productivity measures of output” (Brynjolfsson, 1993, p. 76).

Profit, a common measure of company performance, has limitations as well. It can only reveal that there is a problem. However, it provides little in the way of information about the nature and reasons for that problem (Venkatraman & Ramanujam, 1986). The mere fact that a company is making a profit does not necessarily imply that its operations, management and control systems are efficient (Venkatraman & Ramanujam, 1986). Chan (2000) noted that quantitative measures of performance have been legitimised in IT value research, even though they can be misleading and inappropriate.

Another significant limitation of traditional quantitative approaches, toward measuring ICT impact on company performance, is that they do not take into account the time lag effect. This argument has been clearly stated by Mahmood and Mann (2000) who have explained that the correlation between IT investment, company performance and productivity does not necessarily imply causation, “particularly if the correlations are based on data from the same year only” (p. 4). This means that studies, which are based on the cross-sectional data, are not taking into account the lagged effects of IT investments, and therefore, those findings have been criticised.

Example of such a study, which is based on data which had been collected over a period of no more than one year, is the study done by Brynjolfsson and Hitt (1996). Although they included several components of IT spending, used several different econometric models of the contribution of IS to the productivity of 367 large companies, the study was criticised. Thus, their findings that marginal product for computer capital is at least as large as the marginal product of other capital investments was not accepted as solving the productivity paradox, since they were based on the cross-sectional data.

Mcafee (2002) presented the results of a natural experiment regarding IT adoption, which was conducted at the premises of a high-tech manufacturer. The purpose of conducting that case study was to answer a question as to what extent IT can change the impact on an operational performance. In
order to do this, McAfee has used the ordinary least squares (OLS) regressions. The operational performance measures, which McAfee used, are in fact response time (time elapsed between receipt and shipment of a customer order); on-time completion (proportion of customer orders shipped on or before the committed completion date) and the standard deviation of lead time for all orders shipped on a particular day.

McAfee’s longitudinal research has presented evidence of a causal link between IT adoption and subsequent improvement in operational performance measures. This research has also provided a timescale over which these benefits appear. In all observed areas, performance has improved significantly by the end of McAfee’s research period, relative to any pre-adoption levels.

Additionally, causality, according to Mahmood and Mann (2000), cannot be established simply by using conventional statistical techniques, such as correlation and regression analysis.

Based on these warnings, Sircar, Turnbow and Bordoloi (2000) have collected data from 624 USA based companies over a period of five years, from 1988 to 1993. Based on these data, they have developed a framework for assessing the relationship between IT investments and company performance.

Sircar et al. (2000) have merged and extended the respective studies which have been done by Brynjolfsson and Hitt (1993), and by Mahmood and Mann (1993). In doing so, Sircar et al. (2000) have focused on the strengths of those other studies, while limiting their weaknesses in them. More specifically, Sircar et al (2000) have adopted six direct measures of organisational, strategic, and economic performance. These are: return on investment, return on sales, growth in revenue, sales by total assets, sales by employee, and market to book value, as identified by Mahmood and Mann (1993).
Sircar et al. (2000) have also used IT investment measures, as developed by Mahmood and Mann (1993), as following ratios: IT budget as a percentage of revenue, value of an organisation’s IT budget spent on staff, percentage of IT budget spent on the training of IT staff, and number of PCs and terminals as a percentage of total employees. As a result, Sircar et al. (2000) have established that a positive correlation exists between IT measures and economic measures.

Furthermore, Sircar et al. (2000) have established a strong statistical validity for a relationship between IT investment and company performance, based on a canonical analysis. They found that both IT and non-IT investments (labour and non-computer capital) have a strong and positive relationship with sales, assets, and equity, but not with net income. In addition, Sircar et al. found that spending on IT staff and training of that staff is positively correlated with company performance, even more so than it is with computer capital. That is, having an adequate number of qualified IT employees has a greater impact on company performance than any other IT variable. Their study also showed that, with regard to company performance, it is more important how well IT is used and how well it is aligned with company strategy than the quantity of IT.

Key ratio approaches to measuring IT value use capital budgeting techniques, such as return on investment (ROI). However, key ratio approaches, according to Weill and Olson (1989), do not apply to many IT investments, since it is difficult to determine the income stream. In addition, many measures of IT investment have inconsistent effects on financial measures of business performance (Hitt & Brynjolfsson, 1994; Brynjolfsson, 1993). For example, some companies may have a negative ROI, while IT may be essential for company survival (Sircar, et al., 2000). The reason for a negative return on assets (ROA) is that the numerator - net income before taxes is only marginally correlated with investments, and only in some industries, while denominator - assets is strongly correlated with IT investments (Sircar, et al., 2000). As a result, with an increase in IT investment, ROA numerator increase is less than that of the denominator.
Measures such as ‘economic value added’ (EVA) and ‘Tobin’s Q’ perform well, when the value of a specific asset is discretely identifiable (Tillquist & Rodgers, 2005). The most important consideration, regarding such measures, is to separate IT assets from the context in which it operates. However, there is a lack of systematic methodology, which is specifically designed to separate and identify IT effects (Tillquist & Rodgers, 2005).

In identifying the IT specific contributed value, Tillquist and Rodgers (2005) advise that companies must separate the IT contribution to discrete work practices; isolate IT-based impact on operational and strategic processes; as well as isolate the IT contribution to management decisions. That is: “The value creation analysis must establish the boundaries around all of the elements involved in the value contribution of IT within an organisation, and identify the specific contribution of IT to each element within those boundaries” (Tillquist & Rodgers, 2005, p. 76).

Davern and Kauffman (2000) warn that simply taking an indicator into account, as to how ICT affects company performance, may be inadequate. In order to explain what is meant by their comment, they compared any such indicator to the one that reveals the speed of a car. This speed indicator does not reveal any of the characteristics of the car, for example, its speed potential. It also does not reveal anything about the external environment, such as the state of the road or the weather conditions, and their bearing on how fast a car, possessing certain characteristics, might be able to travel.

This understanding regarding an indicator was further discussed by Chan (2000, p. 45), who explained that IT assessment, that relies on a “few key numbers at a single point in time will be incomplete and possibly misleading”, since ICT systems are dynamic. Thus, when one factor is changed, an ICT assessment needs to go beyond isolated outcomes. By contrast, Chan (2000) has warned that IT value should be identified in relation to a number of performance dimensions, at different points in time.

Based on the discussion above, it can be seen that many authors have noted that the most commonly used performance indicators, often derived
statistically from accounting, are limited by the fact that they are only able to capture a small portion of the process or task being performed (Argyris, 1971; Ouchi, 1977; Ghalayani & Noble, 1996). In other words, financial indicators are unable to capture all of the complexities of the tasks and situations for which they are being used (Ghalayani & Noble, 1996). Thus, accounting-based performance measures are no longer adequate, and their limitations are becoming increasingly obvious in today’s competitive and fast changing markets (Chow & Van der Stede, 2006; Ghalayani & Noble, 1996).

Often, as Perrin (1998) and Feller (2002) point out, performance measures and indicators are chosen on the basis of the data available, and not necessarily because that data reveals what should be used as a performance indicator. This point highlights another limitation of traditional performance measures, namely that the extensive amount of data required can be expensive to obtain. In addition, data on privately-held company performances is usually not available, since the owners are neither required by law to publish financial results, nor are they often willing to reveal such information voluntarily to outsiders (Gibcus & Kemp, 2003). Furthermore, when financial statements and accounting data are available, they may be inaccurate, because they are usually unaudited.

Traditional approaches to ICT evaluation which are based on accounting and statistics measures of performance are static, narrow, one-dimensional and simplistic (Wolstenholme, 2003). As a result, many traditional researchers have considered ICT value as being tangible and static phenomenon. Consequently, such researchers do not take into account a social context and intangible ICT effects (Farhoomand, 2005). Such positivist viewpoint has led to technological determinism, that is, the view that technology is separated from the outside world (Tedre, Sutinen, Kähkönen & Kommers, 2006). The result is that a productivity paradox has arisen, namely an inability to account for both tangible and intangible IT benefits at various levels.
The ICT value literature reveals the nature and limitations of the various traditional measures of performance, which have been used to link ICT with performance. The primary focus of traditional economic studies has been on the productivity impacts of IT, while intangible impacts, such as greater product variety, and enhanced customer service have not been included in the analysis of IT value. Traditional IT investment-performance analyses have not be overly successful, due to their over reliance on financial data (Mahmood & Mann, 2000). That is, they have failed to take into account human-related costs (Ryan & Harris, 2000). This has reduced potential ICT benefits, and resulted in less than optimal investment decisions being made.

The lack of taking into account both a social dimension and intangible ICT effects is the reason for the productivity paradox, according to Love et al. (2006). Ryan and Harrison (2000) have suggested that traditional ICT investment decisions are insufficient, because they focus on financial or technological issues that lead to a wrong expectation regarding ICT benefits. Thus, it is necessary to understand ICT and its related effects in terms of socio-technical (i.e. human, organisational and technical) dimensions. Such understanding will identify the intangible benefits of ICT, which can be more important than cost savings.

Perceptual measures constitute an alternative approach to measuring IT payoffs, especially when it is not always possible to calculate an exact figure regarding ICT value (Tallon, et al., 2000). Tallon, et al. (2000) have used business executives’ perceptions in order to assess the actual impacts of IT on each activity, rather than the expected impacts. A business executive is in an ideal position to identify how and where IT creates value for a business. The views of such executives, regarding the value of ICT, are therefore, acceptable operationalisations of business performance (Devaraj & Kohli, 2003; DeLone & McLean 1992; Venkatraman & Ramanujam 1987).

Due to application of traditional economic research, many researchers and managers have focused only on the return on ICT investment, while ignoring the process of converting the potential value of an ICT application
into its realised ICT value. The conversion process is discussed in the following section.

The main theoretical approaches to establishing ICT value, namely the resource based view (RBV) and contingency approach, regard the translation of IT potential to a realised IT value as being crucial to establish an ICT value. This process of converting IT investment into organisational success is the focus in several process-oriented studies. However, by contrast to using a direct approach regarding the measuring of an ICT impact on company performance, a process-based approach makes use of intermediate measures and concepts (Soh & Markus, 1995; Weill, 1992). For example, by using such an approach, Barua, Kriebel and Mukhopadhyay (1995) have established positive impacts of ICT at intermediate levels.

The process of creating ICT value is discussed in the next section.

### 3.3 ICT value creation process

ICT value has been defined earlier in this thesis as being a combination of informational, strategic, transactional and transformation ICT effects, which take place in an organisation. These ICT effects are actually ICT goals, which an organisation has acquired during the process of ICT use. Thus, ICT value can be defined as goals which are achieved through the use of ICT by an organisation. The emphasis in this statement is on the achieved ICT goals.

The reason for this is that intended ICT goals, developed in the adoption stage of ICT diffusion, may not be the same as the realised ICT goals. In fact, Quinn, Mintzberg and James (1988) have explained that “a firm’s realised strategy almost never equals exactly a firm’s intended strategy” (pp. 14-15). In other words, ICT value in the adoption stage differs from the realised ICT value in the use and effects stages of ICT diffusion. This means that ICT value changes and evolves, through the various stages of the ICT diffusion process.
In their study, Weill and Olson (1989) have identified the importance of converting IT investments into useful output. They have called this process conversion effectiveness and they have explained that this might be the reason that different companies experience a different impact of IT investments on their performances. In other words, some companies are more successful than others, with regard to conversion effectiveness. Weill and Olson have also identified factors which influence conversion effectiveness in each company. These factors are namely top management commitment regarding IT, a previous company’s experience with IT, user satisfaction with systems, and the turbulence of the political environment of the organisation.

Based on the synthesis of previous models on ICT value, Soh and Markus (1995) developed a model describing the process of ICT value transformation. According to this model, ICT investments are transformed into business value via three stages. First, ICT investment is turned into ICT assets, and in this process IT management is crucial. Through the process of ICT use, ICT assets create an ICT impact. In the last stage of ICT value transformation, ICT impact results in changes in organisational performance, which depends on the competitive process.

By creating this model, Soh and Markus (1995) have provided an explanation as to why ICT investment does not always lead to an improved organisational performance. This will depend on the various factors influencing the ICT use stage. In addition, factors of crucial importance regarding the transformation of ICT value, such as management skills, use process, and the organisational culture, vary in each company.

In addition, ICT use has to be tied to company performance, for ICT impact to occur (Devaraj & Kohli, 2003). This means that ICT goals have to be aligned with the organisational strategies, to make the best possible use of ICT in order to meet a company’s business objectives (Peak & Guynes, 2003). Resources themselves have no intrinsic value. They become valuable when needed in order to accomplish some goal (Tillquist & Rodgers, 2005). Only when ICT goals are aligned with organisational strategies does ICT
become the “central nervous system of strategy” (Ellis, 2001, p. 71). If a company does not have an ICT strategy that supports its needs and goals, then ICT will not be fully utilised, and the investment in ICT may not be successful (Brown, 1992).

A stream of literature which uses a contingency approach to evaluate strategic ICT value emphasises that the degree of alignment between ICT and an organisation’s strategies is crucial for achieving an ICT value (Oh & Pinsonneault, 2007). A contingency approach is based on the argument that achieving an ICT value requires that that ICT be aligned with business strategy. This argument was further justified by findings in a study done by Tallon, et al. (2000). They have found that companies, whose ICT is closely aligned with business strategy, have higher perceived IT payoffs. This is also supported by Oh and Pinsonneault’s (2007) findings.

Oh and Pinsonneault (2007) have used three business and IT strategies: cost reduction, quality improvement and revenue growth, in order to measure the alignment between IT and organisational strategy. They have found that ICT strategies for revenue growth and cost reduction are important with regard to achieving high revenues. In addition, they found that company’s expense is minimised when there is a high degree of alignment between business strategy for cost reduction and IS strategy for cost reduction; and between business strategy for cost reduction and IS strategy for quality improvement. In other words, the fit between IS strategy and organisational strategy is crucial for achieving ICT value. Furthermore, Oh and Pinsonneault (2007) have found that companies tend to focus on a particular type of IS strategy at the expense of other IS strategies.

This is in line with the strategic typology developed by Miles and Snow (1978). On the other hand, Sabherwal and Chan (2001) found that alignment between business strategy and ICT strategy is not a factor with regard to the performance of companies which emphasise stability, operational efficiency, and economies of scale. These companies prefer to make very few radical adjustments to the technologies which they use. Therefore,
alignment between organisational and ICT strategies may not lead to success for those companies.

In sum, ICT goals are based on the organisational strategies; and the success of IT investment depends on the alignment between them. This is in line with the systems approach argument that ICT is inextricably linked to organisational context, which was discussed in Chapter 2. Full ICT value realises when ICT is utilised in a way to achieve company strategies and goals (Tillquist & Rodgers, 2005). This presents a strong argument that ICT goals have to be in line with organisational goals and strategies in order to bring value to the company.

Based on this argument, a classification scheme of ICT effects based on the organisational ICT goals, is adopted in the present study. Such an approach has been supported by advocates of a process-oriented assessment of IT business value (Tallon, et al., 2000). It can also simplify the assessment of ICT payoffs in different companies.

ICT value, apart from the ICT utilisation process, is influenced by changes in the organisation and its environment. As a result of these changes, strategies that were never intended arise. Such strategies are called emergent strategies (Mintzberg, 1979). This is illustrated in Figure 3.3. This figure sums up the findings from the strategic literature, regarding the process of transforming intended ICT strategies into realised ICT strategies.

**Figure 3.3:** Types of strategies

![Figure 3.3: Types of strategies](source: Adapted from Mintzberg (1979) and De Wit and Meyer (1994))
Before a company implements ICT, it has to develop an ICT strategy as to how it will use ICT; as well as how ICT will complement the company’s processes; and how to implement ICT to operate most successfully, especially regarding company employees. Successful ICT adoption and implementation requires detailed strategic ICT planning, and aligning of business goals with the ICT adoption strategy (Brown, 1992; Peak & Guynes, 2003). The fit between a company’s strategic orientation and its planning process “creates synergy, promotes efficiency and strengthens the company’s competitive position” (Bahaee, 1992, p. 212). Strategic ICT planning is focused on developing a long-term plan for the use of ICT. The intended strategy incorporates the company’s plans and its objectives (ex ante); and it has two essential characteristics. Firstly, it is formulated in advance, before a decision is made; and secondly, it is consciously and purposefully developed (Mintzberg & Waters, 1985; Mintzberg, 1979).

When intended strategies are adopted in decisional behaviour, they become realised strategies (Snow & Hambrick, 1980). In other words, realised ICT strategies are formed gradually, as a result of a pattern in decisional behaviour. Thus, Mintzberg (1979, p. 69) has defined a strategy as being “a pattern in a stream of decisions”. The intended strategies can be adapted within a process of deliberate and emergent strategies (Mintzberg, 1979).

Emergent strategies enable organisational learning, and they are imposed on the organisation by the environment. In order for an emergent strategy to be realised, consistency over time is required, with the absence of any intended interference. Consistency implies that that no intended strategy be used; or at least that an unrealised strategy be present (Gibcus & Kemp, 2003). Emergent strategies, for the purposes of this research, are regarded as being more likely to characterise ICT use. This is due to the learning (dynamic) process, by which ICT feedback from the “use” process is used to modify existing strategies as well as to formulate new ones. Emergent ICT strategies occur because of constant changes in the environment to which an organisation has to adapt. After ICT has been implemented, and adapted to a company, then the new possibilities which ICT potentially provides become obvious, and some of those intentions which were previously considered are
then abandoned. All of this result in changes to the intended strategies; and new strategies emerge. As a result, ICT value changes and evolves through the various stages of ICT diffusion.

Different types of strategies can be easily applied to ICT value, which is the focus of this study. This is depicted in Figure 3.4.

**Figure 3.4:** Process of realising ICT value

As illustrated in the figure above, the transformation of ICT value, from intended to realised, takes place in the use stage of ICT diffusion. The striking characteristic of the use stage is the interaction between users, ICT and an organisational context which determined the ICT value. It is due to these interactions that initially planned and intended ICT goals may change, and new ones emerge, resulting in specific ICT use. Thus, the use stage of ICT diffusion influences the realisation of ICT effects, and consequently, performance of a company.

A process model of IT value, which was developed by Davern and Kauffman (2000), is used to considers and compare both the potential and realised value of an IT investment. Potential IT value is the expected payoff of IT while realised IT value stands for the actual results from the IT investment. The importance of the Davern and Kauffman (2000) study is that it emphasises that the actual ICT value is produced in the post-implementation period. An examination of realised value, relative to potential value in an ex-post evaluation of an IT project may help management learn why an ICT potential value may have been left
unrealised, and identify management actions that may be useful in future projects in order to ensure the effective conversion of the potential value into the realised value.

Davern and Kauffman’s main argument is that the investment decision should be based on a comparison between the potential value, developed in the adoption stage; and the realised value which occurs in the use stage of ICT diffusion, in relation to the ICT value conversion contingencies that intervene (Davern & Kauffman, 2000). The model which was developed by Davern and Kauffman is presented below.

**Figure 3.5: IT value creation process**

A potential IT value can occur at various levels: individual, group, business process, firm and/or the market. All of these should be assessed. Thus, an IT project may have a positive potential value at one level of analysis, and a negative value at another level. Furthermore, this raises the possibility of potential conflicts occurring between different levels of analysis. The level of analysis regarding a potential IT value may be quite different from the levels at which realised IT value occurs. This is due to a range of factors that are likely to influence the IT value, and act as contingencies for the appropriation of ICT value.
These factors, which influence the creation of an ICT value, consequently influence a company’s performance. Based on the previously established argument that the creation of an ICT value occurs during the use stage of ICT diffusion, factors influencing this stage also influence the creation of an ICT value. Although their framework was general, Davern and Kauffman (2000) have emphasised that management support, ICT planning, training and competitors adopting new ICT are crucial factors in relation to successfully turning a potential ICT value into a realised ICT value. In doing so, Davern and Kauffman developed the idea that complementary assets influence the realisation of an ICT value. In this study, factors influencing ICT use, which are identified in the following section, are considered to influence the creation of ICT value, and consequently, company performance. Furthermore, a company’s performance in this study is conceptualised as being a consequence of interactions between factors influencing ICT use.

A similar conceptualisation of performance was used by Khazanchi (2005) in order to define and test the concept of ‘fit’, using a systems approach. He defined performance as being a consequence of a fit between various factors, without reference to a criterion variable. A fit in terms of a systems approach, is a “feasible set of equally effective, internally consistent patterns of organisation and context and structure” (Khazanchi, 2005, p. 335). Critical factors for the success of IT implementation were the internal/external business environment, technological environment, organisational readiness (e.g. availability of financial resources) trading partner support, financial impact and workflow productivity (e.g. reducing the time and resources). The findings in Khazanchi’s (2005) study demonstrate the need for an organisational and technological fit. He also established that a fit between IT appropriateness factors leads to a company’s positive performance.

In this research project, the focus is on interactions between factors influencing ICT use, which, in turn, influence the conversion effectiveness process. In other words, factors that shape and determine ICT value take place in the use stage of the ICT diffusion process. Based on systems theory,
which was discussed in Chapter 2, factors influencing the conversion effectiveness process interact with each other. It is through this interaction that ICT value is created. The next step in this literature review, therefore, is to identify which factors influence ICT use. By identifying them, it will be possible to establish how they affect a company’s performance.

Thus, in this study, ICT impact on a company’s performance is conceptualised through identified groups of ICT effects. Furthermore, by taking into account the impact of factors influencing the use stage of ICT diffusion on ICT effects, the result of this research project will be a holistic understanding of how ICT impacts on a company’s performance. These factors are identified in the section below.

### 3.4 Factors influencing ICT use

It has been established earlier that the ICT value creation process occurs in the use stage of ICT diffusion. Furthermore, the use stage is characterised by interactions between technological, individual, organisational and environmental groups of factors. Thus, it is through interactions between these factors that ICT value is created. In order to provide a deeper understanding of conversion effectiveness, factors influencing ICT use are identified in the next and subsequent subsections. However, the literature regarding ICT use is concerned with how users accept ICT, based on the characteristics of users and their perceptions of ICT characteristics. That literature identifies mainly individual factors influencing ICT use. In order to identify factors from other contexts, the literature on ICT adoption and implementation are reviewed as well.

The purpose of conducting in-field research is to establish these factors and their interaction in a specific organisational context. The end result of this research project, namely identifying factors which inhibit or enable the achievement of each group of ICT effects, will help managers to achieve greater ICT value, and consequently, improve company performance.

Despite the significant number of studies which identify factors relevant to ICT success, only a handful of studies have taken into account all four
contexts which have been identified in this study. An example of a study using all four contexts is that of Premkumar and Roberts (1999), who conducted a survey at 78 rural small businesses. They reported that the relative advantage, top management support, organisational size, external pressure and competitive pressure are critically associated with the degree of adoption regarding the four ICT applications.

In addition, Rashid and Al-Qirim (2001) have developed a theoretical framework for IT adoption where they have identified factors influencing and leading to the adoption of e-commerce technologies by the New Zealand SMEs. Those factors were clustered in four contexts: technological, organisational, environmental and individual. However, Rashid and Al-Qirim have not empirically tested the impact of those factors. Instead, they have identified factors which positively/negatively influence adoption, based on their appearance in the case studies in the literature. They focused on the CEO’s characteristics only, without taking users into account. However, in the post-adoption stage, users greatly influence the creation of ICT value.

In another study, Barba-Sánchez, Martínez-Ruiz and Jiménez-Zarco (2007) have tried to assess the impact of ICT adoption on SMEs, by reviewing the literature. The key factors in the ICT adoption process, according to them are entrepreneur’s characteristics (age, ethnicity and gender, training and experience effects, and psychological differences between individuals) as well as the innovation orientation. They have concluded that the analysis of the strategic value of ICT must include not only technological characteristics, but also the individual adjustments by a company to the organisational structure, capabilities, resources, incentive structure, the facilitating interaction mechanisms regarding all elements of performance conditioners, and the possible contribution to a competitive advantage.

On the other hand, Runge and Lee (2001) have empirically tested their theoretical framework of IT adoption, by using the correlation matrix and regression analysis. They have identified all four contexts. Once again, however, employees and their IT knowledge were not taken into
consideration. In addition, although Runge and Lee emphasised the importance of IT characteristics, they have used only one factor representing the technological context: relative advantage of IT. In addition, Individual and environmental context variables were found not to be significant in this analysis. Runge and Lee (2001) have found that an owner’s perceptions of IT usefulness, and the social pressure felt by users, exert a strong influence on IT adoption.

In most studies, only one or sometimes just a few contexts have been considered. For example, Jevaraj, Rottman and Lacity (2006) have used individual and organisational groups of factors; Beaudry and Pinsonneault (2005) have used only individual factors; whereas Grover and Goslar (1993) have considered environmental, organisational and technological contexts. Chan (2000) emphasises the importance of taking into account both strategic and human contexts into account.

However, Burton-Jones and Straub (2006) explain that ICT use is a complex activity that involves users, ICT and the ICT goals. In their study on ICT usage and individual task performance, they have found that both users, and the task aspects of use, have to be included in the analysis. Brender (2006, p. 209) has noted that if a system is too cumbersome to handle, then there is a risk that a user will carry out activities in an incorrect manner, thereby influencing ICT use by delaying the data input. Therefore, ICT characteristics should be oriented towards the satisfaction of users, and their learning and training needs. ICT characteristics, particularly with regard to how effective it is for an organisation to use ICT, as well as how easy it is for users to learn to use it, are important aspects for company management to understand (Brender, 2006).

In addition, Melville et al. (2004) have stated that employees’ lack of knowledge and inability to adapt to new behaviour, are the reasons that intended ICT value is not being converted into realised ICT value. That is, any user who is unable or unwilling to recognise the full payoff, regarding the use of ICT, limits the realised ICT value. On the other hand, knowledgeable ICT users can improve the use of ICT, and consequently,
company performance. Weill (1992) has therefore emphasised the importance of the role of management, and its proper commitment regarding the use of IT.

In addition, Bouwman et al. (2005) emphasised the importance of organisation and ICT as a given context within which users use ICT. The importance of an organisational context in ICT value transformation process was emphasised by Melville et al. (2004) who stated: “it is clear that complementary organisational resources such as workplace practices, change initiatives, and culture all interact with IT in the process of value generation” (p. 303).

Thus, factors that influence the ICT value creation process are related to the organisational context and the specific way in which each organisation uses its ICT application. Furthermore, ICT value is created by applying and using ICT by means of a business process which is specific to each company. Thus, the process of conversion effectiveness is specific for each company since each company has specific factors influencing its ICT use, such that: “by observing existing business processes in place, it becomes possible to identify context-specific data” (Davern & Kauffman, 2000, p. 133).

In their study, Soh and Markus (1995) have stated that environmental influences should be taken into account. These influences can influence an organisation to achieve ICT goals, even if such environmental influences do not have a direct impact on organisational performance. Tallon et al. (2000) have warned that the environmental context is a key factor when considering IT value, because ICT goals are derived from the organisational strategies.

By incorporating all of these arguments, it can be concluded that factors influencing ICT use are related to ICT, users, organisational and environmental contexts and ICT goals. Any misunderstanding on the part of management of these different aspects of ICT use may result in a failure by an organisation to “effectively realise promised benefits from ICT due to misunderstanding the relationship between factors and processes influencing ICT” (Peansupap & Walker, 2006, p. 321). Therefore, a range of factors,
including technological, individual, organisational and environmental contexts, will be identified in the next and subsequent sections.

3.4.1. Technological factors influencing ICT use

ICT characteristics can be viewed from two levels of analysis: organisational and individual. From the organisational viewpoint, an ICT application should be integrated with business processes and it should also be compatible with other ICT applications within the company. That is, ICT integration enables “incorporation of technology resources and technology-based practices into the daily routines, work, and management of companies” (The National Centre for Education Statistics, 2002, p. 4).

ICT can support the company’s goals when the ICT integration is seamless; thus such integration leads to a realisation of the full ICT value. Furthermore, ICT applications in a company should also be compatible with each other, in order “to perform required functions while sharing the same hardware or software environment” (Dedale, 2007). Therefore, the full benefits of ICT can be gained by tailoring ICT to the organisational context, and adapting organisational processes to the ICT (Fichman, 2004).

Thus, the capacity for adapting ICT to the organisational context is influenced by the extent to which the system is integrated and compatible. These capabilities are enabled by the extent to which the ICT is open to adaptations and upgrades. Since ICT applications support a wide array of possible configurations, they tend to be open-ended tools. That is, they are open to further adjustments. ICT openness is closely related to the adaptation of ICT to organisational goals. Due to the specifics of the adaptation process in each company, different companies use the same technology in different ways, which leads to a different distribution of potential ICT benefits in each company (Fichman, 2004). The process of adaptation is unpredictable, because not all ICT possibilities and fits with organisational goals can be predicted before the implementation period. The process of adaptation continues over time, making ICT openness an important ICT characteristic.
Technology can also be viewed from the users’ point of view. By examining technology from that perspective, Moore and Benbasat (1991) have distinguished between ICT characteristics and perceived ICT characteristics. According to them, different adopters might perceive primary ICT characteristics in different ways. That perception influences users’ behaviour. Because users’ behaviour is predicated by how they perceive ICT attributes, Moore and Benbasat (1991) suggest focusing on the perceived ICT characteristics, instead of using IT characteristics. Models explaining users’ ICT acceptance are taking into account ICT characteristics as perceived by users.

The IT characteristics which Moore and Benbasat (1991) have proposed are relative advantage, compatibility and complexity. These IT characteristics are based on the work of Rogers (2003) and Davis (1989) Model of Technology Acceptance (TAM). TAM, as a theory of users’ acceptance of ICT, uses a subjectivist approach. In other words, TAM seeks to explain ICT use by focusing on the users’ attitudes towards ICT and their intention to use it. The relative advantage of ICT is the extent to which users perceive ICT to be contributing positively to their work. Venkatesh, Morris, Davis, and Davis (2003) have developed this concept further; and they have used performance expectancy and effort expectancy to determine ICT use.

**Figure 3.6: Technology acceptance model (TAM)**

Ease of use and perceived usefulness of IT are the key concepts of TAM. The complexity of ICT or user friendliness influences how users accept and adopt ICT (Tedre, Sutinen, Kähkönen, & Kommers, 2006). Ease of use is
“the degree to which a person believes that using a particular system would be free of effort” (Davis, 1989, p. 320) or as “the degree to which an innovation is perceived as being difficult to use” (Moore & Benbasat, 1991, p. 195).

Systems that are difficult to use are adopted more slowly than those that are easy to use; or they may even be rejected altogether. In other words, if using ICT requires that users develop new skills, then ICT is adopted more slowly. On the other hand, if using ICT is consistent with the existing ICT knowledge, then users will influence a faster adoption rate, and the fuller use of it (Tedre et al., 2006). This means, not only that ICT characteristics determine ICT use, but also “the right match between the users’ experience and the complexity of the system” (Bouwman et al., 2005, p. 95).

The concept of perceived usefulness is defined by Davis (1989, p. 320) as being “the degree to which a person believes that using a particular system would enhance his or her job performance”. That is, ICT characteristics, as perceived by users, influence users’ attitudes and any intention on their part to use ICT; which in turn, determines any use of ICT. Furthermore, users’ views of technology change over time; and therefore, ICT use changes as well. Consequently, the ICT value also changes. Legris, Ingram and Collerette’s (2003) meta-analysis study extends TAM, with regarding to a number of external variables, namely intrinsic involvement, prior use and experiences, level of education, task technology fit, gender and job relevance. This will be discussed in the next section, regarding individual factors which influence ICT use.

Lee (2004) has examined the antecedent drivers in relation to the adoption of Internet technologies in small businesses. He used factor analysis and discriminant analysis in order to analyse the data from the surveys done by decision-makers in a number of companies. The measure of IT adoption, adopted by Lee (2004), was the use of Internet technologies. Lee (2004) found that compatibility, computer self efficacy and image were important regarding ICT adoption across four different technologies. Ease of use and innovativeness were found to be only significant factors only in relation to
e-procurement and electronic mail, respectively. The results have confirmed the strong association between computer efficacy, compatibility, image, financial slack and relative advantage and Internet technology adoption.

ICT characteristics, as seen from both organisational and individual perspectives, influence the level of ICT use, and explain the occurrence or absence of ICT effects. For example, if ICT is not integrated, compatible, open, or easy to use, then the potential ICT value will not be realised. Moreover, such ICT may become a legacy issue (Mitleton-Kelly & Land, 2005; Mitleton-Kelly, 2004). That is, such ICT application cannot support the achievement of organisational goals. Therefore, ICT openness, ICT integration and ICT compatibility are factors which determine the extent and manner of ICT use.

Furthermore, it can be seen from the discussion above, that simply taking into account the technological side of ICT alone cannot explain the ICT value. ICT is inextricably linked to both individual and organisational contexts. Thus, ICT has to be considered in conjunction with these contexts, in order to provide a better understanding of how it influences company performance. This is the purpose of this research project. Therefore, the individual context is discussed in the next section.

3.4.2. Individual factors influencing ICT use

It is important to take into account the individualistic context because individuals use ICT for their everyday work. They know best how ICT influences their work, as well as processes within the company. Therefore, Peansupap and Walker (2005, p. 139) emphasise that “it is essential to evaluate feedback from users who actually use the system”. Due to the importance of users in relation to the ICT use process, theories explaining ICT use from an individual user perspective have been developed. These theories are focused on users’ acceptance of ICT since different users need a greater or lesser amount of time to accept and use ICT (Rogers, 2003). That is, users’ reactions regarding using ICT, influence their intention to use ICT, which, in turn, determines their actual use of ICT, and its impact on company performance (Venkatesh et al., 2003).
System use is a construct used in technology adoption models, and IS success models (Venkatesh, Brown, Maruping & Bala, 2008). Its importance has been emphasised by Benbasat and Zmud (2003) who have included it as a core property of the IT artifact’s nomological network. They have stated that a core property of IS discipline focuses on: “managerial, methodological, and operational practices for directing and facilitating IT artifact usage and evolution” (p. 186). A review of an earlier research and system use construct is done by Burton- Jones and Straub (2006), as well as by Jasperson et al. (2005). They have found that system use was being treated as a black box concept (Jasperson et al, 2005), and that earlier research has primarily used ‘lean’ measures of system use, while not justifying them. Venaktesh et al. (2003, 2008) have employed duration, frequency, and intensity of use as conceptualizations of system use. For the purposes of this research, determinants of systems use and its outcomes are of interest.

As it was mentioned earlier, ICT use is influenced by the extent to which users make use of ICT. For example, users can use ICT in either a productive or a non-productive way, perhaps because there are too many ICT features, users’ characteristics, or because ICT use becomes a habit (Jasperson et al., 2005). That is, users can use ICT for the routine execution of their knowledge whereby “an individual engages in a recurring pattern of using a selected subset of technology features in his/her work” (Jasperson et al., 2005, p. 535); or to search for new ways of doing things (Burton-Jones & Straub, 2006). A user’s post-adoptive behaviour, according to Jaspers et al. (2005), is characterised by the active learning and use of the ICT.

A study done by Venkatesh et al. (2003) further contributes to this research, by identifying factors influencing users’ intentions and their use of ICT. They integrated fragmented theory and research regarding the individual acceptance of IT/ICT, into a unified theoretical model that captures the essential elements of eight previously established models. The unified theory of acceptance and use of technology (UTAUT), has been able to account for 70% of the variance (adjusted R²) in usage intention, which is a
substantial improvement over any of the original eight models and their extensions.

According to Venkatesh et al. (2003), the factors influencing ICT use which are related to individual users, are: performance expectancy (perceived usefulness); effort expectancy (ease of use), social influence, and facilitating conditions. Furthermore age, gender and users’ experience regarding the use ICT, also influence ICT use, as moderating variables. This is presented in Figure 3.7.

**Figure 3.7: Unified theory of acceptance and use of technology (UTAUT)**

![UTAUT Diagram](source)

**Source:** Venkatesh et al. (2003, p. 447)

Factors influencing ICT use, which have been identified by Venkatesh et al. (2003), are defined in the following table, and are linked to terms used in other models for the same constructs. It is important to note here that performance expectancy, and effort expectancy, have been discussed in the previous section, regarding technological factors which influence ICT use.
<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
<th>Terms used in other models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance expectancy</td>
<td>Degree to which an individual believes that using the system will help him or her to attain gains in job performance</td>
<td>Perceived usefulness, extrinsic motivation, job-fit, relative advantage, and outcome expectations</td>
</tr>
<tr>
<td>Effort expectancy</td>
<td>Degree of ease associated with the use of the system</td>
<td>Perceived ease of use, complexity, and ease of use</td>
</tr>
<tr>
<td>Social influence</td>
<td>Degree to which an individual perceives <em>it to be that</em> important <em>that</em> others believe he or she should use the new system</td>
<td>Subjective norm, social factors, image</td>
</tr>
<tr>
<td>Facilitating conditions</td>
<td>Degree to which an individual believes that an organisational and technical infrastructure exists to support use of the system</td>
<td>Perceived behavioural control, facilitating conditions, compatibility</td>
</tr>
</tbody>
</table>

Source: Venkatesh et al. (2003, p. 428-436)

Organisations create facilitating conditions for ICT use, namely support, seminars and various forms of assistances in order to improve ICT use (Venkatesh et al., 2003). In addition, Frambach and Schillewaert (1999) have defined facilitating conditions influencing ICT adoption as being organisational facilitators (e.g. ICT training, IT support) and social influences. Furthermore, facilitating conditions are influenced by managers’ support. The effect regarding facilitating conditions increases with experience as ICT users find multiple avenues for help and support throughout the organisation, thereby removing impediments to sustained usage. This is especially valuable for older workers. In addition, Venkatesh, Brown, Maruping and Bala (2008) found that facilitating conditions depend on the gender, age, and experience, thus, it has the strongest effects for older women in later stages of their work experience.

Peansupap and Walker (2005) have examined the supporting environment in ICT adoption and implementation in large ICT-experienced Australian construction organisations. According to them, the nature and extent of the supportive environment within those organisations facilitated ICT use. After individual factors (e.g. personal characteristics and clear advantage of ICT
use), the supporting environment factor was ranked as having been the most important for ICT success. Users perceived the supporting environment as having been a valuable element in their use of ICT. Management support factors were rated as having been only moderately important. Users’ perceptions, regarding high levels of supervisor support, led to trust by users. Similarly, an open atmosphere, in which users could provide suggestions and receive encouragement regarding their involvement with an ICT application, generated a positive experience for those users of ICT.

This meant that barriers regarding ICT use, and its adoption, had moved beyond technical and cost-related problems, to ICT management problems within those construction organisations. In turn, professional development and technical support were rated lowly. The explanation, as provided by the Peansupap and Walker (2005), was that most users did not have time to learn how to adequately use an ICT application, or to get the opportunity to learn by trial and error.

One’s attitude toward using ICT is defined as being an “individual’s overall affective reaction to using a system” (Venkatesh et al., 2003, p. 455). This factor has been found to be the strongest predictor of behavioural intention in cases where constructs, related to performance and effort expectancies, were not included in the model. Furthermore, Venkatesh et al. (2003) found that users’ ICT experience, voluntariness, gender, and age are significant moderating influences (see Figure 3.7). They explained that age and gender can be misleading if they are not considered together. Venkatesh et al. (2003, p. 450) have indicated that increased age is associated “with difficulty in processing complex stimuli and allocating attention to information”, regarding ICT use. Organisational psychologists have noted that older workers attach more importance to receiving help and assistance on the job.

In addition, in their study, Legris, Ingram and Collerette (2003) emphasised the importance of a user’s prior experience with the technology, which, according to them, influences other constructs. Previous ICT experience distinguishes novice and expert users, who differ, in the degree of their
knowledge, as to how to use ICT (Lamb & Kling, 2003). Furthermore, expert users (i.e. users with more experience in using ICT) are able to perform some of the day-to-day system modification themselves, and thus fully use ICT. It has to be noted that the voluntariness of use might influence the impact of ICT on a company’s performance (Devaraj & Kohli, 2003). In mandatory settings, some users may not comply with organisational mandates, thereby influencing users’ intentions to use ICT, as well as any loss of ICT effects (Hartwick & Barki, 1994).

In order to increase one’s understanding of the drivers of various conceptualisations of system use, Venkatesh et al. (2008) have introduced a behavioural expectations construct. On the basis of the longitudinal field study of 321 users of a new information system, they have found that behavioural expectations are better than behavioural intentions, in predicting frequency and intensity of system use. In addition, behavioural expectations mediate the effects of the facilitating conditions on ICT use. However, ICT use is positively influenced by behavioural intentions. The reason for this is that a behavioural expectation “accounts for external factors that can influence the performance of behaviour” (Venkatesh et al., 2008, p. 486). Venkatesh et al. have found that users develop strong intentions to use the system as their experience in relation to using the system increases. On the other hand, such intentions weaken the behavioural expectations.

The purpose of both models, as developed by Venkatesh et al. (2003, 2008), is to predict the initial use of the adopted system. Thus, their findings are limited to the ICT adoption context. However, their findings are valuable for describing how users utilise new ICT. However, when the behaviour of those users becomes routinised, as occurs in the use stage of ICT diffusion, habit plays a key role in influencing ICT use (Venkatesh et al, 2008; Melville et al, 2004).

In their model of ICT post-adoptive behaviour, Jasperson et al. (2005) introduced individual cognitions. These include compatibility, complexity, ease of use, facilitating conditions, job-fit, job relevance, performance expectancy, social influence, and usefulness. These individual cognitions
depend on individual differences such as age, education, gender, organisational level, technology experience, training, voluntariness of use, and work experience, leading to post-adoptive intentions, which determine determines post-adoptive behaviour.

Jasperson et al. (2005) model of ICT post-adoptive behaviour contributes to one’s understanding regarding individual user behaviour in the ICT post-adoption stage. Their study also draws attention to the notion of changes which occur during ICT use. These changes are a result of users’ evolution in using ICT whilst they are learning about ICT, and various changes, that is, ‘interventions’ that take place. Users, peers, IT experts and/or managers are stakeholders who influence ICT use, by influencing users’ ICT knowledge via ICT training and by modifying ICT applications. It can be argued that users’ ICT knowledge influences their level of competence and the way in which they use ICT.

Users learn to use ICT through their interaction with ICT. In this study, the interaction between users and ICT is regarded as being a dynamic and complex one, resulting in different levels of ICT use. Furthermore, the complexity of learning explains how knowledge about ICT use is (re)discovered (Attewell, 2001). Users learn to use ICT in a new and often different ways (Dodgson, 1993). It is the users’ ICT knowledge that enables them to: “apply unused features, to apply already-used features at higher levels of use, to discover new uses of existing features, or to identify the need to incorporate new features into the IT application” (Jasperson et al., 2005, p. 536).

That is, users’ ICT knowledge determines their post-adoptive ICT behaviour, as well as the ICT value, by creating both intended and unintended ICT outcomes. Users frequently begin using ICT in unexpected ways, which suit their needs and create unintended ICT consequences (Kumar et al., 1998). Thus, users create unpredictability regarding the ICT use process. Users’ feedback and comments on different areas of ICT use that could be improved actually influence the manner in which ICT is adapted to an organisation (Weiss & Birnbaum, 1989).
Users’ ICT knowledge is greatly influenced by organisational managers. Managers have the power to influence ICT use by providing resources, designing ICT objectives, or by their involvement in ICT use (Jasperson et al., 2005; Ungan, 2005; Thong, Yap & Raman, 1996). Van Akkeren and Harker (2004) emphasised manager’s characteristics such as perceived benefits, computer literacy, assertiveness, perceived control, subjective norm, mistrust of the IT industry and time. Poon and Swatman (1999) have found that a manager’s innovativeness and ICT knowledge have a positive effect on ICT adoption. Those researchers have taken into account a manager’s education, age, experience, and psychological traits.

Management practices, according to Brynjolfsson, and Hitt (1995), account for over 50% of the variance in firm performance. Therefore, management practices should be taken into account in order to gain an understanding as to how IT creates value for a company. Bassellier, Benbasat and Reich (2003) have emphasised the importance of IT competent business managers regarding IT success for companies. Bassellier et al. found that business managers’ levels of IT knowledge, and IT experience, influence their intentions to champion IT use. Such intentions, in turn, not only lead to the creation of strong relationships with IT people, but they also enable managers to support and promote IT in their organisations.

Dos Santos and Sussman (2000) noted that there is rarely any person in an organisation who possesses both IT knowledge and organisational knowledge. Such a person would make the best decisions regarding IT value. Thus, Bassellier, Benbasat and Reich (2003) have emphasised that: “shared knowledge between business managers and IT professionals is an important enabler of the alignment of business and IT objectives” (p. 318). In other words, IT contributes to business value when there is an integration of the business with IT strategic planning.

Thong, Yap and Raman (1996) have explained that IT experts provide IT support, and enable organisational learning, resulting in a lower knowledge barrier for potential IT adopters. That makes IT adoption easier. They
compared the effects of top management support, and external IS expertise, in relation to small business IS implementation. They have found that vendor support, which is a form of external IS expertise, is more closely related to user satisfaction, organisational impact, and overall IS effectiveness than top management support or even consultant effectiveness are. Thong et al. findings suggest that top management support is not the most important factor regarding small business IS implementation. Lack of top management support may be compensated for by high external IS expertise (Thong et al., 1996).

By simply focusing on the individual level of analysis (users), both the organisational and environmental contexts are omitted from the conceptualisation of ICT use. As has already been established in the first section, an ICT system is interdependent on the organisational context. Lamb and Kling (2003, p. 1) argue that “…by focusing on individualism, it provides relatively little detail about the contexts that shape ICT use, and so diminishes the importance of organisational structures and complex social environments”. They have indicated that the existing literature, by focusing on the individual level of analysis, has produced limited success regarding ICT.

By adopting a systems approach perspective, it is recognised in this study that ICT use is shaped by ICT itself, its users and the organisational context. So in the next section there will be some analysis as to how an organisational context influences ICT use.

3.4.3 Organisational context influencing ICT use

ICT user behaviour was described by Jasperson et al. (2005) as being influenced by various organisational and environmental factors. For example, users change their view of ICT, and the way in which they make use of ICT, because they use ICT: “within a complex set of organisational actions...where social structures direct organisational members both in their work-related behaviours and in their interactions with each other” (Jasperson et al., 2005, p. 535).
ICT, as part of the organisational practice and structure, shapes an alternative view of the ICT user as being a social actor- a term coined by Lamb and Kling (2003). In their qualitative study of online information services in 26 companies from three industries, Lamb and Kling (2003) have provided a comprehensive view of the ICT user as being a social actor, regarding how, when, who and why such a person utilises ICT. They emphasised that ICT is used to facilitate the communication and interaction with organisation members and their environments. For example, users use ICT in order to exchange information and to interact with clients. Client demands exert a major influence on data gathering practices and the ways in which people use ICT (Lamb & King, 2003). As such interactions evolve, so too does ICT use.

They argue that: “ICT in use are an extension of (organisational) practice and also part of (organisational) structure- having dual effects and creating unintended outcomes” (Lamb & Kling, 2003, p. 201). Thus, Lamb and Kling (2003) have strongly emphasised that an organisational context has to be taken into account into account when conceptualising ICT use. Unfortunately, they did not identify which factors, regarding organisational and environmental contexts, influence ICT use. However, they have explained that these factors interact with ICT users, and influence ICT use.

Organisational contexts are usually included in many empirical studies. Factors, including organisational culture and strategies, among other elements, play important roles in ICT adoption. Furthermore, Grant (1991) has stated that factors such as know-how, organisational culture, organisational reputation, and environmental orientation are key drivers of superior performance.

Raymond (1990) considered a number of factors from the organisational context regarding IS success, namely organisational size, maturity, resources, time frame (i.e. strategic decision cycle), and IS sophistication and related them to the IS success. Raymond found that in larger companies, users spend more time on-line. In more mature organisations, technology is used offline. Financial resources, according to Raymond (1990) have no
significant relationship to IS success. He has concluded that planning orientation and organisational culture affect the way in which managers use IT. Furthermore, organisational size, resources and organisational maturity are significantly correlated to IS sophistication. By contrast, companies with a longer time frame have not been found to have a more sophisticated IS (Raymond, 1990).

Julien and Raymond (1994) have found that the most important factors influencing ICT adoption are the company’s managerial hierarchy (decentralisation), followed by the firm's being in a less information-intensive sector (clothing or food). Further, a company’s status, management committee presence, and structural complexity have been found to be factors which influence ICT adoption. The retailer's strategic orientation and time-frame are the last factors to enter into the analysis. Julien and Raymond (1994) have concluded that companies which are decentralised, strategically proactive and future oriented adopt IT more easily than the companies which are independent, centralised and strategically reactive.

Corso et al. (2001) investigated ICT adoption and use in 47 case studies, that is, SMEs in Italy. They have established that complexity, at both product and system levels, emerges as a key factor in driving companies’ choices on IT adoption. Based on this, Corso et al. have analysed different approaches regarding ICT adoption. For example, they have established that companies producing simpler items have not adopted interface technologies; but they have adopted all informatisation tools. Increases in the product complexity act as a limiting factor regarding ICT adoption. Companies which have a higher system complexity adopt a range of ICT applications. However, they might not use all of them. An increase in a system’s complexity determines the necessity of technological coordination between SMEs and their customers and leads to ICT adoption.

Anumba, Dainty, Ison, and Sergeant (2006) have explored the interplay of structural, social and technical factors, by using a case study and semi-structured interviewes, regarding the implementation of a geographic
information system (GIS). Because of the embeddedness of ICT in a social and organisational context, the outcome of an implementation process is not just change of technology, but also change in tasks, structures and, in some cases, personnel. Therefore, the ICT implementation process should not be looked at in isolation, but must incorporate aspects such as appropriate communication, culture, effective leadership, championship and environmental/organisational conditions for it to be a success.

Anumba et al. (2006) have explained that the most significant impediments to ICT implementation usually relate to the people using them rather than to the technology itself (e.g. poor user-interface design, mismatch between system functionality and end-user expectations, and poor planning). Furthermore, they have emphasised the importance of organisational culture for the success of ICT. Anuba et al. warn that ICT has to be in line with the core values and culture of an organisation. According to Brown (1995), change can occur at three different levels:

- at the employee's cognitions (i.e. his or her beliefs and values) with no complementary change in his or her behaviour
- at the behavioural level, but not necessarily in connection with a cognitive level.
- at both the behavioural and cognitive levels.

Thus, the culture of the organisation has an important role to play, in determining the extent to which ICT is accepted and effectively utilised by the end users. It is important to recognise, therefore, that technology and culture are intertwined, as technology affects and is affected by, the prevailing cultural environment (Davies et al., 2003).

A strong organisational culture facilitates goal alignment, because all of the employees share the same basic assumptions and so are able to agree on what goals to pursue and how to pursue them (Anumba et al., 2006). In addition, a strong organisational culture should be complemented with flexible implementation approaches which are able to cope with an organisation's external environment and changing requirements (Anumba et al., 2006).
Organisational culture greatly influences learning processes, which is emphasised in the organisational learning literature (Moynihan, 2005; Slater & Narver, 1995). Organisational culture is “the deeply rooted set of values and beliefs that provide norms for behaviour in the organisation”, according to Slater and Narver (1995, p. 67). Learning can influence organisational culture and behaviour in three ways, namely by the direct application of knowledge to solve a problem; by the changed perspective on problems; and by affective use, which increases satisfaction with a change that has already been made (Slater & Narver, 1995). Because of the dynamic interactions between learning and organisational culture, “dynamic complexity of learning” (Jorg, 2005, p. 1) emerges through human interaction. That is, learners are “social beings who construct their understanding and learn from social interaction within specific socio-cultural and material settings” (Easterby-Smith, Crossan & Nicolini, 2000, p. 787).

ICT users learn to use ICT through formal and informal IT training and education. IT training is “the extent to which formal training was provided for end users”; including both formal training provided by vendors, as well as in-house training provided by organisations (Sharma & Yetton, 2007, p. 226). The purpose of IT training, according to Sharma and Yetton (2007) is to deliver:

- application knowledge regarding commands and tools embedded in ICT applications
- business context knowledge, that is, using ICT applications to effectively perform business tasks; and
- collaborative task knowledge which explains how others use the application in their tasks

Sharma and Yetton (2007) explain that next to IT training, users acquire IT knowledge from their situated learning, as well as learning-by-doing, and learning-by-using (Attewell, 1992). The need for formal IT training arises when ICT is technically complex, and highly task interdependent because of the misfit between the routines which are embedded in the existing inter-individual cognitions and those which are required for effective performance with new technologies. In other words, end users are more
likely to reject innovations that are technically complex, require that users
possess advanced skills, generate inconsistent outcomes or need support
from an IT expert (Sharma & Yetton, 2007). When end users face limited
knowledge barriers they can acquire IT knowledge through informal
mechanisms (e.g. self-learning, learning by doing, and from peers) instead
of through formal training.

Users’ ICT knowledge and skills are relevant for affecting company
performance.

Forth and Mason (2004) examine the relationships between skill constraints,
the adoption and utilisation of ICT and a firm-level financial performance.
They find that the availability of ICT skills has a significantly positive effect
on both ICT adoption and utilisation. In addition, the performance of
companies making more intensive use of computers is negatively affected
by ICT skill gaps. In other words, a lack of skilled ICT users restricts
companies in terms of both, ICT adoption and the intensity of its use. Thus,
Forth and Mason (2004) find strong evidence that skill constraints have
negative indirect effects on firm-level performance.

Organisations provide IT training for their employees, whilst they
themselves go through the process of organisational learning. Through the
learning process of ICT use, organisations change the way in which they
perceive and value ICT, ICT strategies, and their goals and actions. Such
organisations develop new knowledge, as well as ICT value, in the ICT use
stage via the learning process. For example, some organisations will
intentionally direct organisational learning at improving effectiveness and
performance. By contrast, for some other companies this process is
unintentional. Learning is a dynamic concept, and its use provides an
explanation for the continually changing nature of organisations.

Organisational ability to learn is critical regarding the success of ICT
(Woiceshyn, 2000). Organisational learning can be described as the way in
which organisation builds and organises knowledge and routines within its
culture, as well as adapting to, and developing organisational efficiency, by
improving the use of the broad number of skills of its workforce (Dodgson, 1993, p. 377). According to the organisational learning literature, such learning is dependent on company knowledge, previous experience, a company’s knowledge of its employees, and organisational culture (Slater & Narver, 1995). Knowledge can be acquired through direct experience, analysis of feedback, members’ interactions and participation (Huber, 1991). The process of learning, as a dynamic phenomenon, is stimulated both by environmental changes and internal factors in a complex and iterative manner (Dodgson, 1993). Every company responds differently to external and internal factors and changes. Therefore, every company learns and uses ICT differently.

Companies differ, with regard to the type of organisational learning they apply in relation to ICT (Senge, 1990; Argyris, 1977). The first type of learning is described by means of Argyris’ (1977) single-loop learning concept, whereby individuals/organisations adjust their behaviour relative to their fixed goals, norms and assumptions. Organisations that use adaptive learning are simply reacting to the events in their environment (reactive) or observing the patterns of behaviour (e.g. trend analysis) and then responding to that behaviour (responsive). That is, the single-loop learning is about coping, responding and adapting more effectively to environmental changes. When problems appear, an organisation reacts by changing some aspects of undesirable current reality. When those problems become less pressing, that organisation brings that change process to a halt.

Organisations more frequently use an adaptive learning model for ICT adoption and use, simply because goals are often vague and shift over time. Thus, new courses of action emerge during the developmental process. None the less, outcomes from the actions taken are difficult to assess (Van de Ven & Polley, 1992). In order to consider certain interactions, Van de Ven and Polley (1992) have developed an adaptive learning model (Figure 3.8) by examining connections between goals, actions and outcomes of an innovation team.
Figure 3.8: Adaptive Model of Trial-and-Error learning

The internal loop between actions and outcomes in this model provides a behavioural illustration of trial-and-error learning. The top outer loop reflects the possibility that actions may create new goals, or that performance criteria may shift so as to justify action. The bottom outer loop incorporates the key element of organisational learning, in which top management may intervene in the assessment process and thereby modify the course of action being taken by the entrepreneurial unit. Finally, environmental events may occur independently of the learning loops, and these contextual events may affect outcome assessments, shifts in outcome criteria, or trigger intervention by resource controllers.

The second type of learning, double-loop or generative learning, is more relevant for complex issues that are important for the survival of the organisation, rather than short-term efficiency. It questions, and leads to changes of organisational values, assumptions and strategies in an organisation (Moynihan, 2005). It requires an ability to challenge assumptions, seeking to reframe questions and remain open to all sorts of contextual changes (Lewis & Moultrie, 2005). This type of learning requires systems thinking and identification and understanding of the underlying causes of problems through interrelationships (Slater & Naver, 1995). The gap between the current reality and a vision of a desired future, produces creative tension, and motivates organisational members for the change process.
ICT is often not used as originally intended. Since complex technologies are so multi-faceted, with interactions occurring between subsystems, it is impossible for a designer to know in advance precisely well how ICT will perform when used (Attewell, 1992). Therefore, the operation of these technologies is learned through experience and often is not completely consistent with the specifications of the designer. That is, organisations learn through using. This learning process might influence realisation of an ICT value.

### 3.4.4 Environmental context

Furthermore, the way in which each organisation uses ICT will depend on the industry standards and legitimate practices of communication and exchange of information (Lamb & Kling, 2003). The external environment would almost certainly play a significant role regarding the adoption of new technologies. However, it has not been included in many IT empirical studies. Thong and Jap (1996) find that competition insignificantly influences IT adoption in small businesses, while Premkumar and Roberts (1999) find that competitive pressure is the only factor influencing IT adoption. However, they find external support to be insignificant.

Lee (2004) has discussed the antecedent drivers regarding the adoption of Internet technologies in small businesses. Competitive pressure as a determining factor was rejected in all four models. A possible reason for this, according to Lee, is that small companies are concerned with other aspects of technology rather than its contribution to their competitive power.

Hong Cheong (2005) has examined the effect of five factors on the adoption of electronic commerce among small and medium enterprises in Brunei Darussalam. He found that these factors explain more than fifty percent of the variation with regard to adoption in small and medium enterprises. He found that competitive pressure was the most important factor influencing IT adoption, followed by the owner’s IT knowledge, relative advantage, security and government support. This study has emphasised the importance of taking into account the company’s external environment in studying ICT adoption.
Tam (1998) has found that a national IT policy, defined as the government’s effort to better facilitate the diffusion and IT applications for economic growth, has no significant impact on firm performance. Such IT policy may have an indirect influence on company performance, such as the creation of a nationwide telecommunications network; enhancing computer awareness; facilitating technology transfer; providing R&D training; and expanding and improving the quality of IT education (Tam, 1998, p. 96). Tam has warned that the positive influence from any such IT policy may be undermined by tight regulations in key industries such as telecommunications and banking, outdated legal and copyright measures, and import restrictions.

Another study, which has regarded the environmental pressure as being the main factor influencing IT adoption, has been done by Iacovou, Benbasat and Dexter (1995). The focus of that study has been on identifying factors which influence the adoption and impact of Electronic Data Interchange (EDI) for small businesses. Iacovou et al. have identified critical factors in relation to adopting and integrating EDI for small businesses, namely organisational readiness, external pressures to adopt, and perceived benefits.

Due to the nature of the technology (EDI) in question, it was obvious that a major reason that small companies become EDI-capable is due to external pressure, especially from trading partners. Iacovou et al. (1995) have explained that organisations that are pressured into adopting EDI will reap limited benefits unless they are willing and capable of investing the resources necessary to integrate that system into their operations. Therefore, both high organisational readiness and an awareness of the benefits (which induce the allocation of the available resources) are required for integrated, high-impact EDI systems.

Piscitello and Sgobbi (2003) have analysed the behaviour of 277 SMEs, based on the structured questionnaire and an empirical in-field investigation. They have found that these companies differed in terms of their behaviour regarding ICT and e-business applications, depending on each company’s strategy when facing global competition. Pisticello and Sgobbi have focused
on the SMEs productive environment, namely the manufacturing and industrial section.

Their empirical research has shown that a correlation exists between the attitudes towards ICT and e-business, on the one hand, and global competition on the other.

The five behavioural patterns, which have been identified through cluster analysis, suggest that the adoption of ICT and e-business solutions does not proceed randomly, but rather that the adoption follows on from an attempt to balance perceived needs in terms of communication tools with clients and suppliers, and the financial and organisational capabilities of the firm.

3.5 Theoretical model

Findings in this literature review have been used in order to develop a theoretical model for this research project. This model, as is presented in Figure 3.9, is based on the argument that ICT value evolves through the stages of ICT diffusion. Intended ICT value is developed in the adoption stage, based on the organisation’s expectations of ICT effects. On the other hand, the realised ICT value emerges as a result of interactions between four groups of factors, namely technological, individual, organisational and environmental. These interactions take place in the use stage. Thus, the use stage of ICT diffusion is crucial for determining an actual ICT value.
As has been explained in this literature review, in the adoption stage of ICT diffusion, a company develops an expectation regarding ICT benefits. This is known as the intended ICT value. It is developed on the basis of ICT characteristics, organisational needs, and environmental influences. It has been pointed out that although companies invest in ICT, they often fail to take advantage of the full potential and opportunities from ICT investments. The reason for this is that they fail to see the need for investing in complimentary activities (e.g. training, supporting infrastructure, education of employees) which enable an easier and more successful realisation of ICT benefits.

On the other hand, a realised ICT value occurs in the use stage of ICT diffusion. It is created through the interaction of ICT, the company and users. On the basis of the reviewed literature, it has also been determined that levels and outcomes of ICT use determine the effects of ICT. ICT value is realised whilst ICT is achieving its function and its utilisation is aligned with a company’s strategies and goals. Realised ICT value has been conceptualised as being the sum of achieved informational, strategic, transactional and transformational ICT effects. This provides an integrated
dynamic performance measurement system which identifies areas for improvement that would help a company achieving its objectives.

The process of transforming intended ICT value into realised ICT value has been described as conversion effectiveness. It is influenced by technological, individual, organisational and environmental factors, which take place in the use stage of ICT diffusion. This means that identified factors influencing ICT use also influence the transformation of intended ICT value into realised ICT value. Those factors have been identified in this literature review. The main factors influencing the use stage are firstly, users’ characteristics, perspectives and tasks; secondly, organisational factors which describe the nature of the organisation and its environment; and thirdly, technological characteristics such as openness to adaptation, and user friendliness.

Thus, the focus of this study is on the use and effects stages of ICT diffusion. The use stage, together with an evaluation of its impact on company performance, has proven to be the most controversial aspect of the ICT literature. Moreover, considering an ICT value in adoption and implementation stages of ICT diffusion, and not during the use stage, results in a mismeasurement of the ICT value. For example, financial returns on ICT investments occur with a time lag, and there are no quantitative measures which incorporate a time lag factor.

A realised ICT value is the sum of informational, strategic, transactional and transformational ICT effects. Thus, the impact of ICT on company performance depends on interactions between factors influencing ICT use, which link business processes to company performance. Furthermore, the dynamics of interactions between factors influencing ICT use, and the importance of specific factors vary from one situation to the next (Legris & Collerette, 2006).

The theoretical model developed for this study clearly indicates that ICT value is created through interactions between factors influencing ICT use. Thus, these interactions are of crucial importance in explaining how ICT
impacts on company performance. Based on these underlying assumptions, the objective of this research project is to answer the question as to how interactions between factors influencing ICT use impact on a company’s performance. The answer to this question will provide firstly, a deeper understanding of ICT value creation process; secondly, identification of factors which inhibit and enable the achievement of each group of ICT effects; and thirdly, hopefully a tool to improve company performance.

3.6 Conclusion

The purpose of this literature review has been to analyse the ICT value creation process. Through this discussion, the controversy regarding evaluating ICT investment has been revealed. Due to application of traditional economic tools, many researchers and managers focus only on the tangible return on ICT investment, while ignoring intangible ICT benefits. Intangible investments are unaccounted for on a company balance sheet, and therefore, are omitted in conventional calculations of productivity. In addition, the main focus of this stream of literature has been on the adoption and implementation stages of ICT diffusion.

There are a number of studies that have tried to establish whether or not ICT has an impact on company performance. Indeed, establishing whether or not ICT has a positive, or a negative, or perhaps even no impact on company performance is regarded as being a ‘Holy Grail’. Many researchers have attempted to find it, but an answer to that question still remains elusive, and commonly slips from researchers’ hands. Apart from different conceptualisations of ICT and the performance of a company, the literature on ICT value differs in terms of the research methods used. As a result, the complex and unpredictable ICT value creation process is mismeasured. On the basis of the limitations of the methods outlined, a clear need for a different method of evaluating ICT value has emerged. This will be described in more detail in Chapter 4 and Chapter 5, in which research methodology and research design will be discussed.
In sum, the literature has not fully explored the effect of actual ICT usage on organisational performance (Devaraj & Kohli, 2003). The identified limitations in the ICT value literature are:

- lack of empirical evidence to gauge ICT usage and its impact on firm performance, partly because of the difficulty in developing measures and collecting data (Zhu & Kraemer, 2005)
- lack of theory to guide empirical research (Burton-Jones & Straub, 2006; Zhu & Kraemer, 2005); and as well there is a need for a theoretically rigorous and empirically relevant framework for examining the use and value of ICT in organisations
- the majority of previous studies have tended to examine ICT application use immediately after adoption and do not account for users’ history in using ICT (Jasperson et al, 2005; Zhu & Kraemer, 2005)
- significant differences among studies in terms of the level of analysis, methodologies employed, variables, and contexts examined (Devaraj & Kohli, 2003)
- lack of conceptualisation of ICT use (Burton-Jones & Straub, 2006; Weill, 1992)

It has been suggested in this chapter that ICT value is created in the use stage of ICT diffusion, whereby the interaction between ICT, users and an organisational context determines the ICT impact on a company’s performance. The main outcomes of the literature have been as follows:

- the ICT life cycle within a company is a process of ICT diffusion, with a number of stages, namely adoption, implementation, use, and ICT effects
- the conceptualisation of ICT value is the sum of achieved informational, strategic, transactional and transformational ICT effects
- the ICT value creation process has been explained
- factors influencing ICT use have been identified and grouped into technological, individual, organisational and environmental contexts
By contrast to the reviewed literature, this research project is qualitative in nature. This will be further developed in Chapter 4, where an adopted post-positivist paradigm of inquiry will be discussed. Based on that, appropriate research methods have been chosen and will be discussed in more detail. In Chapter 5, data collection and data analysis strategies will be outlined, whereby the research design for this study will have been created.
4.1 Introduction

The objective of this research is to explain how interactions between factors which influence an ICT system in the use stage of ICT diffusion impact on the performance of a company. Based on that research objective, this research project is explorative and descriptive in nature. In order to achieve those objectives, the identification of appropriate research methods is of vital importance. The research methods guide the choice of data collection and data analysis strategies. Thus, the purpose of this chapter is to identify the most appropriate research methods for this research project. This choice is based on the philosophical assumptions which guide this research project.

Philosophical assumptions provide a rationale that supports the validity of the chosen research methods. In addition, they lead to identifying general procedures of research called strategies of inquiry. Identification of philosophical assumptions, paradigm of inquiry and research methods, appropriate for this research project will determine detailed procedures of data collection and analysis strategies (Creswell, 2003). Such a specific plan for collecting and analysing data with a purpose of achieving a research objective is known as the research design (Yin, 1994). This is discussed in more detail in Chapter 5.

The particular methodology developed for the purpose of this study is based on the critical realist ontology, modified objectivist epistemology and analytic induction methodology. Such combination of the philosophical assumptions direct to the application of the post positivist paradigm of inquiry. A research method commonly used by post positivists is the case study research method. This particular research method is applied in this study, together with systems theory research method. The strength of the latter research method, and the reason for its application, is that it is specifically used for a purpose to analyse interactions in a system. More specifically, analysis of the interactions between the factors influencing ICT use is the objective of this study. The choice of the appropriate research methods is further justified and discussed in this chapter. The identified research methods will guide this research during the in-field stage,
collecting the right data and analysing these data using the appropriate research strategies. This is illustrated in Figure 4.1.

**Figure 4.1: Methodology**

The philosophical assumptions and research methods, identified in figure above, will be further discussed in this chapter. That is, the outline of this chapter will follow the structure of Figure 4.1. After identifying the philosophical assumptions, and paradigms of inquiry, the research methods will be discussed in more detail.

### 4.2 Philosophical assumptions and paradigms of inquiry

Philosophical assumptions define and constrain each research project regarding the beliefs about the reality, knowledge and methods for investigating the reality (Creswell, 1998). They are also the foundation for establishing the appropriate paradigm of inquiry, thus, defining a relationship between the philosophy and the social sciences (Guba & Lincoln, 1994). Philosophical assumptions are identified in the following table.
Table 4.1: Beliefs underlying the conduct of research

<table>
<thead>
<tr>
<th>Beliefs about</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ontology</strong></td>
<td>Whether social and physical worlds are objective and exist interdependently of humans, or, are subjective and exist only through human action</td>
</tr>
<tr>
<td><strong>Epistemology</strong></td>
<td>Criteria for constructing and evaluating knowledge</td>
</tr>
<tr>
<td><strong>Methodology</strong></td>
<td>The research methods that are appropriate for generating valid evidence</td>
</tr>
</tbody>
</table>

Source: Orlikowski and Baroudi (1991, p. 8)

Each of the philosophical assumptions is further discussed and identified in relation to this research. This will guide the choice of the appropriate paradigm of inquiry which will be discussed later.

4.2.1 Ontological assumption

The ontological assumption deals with the nature of reality. It refers to the form and nature of reality and, therefore, what is there that can be known (Baert, 2005). In paradigms of inquiry there are two basic types of reality. Reality is assumed to be objective and therefore, independent of humans, or alternatively, subjective and having existence only through the action of humans in creating and recreating it (Orlikowski & Baroudi, 1991).

Through the philosophy it has been argued that reality is material (materialists), mental (idealists), a combination of the two (dualism) or agnostic (Benton & Craib, 2001).

As explained earlier, the focus of this research is on both, the subjective reality created by ICT users (e.g. users’ attitudes toward ICT use, organisational culture), and objective in terms of the ICT characteristics which enable ICT to be used in certain ways (e.g. ICT openness for adjustments, ICT integration with the company’s processes). Based on such focus, it can be noted that the reality in this research project is considered objective and constructed. This is in line with the systems theory which recognises real systems that exist independently of an observer and are perceived by the observer; and conceptual systems (e.g. mathematics) which are symbolic constructs. This explains the dual nature of reality: it is both objective and constructed. Critical realists adopt such interpretation of
reality. In other words, the ontological assumption adopted in this research stems from the critical realism.

The critical realism is discussed here as a means of introducing the critical realist ontology. According to Bates (2006), critical realists differentiate between the context or structure within which actors operate and the agents that inhabit them. The structure generates events which can be identified by social sciences. Additionally, they place actors and their behaviour in the centre of theory. Actors and the structure are linked, and this relationship is the concern of the critical realism. This allows the adoption of an explanatory focus on the ‘complex interaction between structure and agency’ (Reed, 2005).

Therefore, critical realists consider the reality independent of our knowledge and construction of it. The world exists, but our knowledge of it is fallible, according to the critical realists (Welsh & Dehler, 2007). Since they are not identical, the role of science is to explain the structures which contributed to the production of identified phenomenon (Lawson, 1997).

According to Baert (2005) critical realists incorporate social theory and its affinity for holistic reasoning. They recognise three levels of reality (Baert, 2005; Lawson, 1997):

1. the domain of the actual: events that take place,
2. the domain of the empirical: people’s experiences obtained by observations, and
3. the domain of the real: structure, powers and mechanisms which produce the phenomena in question

For example, Vincent (2008) argued for the application of critical realist ontology as a meta-theory for researching inter-organisational relations. More specifically, it provides a perspective of agents, social processes and outcomes, which enables exploration of how particular antecedents associate with specific outcomes as they are transmuted through the collective capacities of social agents (Vincent, 2008). He used the extensive case study on IT outsourcing agreement to show the benefits of using
critical realist ontology over the existing theories on inter-organisational relations. In summary, his research project is an example of how critical realist ontology can be used to investigate the role of agents and their behaviours within the inter-organisational relations and networks.

In addition, application of critical realist ontology enables investigating the phenomenon of interest in a broader context and to focus upon processes of emergence and change (Welsh & Dehler, 2007).

In the ICT area it is recognised that there is a reciprocal relationship between ICT research and social reality. According to Orlikowski and Baroudi (1991), objectivity and value-neutrality in this area may be misleading. Therefore, neglecting the social contexts of IT may reveal an incomplete picture of IT phenomena (Orlikowski & Baroudi, 1991). Following this thought, it is recognised in this research, that the social aspects of ICT use and ICT itself are interconnected, and through their interaction ICT impact on organisational performance is created.

4.2.2 Epistemological assumption

The epistemological assumption or ‘theory of knowledge’ refers to the nature of the relationship between the knower and what can be known about observed reality (Ponterotto, 2005). Epistemology, that is, knowledge about the reality is obtained through an interaction between the knower and the known. That is, investigators’ “perception is not a reflection of real things and knowledge is not a simple approximation of the truth or reality” (Bertalanffy, 1972, p. 423).

Modified objectivist epistemology acknowledges that the researcher may have some influence on what is being researched, but objectivity and researcher subject independence remain important guidelines for the research process (Ponterotto, 2005). Additionally, objective knowledge is possible, although it may be constricted by the situation of the knower. This is particularly in line with complexity theorists who call it a “new conception of objectivity” which is “subject to intrinsic constraints that
identify us as part of the physical world we are describing” (Morcol, 2001, p. 114).

### 4.2.3 Methodological assumption

The methodological assumption refers to the process of research which answers the question: how does one get to know reality? It refers to “how the inquirer goes about finding out what he or she can know about reality” (Guba & Lincoln, 1994, p. 108). Consequently, understanding of reality leads the decision on the most appropriate research method for this study project.

As noted earlier, research methods chosen for this research have to incorporate both the social and technological aspects of reality. Analytic induction takes into account actor’s perspective to define the phenomenon and to make the analysis valid when applied to an increasingly diverse range of cases (Smelser & Baltes, 2001). In relation to this study, that means that an ICT system will be explained based on the users’ views, experiences and insights. Furthermore, analytic induction methodology involves generating, as well as testing theory in a provisional manner. For example, analytical induction in this research will be used in a way to compare the factors influencing ICT use identified in each case study, as well as identify which factors influence company’s performance. That strategy is known as the cross-case analysis (Yin, 2003).

Additionally, analytic induction allows for new concepts and relationships to emerge during the research process, with the goal of representing the reality most accurately (Ratcliff, 1997). According to Smelser and Baltes (2001) multiple forms of evidence are preferred for this strategy, which is exclusively qualitative. Analytic induction seeks new varieties of data in order to force revisions that will make the analysis valid when applied to an increasingly diverse range of cases. The emphasis in the process is upon the whole, even though elements are analysed as relationships between elements (Ratcliff, 1997). Qualitative inquiry particularly uses inductive logic that begins with specific observations and builds toward general patterns (Patton, 2002).
Analytic induction is in line with methodologies such as case studies or convergent interviews (Perry, Riege & Brown, 1999). These methods are process oriented and do not investigate cause and effect relations but rather are concerned with underlying ‘causal tendencies’ or powers. The data analysis is usually summarised in interpretative and ‘value laden’ ways. In short, a qualitative research methodology is appropriate methodology for this research. Specifically, this study is asking ‘how’ questions which are typically used in qualitative research studies (Creswell, 1998; Yin, 1994): how factors influencing ICT use impact a company’s performance.

Discussion on the specific ontological, epistemological and methodological assumptions in the present research project is of vital importance in guiding the choice of the appropriate paradigm of inquiry, and consequently the choice of the research methods. More specifically, each paradigm of inquiry suits certain research question and philosophical assumptions. Based on this argument, I have found that the post-positivist paradigm of inquiry is most applicable to the specific philosophical assumptions of this study, which have been discussed earlier. This point is further elaborated in the section below. In addition, the post-positivist paradigm of inquiry is discussed in the following section, followed by identification of the most appropriate research methods for this study.

4.2.4 Post-positivist paradigm of inquiry

There are a number of taxonomies describing the research paradigms, which are also known as paradigms of inquiry. Research paradigms proposed by Guba and Lincoln (1994; 1998) are outlined as widely known and accepted paradigms of inquiry: positivist, postpositivist, critical and constructivist. Therefore, they are used for the purpose of the following discussion. More specifically, postpositivist paradigm of inquiry will be discussed as underpinning the current research project. Positivist paradigm of inquiry will also be discussed, together with its limitations, as commonly used research paradigm in the IT literature.

In contrast, the critical paradigm of inquiry is not represented at all in the IT field while the constructivist (interpretative) paradigm of inquiry represents
only 3.2% of the total number of articles which Orlikowski and Baroudi (1991, p. 6)\(^1\) reviewed. Consequently, these paradigms of inquiry are not relevant for this study, and for this reason they are not discussed here.

The postpositivist paradigm is actually known as the stream in research that in the last few decades invested numerous efforts to respond to the criticism of positivism (Guba & Lincoln, 1994; 1998). Postpositivists increasingly use qualitative techniques to readdress some of the problems in positivism. For example, the post-positivist researcher becomes a tool for describing the research phenomena and for building the theory (Dey, 1993).

Postpositivist ontological assumption is that reality exists but is only imperfectly apprehensible, and findings are consequently, assumed to be probably true (Denzin & Lincoln, 1998). Therefore, postpositivist claims about reality are subjected to the widest possible critical examination. Further, its purpose is gaining the holistic view of the phenomena in order to determine an accurate description of reality (Perry et al, 1999). According to Morcol (2001, p. 105), the knowledge is understood as “contextual, presupposed, constricted, and/or constructed”. In other words, postpositivism assumes a critical realist ontology, and modified objectivist epistemology, defined in the earlier sections as the philosophical foundation of this research project (Guba & Lincoln, 1994).

Furthermore, according to Perry, Riege and Brown (1999), the postpositivist paradigm is appropriate for the research where the objective is to understand complex interactions, processes and individual’s perspectives. Since this is the case with this research project, the postpositivist paradigm is adopted.

Furthermore, the postpositivist paradigm of inquiry corresponds to complexity theory which is used in this study to consider ICT use as a complex system. Complexity theory is realist in its ontological assumption.

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\(^1\) Orlikowski and Baroudi (1991) surveyed six journals (MIS Quarterly; Information Systems Research; Communications of the ACM; Information Systems Journal; European Journal of IS; and Accounting, Management and IT ) between 1993 and 1998 to record empirical research, the particular methods used; and the occurrence of multiple methods.
This means that it adopts both deterministic and indeterministic picture of reality, and recognises the contextual nature of knowledge (see Table 4.2).

Table 4.2: Complexity perspective and philosophical assumptions

<table>
<thead>
<tr>
<th>Complexity perspective</th>
<th>Realist ontology</th>
<th>Post-positivist epistemology</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-existence of determinism and indeterminism</td>
<td>Subject-object distinction: problematic</td>
<td>Holistic methods (simulations)</td>
<td></td>
</tr>
<tr>
<td>Nonlinear relations</td>
<td>Contextual nature of knowledge</td>
<td>Some use of analytical and deductive methods</td>
<td></td>
</tr>
<tr>
<td>Limited predictability</td>
<td>Limited generalisations, or laws of complexity</td>
<td>Qualitative and quantitative methods</td>
<td></td>
</tr>
<tr>
<td>Reality as an emergent whole</td>
<td>Instrumentalism</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simple-complex: blurred</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase transitions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-organisations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co-evolution</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Morcol (2001, p. 106)

Complexity theorists describe emergent holistic and qualitative implications of systems, whose properties cannot be reduced to those of their parts using a postpositivist orientation (Morcol, 2001). These systems are integrated into and co-evolve with their environments. In the IT literature this paradigm of inquiry is known as ‘descriptive positivism’. It has been used in approximately 23.9% in IT articles which Orlikowski and Baroudi (1991) reviewed.

In relation to this research, a postpositivist paradigm takes into account multiple perceptions of participants in the research, together with their interactions and influence on company’s performance and technological aspects of ICT use. It recognises the values which are added to the results. Furthermore, the focus of the current research project is on an ICT value, which has been established as a complex social phenomenon, earlier in this thesis. Such complex phenomena are usually researched by applying the postpositivist paradigm, according to Perry et al. (1999). Therefore, a postpositivist paradigm of inquiry is considered the most appropriate for this study.
In the next section, the positivist paradigm of inquiry, which is widely used in the IT area, is shortly discussed. The purpose of that discussion is to further emphasise the position of the current research project in relation to other positivist research which were also evaluating the ICT impact on company performance. Furthermore, identification of the weaknesses of positivist paradigm will further strengthen the approach to ICT value adopted in this study.

4.2.5 Positivist paradigm of inquiry

The positivist paradigm of inquiry assumes there is an apprehensible physical and social reality driven by unchangeable natural laws and mechanisms (Guba & Lincoln, 1994; 1998). This paradigm assumes that the knowledge is only of significance if it is based on observations of the external reality (Easterby-Smith, Thorpe & Lowe, 1991), where reality is seen to exist independently of humans (Orlikowski & Baroudi, 1991).

Researchers of the positivist paradigm are interested only in linear relationships, and ignore the non-linear and dynamic nature of most relationships. That is, in positivism, variables are statistically manipulated or added together in some linear fashion to test hypotheses and draw inferences about the relationships among separate indicators, or the statistical significance of differences between measured levels of the variables for different groups. However, Chan (2000) argues that the productivity paradox cannot be solved by using the hard evidence, due to several reasons. Firstly, traditional accounting system is inadequate; secondly IT investments fuel the need for further investments, but they do not increase productivity outside the computer manufacturing industry; and thirdly, IT capital is spent with a purpose to increase the market share, and not to increase the market. This has been discussed in more detail in Chapter 3.

The primary critique of positivism by qualitative-naturalistic evaluators, according to Patton (2002), is that such an approach oversimplifies the complexities of real-world programs and participants’ experiences. That is, positivists focus on selected variables, while ignoring other variables that
might greatly alter findings (Guba & Lincoln, 1994). Consequently, they miss major factors of importance that are not easily quantified, and fail to portray a sense of the researched object and its impact as a whole (Patton, 2002).

ICT systems cannot be investigated without understanding the complexity within the systems, and without identifying and understanding individual actors within them, according to Tedre, Sutinen, Kähkönen, and Kommers (2006). In addition, ICT has to be studied in an organisational social context, in which it is embedded. Social context cannot be understood without reference to the meanings and purposes which users attach to their activities (Patton, 2002). Therefore, the positivist paradigm of inquiry is inappropriate for social science phenomena such as ICT systems, since it ignores the complexities of phenomenon and its relationships with the social context (Perry et al, 1999; Easterby-Smith, Thorpe & Lowe, 1991).

Therefore, there is a need for recognition of important contribution of qualitative studies, individual and group-level analyses and ‘soft’ IT value measures. This point has been summarise by Chan (2000) who stated that: “despite the call for hard measures of economic impact, the value of IT may not be fully understood without incorporating, at some point, qualitative, individual, and group-level measures” (pp. 228-229). The qualitative nature of the current research project is further discussed in the next section.

4.3 Qualitative research

The postpositivist paradigm of inquiry uses both qualitative and quantitative research methods. However, the nature of this research is mainly qualitative, which is a result of the research objective. More specifically, the purpose of the research project is to provide a deep understanding of an ICT system, to identify factors from four contexts which influence the ICT system and to establish interactions between these factors, based on the real-life setting. Thus, qualitative research methods would be the most appropriate for researching an ICT system, since they involve an “interpretative, naturalistic approach to its subject matter” (Denzin & Lincoln, 1994, p. 2). Qualitative research is an inquiry process of the social phenomenon in its natural setting.
based on the meaning people bring to them (Creswell, 1998; Denzin & Lincoln, 1994).

As such, qualitative research will provide a complex, holistic picture of the ICT utilisation in an organisation. It will facilitate description and nature of interactions between factors which influence an ICT system. In addition, a qualitative research will consider multiple dimensions of an ICT system, namely technological, individual, social, organisational, and environmental. Due to the qualitative nature of the current research project, multiple sources of evidence will be used (employees, managers, Board of Directors, IT employees) and an inductive research strategy will be employed. As a result, a holistic picture of how interactions in an ICT system influence organisational performance will hopefully, be gained.

Therefore, in this section, the characteristics of the qualitative research, which are outlined in Figure 4.3, are shortly discussed below.

**Figure 4.2: Characteristics of the qualitative research**

<table>
<thead>
<tr>
<th>Researcher is an instrument of data</th>
<th>Data is in form of words or pictures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcomes as process rather than product</td>
<td>Qualitative research</td>
</tr>
<tr>
<td>Complex, holistic picture</td>
<td>Interpretative, naturalistic approach</td>
</tr>
<tr>
<td>Multiple sources of information</td>
<td>Data is analysed inductively</td>
</tr>
<tr>
<td>Focus is on participants’ perspectives</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** Adapted from Creswell (1998, p. 16) and Merriam (1998, p. 5)

The product of qualitative research is comprehensive, holistic, expansive and richly descriptive findings (Merriam, 1998). This holistic approach assumes that ICT utilisation process is understood as a complex system that is “greater than the sum of its parts” (Patton, 2002, p. 59). However, the main strengths of a qualitative approach is its ability to look at changing
processes over time, to understand actors’ meanings, to adjust to new issues and theories as they emerge, and to contribute to the evolution of new theories (Avison, 1997).

Qualitative research implies the application of the qualitative research methods. In contrast to the quantitative research methods which facilitate a broad understanding of a phenomenon, application of qualitative methods in this study will illustrate multiple contexts of an ICT system; explain complex processes of interactions between factors influencing ICT use, and their impact on a company’s performance. The qualitative research methods will be used in the research project in order to identify and explore factors which influence an ICT system. As a result of identification and analysis of how these factors influence the performance of a company, topics which were inadequately investigated in the previous research, will be investigated in the current research project (Morrow, 2007a). Application of the qualitative research methods in this study will enable in-depth view of an ICT system. Furthermore, application of qualitative research methods will facilitate the theory-building process and bring new knowledge on ICT value creation (Creswell, 1998). The choice of qualitative research methods appropriate for this research project is made and justified in the following section.

4.3.1 Strategies of inquiry or qualitative research methods

Morrow (2007a) warns that it is important to think carefully about the best strategies of inquiry to accomplish the research objective. The strategies of inquiry determine the choice of specific approaches and methods for collecting and analysing empirical materials (Denzin & Lincoln, 1994). However, there is no consensus on how to classify the varieties of qualitative research (Patton, 2002). Therefore, a number of qualitative research methods, which have been outlined by Patton (2002) and Creswell (1998), are compared in regards to their focus and the research objective of the research project. This is presented in Table 4.3.
### Table 4.3: Dimensions for comparing research traditions in qualitative research

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Focus</th>
<th>Discipline Origin</th>
<th>Data collection</th>
<th>Data analysis</th>
<th>Narrative form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systems theory</td>
<td>Holistic view of a system as a whole and its behaviour; How and why does this system as a whole function as it does?</td>
<td>Inter-disciplinary</td>
<td>Multiple sources to establish different views of phenomena</td>
<td>Description</td>
<td>System, its dynamics and interaction of its parts</td>
</tr>
<tr>
<td>Case study</td>
<td>Developing an in-depth analysis of a single or multiple cases</td>
<td>Social sciences</td>
<td>Multiple sources-documents, archival records, interviews, observations, physical artefacts</td>
<td>Description, Themes, Assertions</td>
<td>In-depth study of a “case” or “cases”</td>
</tr>
<tr>
<td>Ethnography</td>
<td>Describing and interpreting a cultural group</td>
<td>Cultural anthropology Sociology</td>
<td>Artefacts during extended time in the field</td>
<td>Description, Analysis, Interpretation</td>
<td>Description of the cultural behaviour of a group or an individual</td>
</tr>
<tr>
<td>Grounded theory</td>
<td>Developing a theory grounded in data from the field</td>
<td>Sociology</td>
<td>Interviews with 20-30 individuals to “saturate”</td>
<td>Open coding; axial coding; selective coding; and conditional matrix</td>
<td>Theory of theoretical model</td>
</tr>
<tr>
<td>Phenomenology</td>
<td>Understanding the essence of experiences about a phenomenon</td>
<td>Philosophy Sociology Psychology</td>
<td>Long interviews with up to 10 people</td>
<td>Statements, Meanings, Meaning themes, General description of the experiences</td>
<td>Description of the “essence” of the experience</td>
</tr>
<tr>
<td>Biography</td>
<td>Exploring the life of an individual</td>
<td>Anthropology Literature History Psychology Sociology</td>
<td>Primarily interviews and documents</td>
<td>Stories, Epiphanies, Historical content</td>
<td>Detailed picture of an individual’s life</td>
</tr>
</tbody>
</table>

Source: Creswell (1998, p. 65) and Patton (2002, pp. 120; 132-133)
Based on the specific research objective of this study, the choice of the research methods appropriate for this study is further constrained. The focus of this study is answering the research question how the interaction between factors influencing ICT use impacts on a company’s performance. More specifically, the research methods appropriate for the current research project have to gather rich and descriptive data on an ICT system from several contexts; and facilitate identification and analysis of interaction between factors which influence an ICT system in the use stage of ICT diffusion.

Apart from the type of research question, Yin (2003) has listed two more conditions for choosing the appropriate research strategy. These conditions are the extent of control an investigator has over actual behavioural events and the degree of focus on contemporary as opposed to historical events. Obviously, the focus of this study is on the contemporary event, that is, an ICT system. In order to develop understanding of such system, it will be researched in an organisational real-life setting. In contrast to the quantitative studies, this study does not require to measure and control the variables (Edwards, 1998). These conditions eliminate the choice of ethnography, grounded theory, phenomenology and biography as appropriate research methods for the current research project.

More specifically, ethnography is a research method used in cultural anthropology and sociology with a purpose to investigate a cultural group, based on the collected artefacts. The application of this research method clearly could not lead to achieving the research objective of the study. Grounded theory, on the other hand, is used to develop a theory based on the collected data. Since the theory on ICT value has already been established in the literature, this would not be appropriate research method for the current study. Application of phenomenology and biography research methods focuses on experiences of ICT use, or life of an individual. This is not the focus of the current research project, and therefore, these research methods are not an option for this study.
The result of this process is the identification of the case study and systems approach as the most relevant research methods for the current study. The case study research can identify new issues or insights that might not have been contemplated by the researcher and previous theories (Carson et al, 2001). In addition, case study is embedded in real-life situations, and results in a rich and holistic explanation and description of a phenomenon (Merriam, 1998). Therefore, the popularity of case study research method is growing, and it is commonly used in IT research (Chen & Hirschheim, 2004; Yin, 1993; Orlikowski & Baroudi, 1991).

In addition, it is considered in this study, that an ICT system is characterised with interactions between factors from technological, individual, organisational and environmental contexts. The result of these interactions is realised ICT value. Thus, the application of systems theory is of particular importance for the current research project, in investigating the interactions between those factors and explaining their impact on a company’s performance.

The combination of systems theory and case study research methods is rarely seen in the literature. The only research found to combine these methodologies is the one by Anaf, Drummond and Sheppard (2007). They applied these methodologies in health research, in contrast to this research project. Nevertheless, their arguments for combining systems theory and case study research are applicable to this study. They argued that application of systems theory principles is ideally suited to exploring social and organisational systems. Exploring a system is, according to them, perfectly amenable to case study techniques such as interviews and focus groups. However, “the eventual analysis of the data will be guided by the overall relationship of parts within the system” (Anaf et al., 2007, p. 1313). Patton (2002) emphasise that systems theory research method is very helpful in making sense of qualitative data.

Combination of systems theory and case study research may advance the qualitative paradigm by exploring innovation within case study design. Furthermore, data collection strategies remain qualitative, analysis is
inductive, and the research process results in thick descriptions of the case under investigation (Anaf et al., 2007). This combination of methodologies also leads to findings tailored to the cases and systems under investigation.

### 4.3.2 Case study research method

Case study was defined by Yin (1994) as an “empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between the phenomenon and context are not clearly evident” (p. 13). In addition, case study research method provides rich and thick description that focuses on the contextual meaning of the phenomenon being studied (Merriam, 1998). It uses multiple sources of evidence to triangulate findings which are exploratory and descriptive in nature, rather than normative prescriptive (Creswell, 1998). As a result, case study provides different perspectives on the problem, process or event (Creswell, 1998) and illustrates the complexities of a situation (Merriam, 1998). It explains the reason for a problem, the background of a situation, what happened and why (Merriam, 1998).

One of the most defining characteristics of the case study is the ‘case’. Stake (1995, p. 16) further explained that the purpose of the case study is to understand the case, “to appreciate the uniqueness and complexity of its embedness and interaction with its contexts”. Following this, a case can be defined as the object of a study (Schwandt, 2001). The object of the current research project is an ICT system, which is characterised by interactions between the four contexts. These interactions create an ICT value, that is, the impact on company performance.

Dooley (2002) suggested that definition of a case attempts to convey a balanced, multidimensional representation of the context, participants and reality of the situation. This is true for the case in this study. By focusing on an ICT system, four different contexts will be considered, and different groups of stakeholders will be interviewed, namely employees, IT employees, manages and the Board of Directors (BoD). Thus, an application of the case study research method will result in a detailed contextual analysis of an ICT system and its relationships with the organisational
contexts (Dooley, 2002). Furthermore, the case study research is process oriented and is concerned with underlying ‘causal tendencies’, that is, factors influencing ICT use, and their combinations which influence organisational performance.

Case is also known as the bounded system (Merriam, 1998), which makes it subject to the principles of systems theory: interrelationships, interdependencies, and goals seeking behaviour (Anaf et al., 2007). More specifically, Anaf et al. (2007) explained that any open system would suit exploration through case study and systems theory principles since it allows relationships between inputs, outputs, and the environment. That is, a system is classified as a whole consisting of two or more parts, which interact with each other in striving toward achieving a common purpose. For example, an ICT system is part of the complex organisational system, with which it interacts constantly in achieving a company’s goals and answering to changes in the external environment. ICT system is also more that the sum of the stakeholders. This means that both the system and the case, in this research project, are applicable to exploring the research question.

The case in this study is an ICT system embedded in the organisational context. Thus, by describing the case, I will inadvertently describe the system because they are logically connected (Anaf et al., 2007). The inputs of an ICT system are factors influencing ICT use, while the outputs of an ICT system are ICT effects. The process thorough which inputs are being transformed into outputs occurs through the interactions between the factors influencing ICT use. This is illustrated in the figure below.

**Figure 4.3: Defining the case**
The depth of the analysis, according to Anaf et al. (2007), depends on the type of case study. For example, it can study a few cases in detail (Ragin, 2000), or focus on the complexity of a single case (Stake, 1995). This will depend on the purpose of the study of the case (Stake, 1995). The purpose of this study is to examine how different contexts interact with an ICT system, and impact a company’s performance. In order to provide findings that can be generalised, a multiple case study will be used (Yin, 2003). That is, I will investigate ICT systems in several companies with a purpose to develop better understanding characteristics of ICT systems as well as interactions between factors influencing ICT use. Following Dooley’s (2002) advice, each case study will be presented as a single case. In the cross-case analysis stage, factors influencing ICT use will be compared across cases, in order to identify those factors which influence company performance.

In order to choose the cases which are similar, and which could be comparable, it is important to define the criteria for choosing the case. Thus, the research will be conducted only in companies which:

- have implemented ICT application minimum one year prior to this research is being conducted

Using multiple case studies leads to the most important issue of case study research- generating knowledge (Stake, 1995). Yin (1994) stated the case study research method can be useful in understanding a case in relation to the research problem. More specifically, the findings from a case study can be linked to a theory, and support it or refine it. This is what a term ‘analytic generalisation’ points to. In this research, ICT use and ICT value are seen as a unique result of each organisation’s specifics. By observing a few organisations and their utilisation of ICT, this research will explain what makes ICT use successful.

Case study research method will facilitate rich descriptions of ICT systems, in terms of multiple contexts which interact with ICT systems. In other words, it will enable identifying factors influencing ICT use in a specific organisational setting. In other words, case study research emphasise the
study and the contextual analysis of a limited number of conditions and their relationships (Dooley, 2002).

In contrast to the quantitative multivariate methods, these factors will reflect the unique characteristics of each ICT system. Furthermore, the essence of applying systems theory involves a holistic exploration of interrelationships and interdependencies (Anaf et al., 2007). In relation to the research objective of this study, this means that the systems theory will enable exploring the interactions between the factors influencing ICT use. Additionally, systems theory will enable investigating the impact of these interactions on a company’s performance. Combining systems theory with case study research will enhance the understanding of ICT systems and creation of ICT value.

4.3.3 Systems theory research method

Systems theory is an interdisciplinary, inductive, exploratory, process-oriented, qualitative research method that takes place in the field, takes into account the perspective of those in the system, gives qualitative description of the system and is sensitive to the context (Patton, 2002). It was also identified by Gigch (1974, p. 11) as both a method of inquiry and a way of thinking, which emphasises the whole system instead of component systems, and strives to optimise the whole system’s effectiveness instead of improving the efficiency of a nearby system. Systems theory research method is based on the systems theory, and is commonly referred to as systems approach. It actually uses systems theory and applies it to complex, adaptive, self-regulating systems (Patton, 2002) like organisations and ICT system. A systems approach is, according to Skyttner (1996, p. 25), an application of general systems theory that “operates in an integrated framework of modern organisational knowledge and management science”.

The central themes of the systems approach are the interaction of parts within a system and the interaction of the system with its environment (Johnson, Tsiros & Lancioni, 1995). The objective of this study is to understand and describe how interactions between the factors influencing ICT use impact on organisational performance. Thus, systems approach will
enable achieving the research objective, since it focuses on interactions between the whole, its parts, and its environment (Collins, 2006). Furthermore, ICT is considered to be a part of the organisation, which acts within a larger system – external environment. Therefore, applying systems theory as a research method, in this study, will enable looking at interactions between users, ICT and the organisational environment, i.e. factors influencing ICT use (Johnson et al., 1995).

However, emphasis on the interactions in this research project is not referring to the dominant model of cause and effect relationships, where relation between variables X and Y is established as a law. Considering only a few variables does not allow for greater understanding of ICT value (Dent, 2003). The cause and effect model, applied in this study, are following the interaction model proposed by Dent (2003). This model includes the structure, environment, time and case and effect among a number of factors. Additionally, interaction is the unit of analysis in the model proposed by Dent (2003). The present research project considers relationships between factors from four contexts which relate to the structure and environment of an ICT system, and evolve and change together.

**Figure 4.4:** Systems methodologies

![Diagram of systems methodologies](source: Schwaninger (2001, pp. 110-111))
In doing this, it is important to regard those factors and their interactions holistically. Holistic thinking is central to a systems perspective. A systems perspective considers things as whole entities embedded in context that shift larger wholes. The aim of the systems approach is to ensure that no important factor in the structure is excluded (Skyttner, 1996). It works on the problems of identifying, reconstructing, optimising and controlling an organisation, while taking into account multiple objectives, constraints and resources (Skyttner, 1996). Mantell (1972, p. 48) explained that the systems approach offers a different way of thinking: “it uncovers the laws or causal factors that underlie the behaviour of a system”.

Systems methodologies can be grouped into positivistic, hermeneutic and combined methods shown in the figure below. Systems approach applied in this study is based on the sensitivity model which will be discussed as part of the research design in Chapter 5. Reed (2006, p. 13) summarised the concepts and approaches embedded in systems approach. The focus of systems approach is on the purpose for which a system was created, together with the interaction, interdependence and relationship between the components of a system (Skyttner, 1996; Gigch, 1974; Lewis, 2005).

4.3.4 Relevance of the case study and systems approach for this study

The combination of the case study and systems approach research methods will contribute to achieving the research objective. Most importantly, application of those research methods will enable evaluation and descriptions of interactions between factors influencing ICT use.

Many phenomena can be explained by identifying the factors which influence the researched phenomena, according to Yin (2003). This will be done with an ICT system. A case study can provide a rich and intensive understanding of processes, phenomena, variables and/or relationships. Therefore, it is an ideal methodology when a holistic, in-depth investigation is needed (Tellis, 1997), which is the case with this research.
However, a social phenomenon, such as an ICT system, is a result of various factors which do not act in isolation but in interaction with each other to produce an outcome (Roberts, 2004). This interaction is a dynamic and complex process which requires an in-depth understanding of peoples’ perspectives.

Quantitative methods can model several kinds of interaction effects, but only at the cost of requiring a large sample size (George & Bennett, 2005, p. 22). On the other hand, the case study method has the ability to accommodate complex causal relations. That is, the use of statistical methods in evaluating tangible ICT effects leads to the productivity paradox. Brynjolfsson (1993) explained that this paradox is due to deficiencies of the research methodologies.

The strength of a case study research method is considering contextual factors, which is extremely difficult to do in statistical studies. Furthermore, the use of a case study enables high levels of conceptual validity by identifying the indicators of the theoretical concepts which are being measured (George & Bennett, 2005, p. 19). The application of a case study method results in identification of new variables and hypotheses (George & Bennett, 2005). The powerful advantage of using case study method in the current research project is that it enables observing and identifying a large number of factors influencing ICT use and inductively observing their interactions, and the outcomes of these interactions. This could not be achieved by means of statistical methods since they necessarily leave out many contextual and intervening variables.

Yin (2003) advised to complement a case study method with some other research method in order to identify factors influencing the phenomenon under study. This is due to limitations of the case study research method. That is, factors cannot be ranked in the order of importance, the interaction between factors cannot be determined nor can any causal understanding be developed based solely on the case study method only (Yin, 2003). Therefore, systems theory research method is applied.
There are several reasons for choosing systems approach over commonly used factor analysis and regression analysis. The most important reason is that regression and factor analyses can incorporate only a few factors in their models. For example, linear regression models result in a list of independent variables “and their associated parameter estimates and standard errors” (Brown, 2008, p. 10). Brown (2008, p. 1) criticised linear regression models since they are “based on rudimentary intercepts and slopes that reveal little more than correlations within a set of variables”.

Additionally, factor and regression analyses are weak in developing the understanding of the underlying causal processes, which is an important aspect of this research (Yin, 2003). Miles and Huberman (1994, p. 146) explained that quantitative procedures “deal with associations, not really causes”. That is, the results of the quantitative analyses are “plausible possibilities ‘smoothed’ across many persons and situations”. In contrast to these approaches, in this study, ICT system is considered a social system in which everything is in interaction with everything else, “rather than as a study of the billiard-ball impact of A (as vs. C) on B” (Miles & Huberman, 1994, p. 146).

Another source of complexity, next to users, is conjectural and multiple outcomes that arise from the interaction between various factors influencing ICT use. Conjectural causes are those which affect each other and their effects as well (Miles & Huberman, 1994). Since effects of multiple causes differ according to the context, and “different combinations of causes can turn out to have similar effects”, Miles and Huberman (1994, p. 146) argued “we have to think of causes and effects as arranged network”.

In addition, data will be collected from the users, whose behaviour (ICT use) in interaction with an organisational system cannot be captured by using the regression and factor analyses.

The argument adopted in this research is that different combination of factors influencing ICT use may lead to a different impact on organisational performance. Therefore, systems theory is applied to consider ICT system
which changes as the interactions between factors influencing ICT use change. Systems theory outlines dynamic dimensions of the interactions between the company’s context, users and ICT. Its central thesis is holistic thinking. It views the system as a whole that is both greater than and different from its parts.

4.4 Conclusion

Philosophical foundations of this research project have been discussed in this chapter. This further identified the postpositivist paradigm of inquiry as the most appropriate for this study. By contrasting it with the positivist paradigm of inquiry, the position of this research was further established. Based on the specific conceptualisation and focus of this study on ICT system, the most appropriate research methods for this study were chosen in this chapter. They are the case study research method and systems approach method.

More specifically, the research is focused on an ICT system and includes the technological, individual, organisational and environmental contexts. These contexts create ‘wholeness’ through mutual interaction. As stated by Brender (2006), any external influence will influence these contexts, their interactions, and consequently the company’s performance. Since the aim in this study is to identify factors influencing ICT use, this study is explorative.

Based on the findings in this chapter, research design will be presented in the following chapter. Data collection and analysis strategies will be discussed in relation to the research objective.
Chapter 5
Research design
5.1 Introduction

This chapter deals with practical questions connected to conducting the research in the field: which data are most relevant to be collected, and which collection strategies are the most appropriate. Data collection and analysis strategies are designed with the purpose of answering the research question. That is, I have asked how the interaction between factors influencing ICT use impacts on a company’s performance. As Yin explains:

Research design is an action plan for getting from here to there, where here may be defined as the initial set of questions to be answered, and there is some set of conclusions (answers) about these questions. It is the logical sequence that connects the empirical data to a study’s initial research questions and, ultimately, to its conclusions. (1994, p.19)

As a result of explicitly defining and explaining what steps were taken in this research, a clear picture emerges of how the processes were applied in the organisational setting. This perspective allows for an understanding of how the data were analysed, and it defines their reliability, with the consequence that the validity of this research project is increased.

The ideas expressed in this chapter, in regards to the research design, are closely connected to those presented in the previous Chapter 4. More specifically, choice of most appropriate data collection and data analysis strategies for the present research project, identified in this chapter, is guided by the research methods and philosophical assumptions discussed in Chapter 4.

The outline of the research design is presented in the first section of this chapter, in conjunction with the discussion on the criteria for judging the quality of proposed research design and its validity. Each step of the research design and in-field experience is presented subsequent sections. For example, the process of gaining access to companies, as well as the process of choosing interviewees, are introduced and justified in the second section of this chapter. Next, the data collection strategies are identified and discussed. Finally, in the last section, analysis strategies, which have been
applied in the current study, are described. These are, namely content analysis and a systems theory tools.

The aim of the study has been to obtain a uniquely rich picture of ICT use in an organisation. From this illustration, a clear representation of factors influencing ICT use, its specificity to each organisation, and its influence on a company’s performance, will become evident. Consequently, the nature of this study is explorative and descriptive (Creswell, 2003).

### 5.2 Research design outline and its validity

The purpose of carefully planning the research design is to make sure that the research question is being answered by collecting the right data and using the most suitable data analysis strategies. Each of these actions helps in achieving the main objective of this study, and that is to explain and describe how ICT use in a company can influence its performance.

Following Yin’s (1993) advice, the outline of the research design has been developed and presented in Table 5.1. The purpose of this outline is to demonstrate how the data collection and analysis methods are applied in this study, in regards to achieving the research objective. This will be discussed in more detail in the subsequent sections.

<table>
<thead>
<tr>
<th>Data collection strategies</th>
<th>Research objectives</th>
<th>Data analysis strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Semi structured interviews</td>
<td>- Identify technological, individual, organisational, and environmental factors influencing ICT use</td>
<td>- Content analysis</td>
</tr>
<tr>
<td></td>
<td>- Describe ICT use in a company’s context</td>
<td>- Content analysis</td>
</tr>
<tr>
<td></td>
<td>- Describe the ICT effects (informational, strategic, transactional, transformational)</td>
<td>- Content analysis</td>
</tr>
<tr>
<td>- Focus group meetings</td>
<td>- Establish interaction among factors and ICT effects</td>
<td>- Cross-link (impact) matrices</td>
</tr>
<tr>
<td></td>
<td>- Validate identified</td>
<td></td>
</tr>
</tbody>
</table>

Table 5.1: Research design
Several strategies have been employed in order to achieve the validity of the research design. Interview guide has been designed with a purpose to ensure consistent approach to interviewees. Ethical guidelines have been developed to ensure confidentiality of interviewees. In addition, codes assigned to each interviewee have been used in data analysis chapters with the same purpose. Careful attention has been given in approaching the companies, recording the interviews and field notes.

The rigour of the analysis, in this study, was ensured by using a triangulation strategy, which is commonly used as part of the case study research method (Tellis, 1997). Triangulation is defined by Patton (1990) as: “a process by which the researcher can guard against the accusation that a study’s findings are simply an artefact of a single method, a single source, or a single investigator’s biases” (p.470). Triangulation is used in this research project with a purpose to confirm the validity of the research processes, to ensure accuracy and alternative explanations (Tellis, 1997; Stake, 1995). More specifically, three kinds of triangulations were used: triangulation of sources, analyst triangulation and theory triangulation (Denzin & Lincoln, 1994; Patton, 1990). Since quantitative data collection methods have not been used in this research, methodology triangulation was not an option.

Furthermore, the criteria for judging the quality of research design, proposed by Yin (1994), have been used for establishing the quality of the present research project. These criteria refer to construct validity, internal validity, reliability and external validity. They are shortly discussed in the
following paragraphs. However, they will be explained in further detail later in this chapter.

The construct validity of the research design refers to establishing correct methods for the concepts being studied (Dooley, 2002). It is used for “establishing correct operational measures for the concepts being studied” (Yin, 1994, p.33). Indeed, this was achieved in this study by applying theory triangulation. That is, factors influencing ICT use, which have been established in the literature review, have been used as a foundation for both designing the interview questions and analysing them. Findings of this study have also been compared with the theories.

The second of Yin’s criteria, internal validity, is established when causal relationships and identifying conditions are openly revealed (Yin, 1994). Internal validity is used to demonstrate causal relationships, and conditions which will necessarily lead to other conditions (Dooley, 2002; Edwards, 1998). In the current study, I have attempted to achieve internal validity by using multiple sources of evidence. More specifically, the following groups of stakeholders, influencing ICT use in a company, have been interviewed with a purpose to cross-validate findings: employees, Board of Directors, managers and IT persons. This is known as triangulation of qualitative data sources, which is one of the strengths of the case study research. Furthermore, I have used the same questions in regards to interviewing each group of stakeholders. Thus, a chain of evidence has been created which provided different perspectives on ICT use. These perspectives have been presented and discussed in focus group interviews with the stakeholders.

All data collected was coded in a consistent way for the data analysis. Additionally, two analysts have reviewed the interviews, and discussed their independent interpretations in relation to the content and meaning of the materials. Triangulation through multiple analysts enabled better reliability and validity of analysed data. The result was avoiding the potential bias that comes from a single person doing everything. The accuracy of fact and interpretation of data have been also checked with interviewees, which added to the reliability of the current research project.
Interviews have been conducted using Croatian language, since the study was conducted in Croatia. The translation of quotations from the interviews have been checked, in regards to accurateness and potential biases, by the principal supervisor, Dr Hazbo Skoko, who fluently speaks Croatian language.

Reliability of the research design shows that “the operations of a study can be repeated with the same results” (Yin, 1994, p.33). In order to ensure that the present research project can be replicated, several strategies have been used. The procedures in regards to the research process have been documented; case study protocol and a case study database have been developed; interviews have been time recorded, as well as the time of the interviews, and information on interviewees (Dooley, 2002; Yin, 1994).

External validity is the last criteria for judging the quality of research design. It is used with a purpose to determine if the findings can be generalised beyond the case studies being studied (Dooley, 2002; Yin, 1994). Achieving the external validity is one of the strengths of case study research (Edwards, 1998). The case study research uses replication logic, and analytical generalisation which means that “the investigator is striving to generalise a particular set of results to some broader theory” (Yin, 1994 p.36). This is achieved by interviewing more individuals that yield the same results, and relating findings back to the literature (Dooley, 2002).

Following the replication logic, the findings of each case study, in connection to the current study, will be compared and contrasted in the cross-case analysis (Chapter 7). As a result of comparing the factors influencing ICT effects, across cases, a more generalised conclusion may be reached on critical factors that affect ICT effects. Furthermore, in describing the pattern matching mode of case study analysis, factors established in the literature were compared with the ones emerging from the collected data (Yin, 1994).
5.3 In-field research and data collection strategies

This research has been conducted in Croatian companies, reflecting a call for the international perspective on ICT impact on company performance (Tallon & Kraemer, 2006; Mahmood & Man, 2000; Tam, 1998; Dewan & Kraemer, 1998). That is, most of researches have been conducted in USA companies. In addition, the fact that there are no similar researches done in Croatian companies, strengthens the need for the current research and identifies its contribution.

This research has been conducted in five Croatian companies. They were chosen based on the criteria that they implemented ICT application minimum a year before the research was conducted. This criterion was identified with a purpose to investigate ICT systems in the use stage of ICT diffusion. However, due to lack of full access to relevant stakeholders, only findings relevant to the three companies will be presented in this thesis, in Chapters 6 and 7. Pseudonyms have been assigned to these companies, for the confidentiality reasons: Triumph, Eagle and Falcon.

The process of approaching the companies, gaining their consent for conducting the research and identifying knowledgeable interviewees is described in the next section.

5.3.1 Snowball strategy

Approval from company authority for conducting the present research project has been gained by approaching the right ‘gatekeeper’ in each company (a person who grants or denies the access to the company). They have been introduced to the research project, and the research process at the first meeting. All approached companies were willing to participate in the research, once the right contact was made. Based on their valuable knowledge of the company, its employees, and the research project, gatekeepers have suggested the most knowledgeable interviewees: employees from different departments, IT employees, managers and the
Board of Directors. This type of sampling is known as the snowball or chain (Patton, 1990).

A sample strategy explains the process of choosing research participants and sources of data, with a purpose to gather data that is rich, descriptive and illustrate the phenomenon of interest intensely (Morrow, 2007; Patton, 2002). In the snowballing method, the social relation itself is used as a chain of connection for building the group of research participants. Miles and Huberman (1994, p.28) explained that the snowballing method “identifies cases of interest from people who know people who know what cases are information-rich”. The underlying assumption of this method is that the connected segments of the network, which form the sample network, are representative of all other segments of the network (Scott, 1991). The knowledge of the agents is used in determining the boundaries of the population.

The snowballing method was the most convenient sampling method for this research, for the simple reason that the gatekeepers were well aware of the knowledgeable informants for this study, while the researcher did not have any previous contact with the organisation and its employees. Therefore, there was no way of knowing and approaching the ICT stakeholders in the company without the help of the gatekeepers.

Bryman and Bell (2007, p.200) emphasised that the snowballing method is “the only feasible method when there is no accessible sampling frame for the population from which the sample was taken”. Additionally, the gatekeepers recommended participation in the research project to employees. For this reason, interviewees felt safe in discussing organisational issues which, consequently, resulted in collecting rich data on ICT use and ICT effects.

5.3.2 Ethical considerations

Several authors warn about the importance of respecting the rights of the research participants and the research sites (Angrosino & Mays de Perez, 2003; Creswell, 2003; Fontana & Frey, 2003). In this research project,
ethical considerations are part of the data collection process, which had been approved by Charles Sturt University Ethical Committee (Appendix 1), since it includes people and organisations.

Participants of this research project have been informed about the research project, their rights, as well as the confidentiality and anonymity of the interviews. This was done by providing gatekeepers with a document, containing relevant information on the research process, which they distributed to the potential interviewees. Interviewees were advised about the voluntary nature of participation and their right to withdraw at any time. This procedure ensured that the interviewees were not coerced into participation (Creswell, 2003). Additionally, before each interview, I made sure interviewees were aware of the nature of the research, their rights, confidentiality of their responses and I explicitly asked for their consent to record the interview.

As an additional safeguard, several strategies have been applied in the process of data analysis and presentation. Codes for the interviewees have been used in data analysis chapters, and pseudonyms have been assigned to each company. In addition, I answered any questions the organisation might have had, and provided them with a copy of the results.

The procedures described above, guaranteed the participants’ rights, and also facilitated and encouraged the most appropriate insights and knowledge on ICT use in their company.

5.4 Data collecting strategies

Data collection strategies, which have been applied in this study, are described in this section. Application of these methods ensured collection of the right data needed to achieve the objective of this study, which is to establish how interaction between factors influencing ICT use impact on a company’s performance. Hence, the aim was to collect data which provided different but complementary information on:

- Organisational contexts, strategy, intended ICT value and use
- ICT use in the organisation
• Different stakeholders’ view on ICT use
• Factors influencing ICT use
• Influence of these factors on the company’s performance
• Company’s performance objectives

Data on topics, identified above, have been collected by means of the semi-structured interviews and focus groups. Interviews are the primary source of evidence in a case study research (Yin, 2003).

The semi-structured interview was the most suitable format of interviews, since it supported flexibility in asking the questions, engaging in a dialogue with the interviewees. It also allowed me to adapt to various contexts of social interaction, respond to the unanticipated developments and adjust to the different setting of the interviews. In comparison to the structured and very structured interviews, the semi-structured format of the interviews provides a “greater breadth of data” (Fontana & Frey, 2003, p.74).

The semi-structured type of the interview increases the chances of identifying factors specific to each company, which may not be identified in the literature. Yin (2003) emphasised that the specific information relevant for a case study research is not readily predictable. Therefore, the interview questions have been developed before entering companies, based on factors influencing ICT use, identified in the literature review. However, these questions were adjusted, in relation to each company’s specific ICT use, during the research process.

In contrast to the in-depth interview where individuals are interviewed separately, in the focus-group meeting, groups of people are interviewed (Fontana & Frey, 2003). Focus-group meetings were organised with the interviewees to share and validate the non-attributable findings (individual respondents were not identified), from the interviews and the cross-link analysis. Factors influencing ICT use identified in the content analysis, as well as the interactions between them, were validated in the focus-group interviews.
However, the focus-group interviews were not possible in every company since the participants did not have time for it. In order to secure the benchmark for the information gained in the interviews, every interview was used as a reflect-back interview on the previous interviews. That is, after each interview was done, it was transcribed and analysed for the ICT issues emerging from it. These issues were further discussed with other interviewees. It was especially important to triangulate the data between the three groups identified as key stakeholders in the company for this research. For example, if an employee would explain integration problems with ICT, that issue would be a basis for the question to IT department and managers.

The semi-structured interviews and focus group interviews have been the most important source of data in the current research project. Getting access to the secondary data was difficult. Some of the organisations did not have the evidence and documents on IT/ICT in the company (e.g. Eagle) while others were not ready to share it (e.g. Falcon). Therefore, documentation about case studies collected for this study was obtained mainly from newspaper and internet articles. In addition, it was not possible to obtain archival records, such as financial statements that are public documents in Croatia, without the company’s approval.

5.5 Interview process

The interview participants have been employees, managers, members of the Board of Directors and IT employees. Both one-to-one semi-structured interviews and focus group interviews have been conducted in the organisational setting. The role of the interviewer was moderately directive (Fontana & Frey, 2003). The interviews have been conducted with a purpose to collect data in relation to ICT utilisation, relevant factors influencing it, and to identify their impact on the company’s performance. The purpose of the interviews was exploratory.

Each semi-structured interview was recorded with the explicit permission of the interviewees. The interview process was adapted to each interviewee. For example, some interviewees talked about specific issues beforehand, and therefore, those questions were skipped in the interview. Also, the order
of the questions asked in the interview was in accordance to the progress and the flow of the interview. Hence, in some interviews specific topics had been discussed more extensively. The time frame of the interviews, which was up to 90 minutes, allowed conversational characteristic of interviews while following a certain set of questions.

**Table 5.2: Research themes**

<table>
<thead>
<tr>
<th>Groups of factors</th>
<th>Stakeholders in a company</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Employees</td>
</tr>
<tr>
<td><strong>Individualistic</strong></td>
<td>Characteristics, job description, attitudes toward ICT, knowledge of ICT, BoD’s knowledge and support</td>
</tr>
<tr>
<td><strong>Organisational</strong></td>
<td>Organisational culture, ICT seminars and workshops</td>
</tr>
<tr>
<td><strong>Technological</strong></td>
<td>Technological ICT characteristics</td>
</tr>
<tr>
<td><strong>Environmental</strong></td>
<td>Environmental influence and collaboration with customers and suppliers</td>
</tr>
<tr>
<td><strong>ICT effects</strong></td>
<td>How ICT use influences them and their work</td>
</tr>
</tbody>
</table>

As seen in the table above, interviewees’ position in the company directed the general outline of the possible questions (Appendix 3). For example, managers and the members of the Board of Directors were asked about the organisational and ICT strategies. Employees were asked about their experience in daily activities using ICT for their work, ICT user friendliness, their ICT knowledge, attitudes, ICT education, and IT support. IT Department employees were asked more about the technological characteristics of ICT, their relation with the Board of Directors, alignment of ICT and organisational strategies, ICT education, users’ ICT knowledge
and attitude, and their support. It can be noted that all of this themes are actually factors identified in the literature review, as influencing ICT use. Specific detailed questions, presented in Appendix 3, were developed based on the research themes in Table 5.2.

The last part of the interview process was designed to assess the interactions between identified factors. For this purpose, interviewees have been asked to fill the cross-link matrices, which will be discussed in the data analysis section in more detail. The main strategy in filling in the cross-link matrices were questions arising from the blank cell in the matrix created by crossing the factors in the row with a factor in the column: How factor 1 in the row influences factor 2 in the column of the matrix: no influence, weak influence, medium influence or strong influence? The question format was therefore, structured in the form of a survey designed to obtain quantitative data.

Patton (1990) suggested such interactions can be identified and valued by the interviewees themselves or by the evaluator in analysing the data. In this research both interviewees and the researcher evaluated the interactions between factors influencing ICT use. Patton (1990, p.416) suggested that after the descriptive analysis is completed, the researcher “is at liberty to offer interpretations and judgements about the nature and quality of this supposed process-outcome connection”. Following his suggestion, I evaluated interactions, which were not covered in the interviews during the content analysis process. This way, I included the richness of data and different stakeholders’ perspectives emerging from the content analysis.

There are no rules on how many participants should be interviewed in a qualitative research (Patton, 2002). This depends on the purpose of the research, what the researcher wants to know, usefulness of data, and credibility of interviewees (Patton, 2002). For the purposes of this study, 62 interviews have been conducted altogether, from which 52 have been used for the content analysis. This is a much larger number of interviews, from what Dooley (2002) suggested. He suggested that 12 interviewees may be quite sufficient, especially when the data collected from each interview is
varied, extensive and in depth. However, the somewhat large number of interviews, conducted in this study, can be justified. It reflects extensive and in-depth understanding of an ICT system based on the views of three groups of stakeholders in three different organisations. A large number of interviews enabled identifying and understanding the company’s multiple dimensions (social, cultural, technological, and environmental) that interact and influence each other. This resulted in a realistic picture of ICT utilisation, as well as identification of the factors influencing ICT use.

The number of interviews with different groups of stakeholders in each company is presented in Table 5.3.

**Table 5.3:** The structure of interviews done for the purpose of this research

<table>
<thead>
<tr>
<th>Interviews with</th>
<th>Triumph</th>
<th>Eagle</th>
<th>Falcon</th>
<th>Case study 4</th>
<th>Case study 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT department</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Managers</td>
<td>7</td>
<td>6</td>
<td>7</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Employees</td>
<td>12</td>
<td>7</td>
<td>5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>23</strong></td>
<td><strong>18</strong></td>
<td><strong>12</strong></td>
<td><strong>6</strong></td>
<td><strong>3</strong></td>
</tr>
<tr>
<td>Not recorded interviews</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total number of employees</strong></td>
<td>300</td>
<td>300</td>
<td>250</td>
<td>500</td>
<td>24</td>
</tr>
<tr>
<td><strong>Total number of computers</strong></td>
<td>120</td>
<td>130</td>
<td>50</td>
<td>300</td>
<td>3</td>
</tr>
</tbody>
</table>

The number of interviewees in Falcon is not equal to the number of interviews done in total. The reason for this is that interviews with 2 interviewees have been done at the same time.

The codes for the interviewees have been developed with a purpose to illuminate only their position in the company. Hence, members of the Board of Directors (BoD) are coded as BoD1, and so on. Codes for IT employees (IT1 etc.) and employees (E1, E2 etc.) follow the same logic. The codes for managers in different departments are developed using two letters. The first letters M, stands for manager, while, the second letter of the code, reflects the name of the department. Additional characteristics of the interviewees, which might reflect the findings, are identified and presented in Appendix 2.
5.6 Data analysis strategies

Unlike the statistical data there are no ‘recipes’ for analysing case study data (Yin, 2003a) or qualitative data (Patton, 1990). Therefore, the research objective is the essential criteria for designing data analysis strategies.

The content analysis was applied with a purpose to identify factors from different contexts which influence ICT use in each company. Furthermore, cross-link analysis, was used to establish and interpret interaction between factors, and their impact on a company’s performance. Both of these data analysis strategies are explained in the subsequent sections.

5.6.1 Content analysis

The analysis of the collected data, in the present study, was based on the interview transcripts, or in other words, text, “the good stuff of social science” (Ryan & Bernard, 2003, p.259). Content analysis was therefore, used to analyse this text, since it is relevant for analysing words and a large block of text. The content analysis is a generic name for a variety of means of textual analysis that involve comparing, contrasting, and categorising a corpus of data to test hypothesis (Schwandt, 2001).

Transcribed interviews have been first analysed in terms of factors influencing ICT use. Thus, the content analysis process was done by coding the topics that emerged from the interviews (Patton, 1990). The themes emerging from the data were factors influencing ICT use. As a result, the themes were organised into ‘case records’, which are interviewees’ explanation and analysis of each factor (Patton, 1990). These case records will be presented in Chapter 6, to “allow the reader to understand the case as a unique, holistic entity” as Patton (1990, p.387) advised. Furthermore, they will be presented in a way to tell a story about each ICT system. While doing this, the actual interpretative analysis was done (Ryan & Bernard, 2003; Miles & Huberman, 1994).

Factors influencing ICT use are identified as a result of the application of the content analysis. The next step in the analysis process was to assess how
factors influencing ICT use are interacting with one another. This is done by applying cross-link analysis, which is discussed in the following section.

5.6.2 Systems theory tool: Cross-link analysis

The interactions between the factors influencing ICT use have been established and analysed by applying as sensitivity analysis (Schwaninger, 2001; CRGRAPH, 2008) or cross-link analysis (Messerli, 2000). This is a systems theory tool, used for capturing the interactions, analysing dynamic systems and understanding a system as the whole (CRGRAPH, 2008; Messerli, 2000; Scott, 1991; Patton, 1990). It has been adapted and successfully applied in different areas to evaluate key factors for explaining and improving all variety of systems (Vester, 2002a; Chan & Huang, 2004). Cross-link analysis provides a set of methods specifically designed to analyse the relational aspects of the social structures (Scott, 1991). Hence, it is appropriate method of analysis for studying the interactions between factors influencing ICT use, which is the focus of the current research project.

The application of the cross-link analysis follows three steps. Firstly, the factors influencing ICT use are identified, as described in the previous section. Secondly, interactions between these factors are assessed via cross-link matrices, and displayed in a coordinate system named map of interactions. The third and final step of the cross-link analysis is to interpret and discuss how the interactions between the factors influence a company’s performance (Miles & Huberman, 1994). In order to provide better understanding of data analysis process, cross-link matrices and map of interactions will be explained in more detail in the following sections.

Cross-link matrices

Matrices are of extreme importance in social sciences. According to Miles and Huberman (1994, p.11), creation of various matrices, graphs and networks contribute to “valid qualitative analysis”. They are used with a purpose to illuminate various complex interrelationships (Bradley & Meek, 1987). As a result, matrices often throw light on important aspects of the social structure (Scott, 1991). Visual displays have been an important part of
the qualitative analysis (Ryan & Bernard, 2003). They enable drawing justified conclusions from the data and verification of the findings. Miles and Huberman (1994, p.11) stated that “the dictum ‘you are what you eat’ might be transposed to ‘you know what you display’”.

After factors influencing ICT use have been identified in the content analysis, the interactions between them are established via cross-link matrices. The characteristic of the cross-link analysis is that, identified impact factors, are listed twice – once in the rows and once in the columns and connected. Consequently, the individual cells show the actual relations among the factors (Patton, 1990).

Table 5.4: Example of impact matrices

<table>
<thead>
<tr>
<th></th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>ICT effect 1</th>
<th>ICT effect 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Factor 2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 3</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICT effects 1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICT effects 2</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

In filling any kind of matrix, a rule of thumb is to always evaluate the influence of the factor in the row of the matrix on the factor in the column of the matrix. Therefore, when describing the contents of any particular cell the rows are referred to before the columns (Scott, 1991). The cross-link matrix presents direct connections between the factors. The diagonal cells (grey cells in table 5.4) running from the top left to the bottom right of the matrices is referred to simply as ‘the diagonal’ (Scott, 1991). For this research the diagonal has no particular meaning, as the concern in this research is with interactions between factors. The value of the diagonal is always 1.

In this research, the interactions between factors have been assessed qualitatively through content analysis and focus-group meetings. The interactions are measured by direction of the relationship, which can be positive or negative (‘+‘ or ‘-‘) and the value (Messerli, 2000). Since the interactions between factors are positive and negative, two matrices are used
– one for positive interactions, and the second one for the negative interactions between the factors. Additionally, the values of interactions typically indicate the strength of a relation. In the case of this research, the intensity of interactions between factors is assigned according to a scale with four degrees of intensity: no direct influence, weak influence, medium influence or strong influence expressed in values 0, 0.5, 1 and 2.

The relation between two factors in the cross-link matrices is different depending on the observation of the influence of the first factor on the second one, or vice versa. It is common that one factor exercises power on the other factor and the second factor does not influence the first factor. Such a relationship involves the influence between factors in one direction but not in the other (Scott, 1991).

Using the matrices for the purposes of this study ensured that the interrelations between all factors have been considered. Furthermore, ICT effects, previously identified in the literature review, have been considered as factors. By doing so, the impact of each factor on ICT effects was established (Miles & Huberman, 1994). The established relationship between factors and ICT effects enabled answering the research question: how interaction between factors influencing ICT use impact on a company’s performance. By identifying factors which influence each group of ICT effects, it will be demonstrated that ICT value is a result of multiple causes which vary with different organisational contexts and combination of causes (Abbott, 1992a; Miles & Huberman, 1994).

The essence of systems approach, which has been adopted in this study, is to provide understanding how factors influencing ICT use fit together creating “a constellation of excellence”, that is, ICT value (Patton, 1990, p.426). Patton (1990) explains it is not possible to prioritise any of the factors since they all work together and each factor “makes a critical contribution to an integrated, effectively functioning whole” (Patton, 1990, pp.426-7).

A similar data analysis strategy was used by Khoumbati, Themistocleous and Irani (2006) who were focused on understanding the interrelationships
among the key factors influencing EAI technology adoption. They used Fuzzy Cognitive Mapping (FCM) as a modelling technique to explore causal interrelationships between the factors influencing ICT adoption. In contrast to the present research project, Khoumbati et al. study has been conducted in a hospital setting. They identified factors influencing ICT adoption based on interviews and text analysis. These factors were namely patient satisfaction, physicians and administrators relationships. Furthermore, interviewees were asked to express the degree of causal influences between the factors, in order to obtain causal link strength which identified causal relationships among the factors.

The study done by Khoumbati et al (2006) is a relevant study to this research project in terms of research methodology, that is, in considering interrelationship between factors. This approach enhanced the quality of the evaluation process and emphasized the importance of each factor and its interrelationship with other factors. This will be done in the present research project as well. However, in contrast to Khoumbati et al. study, this study is taking into account wide range of factors influencing ICT use specific for the organisational context. Furthermore, interactions between factors are assessed based on the interviews with a number of interviewees, including ICT users, managers, Board of Directors and IT employees, while Khoumbati et al. based their findings on three senior management interviews.

Cross-link matrices, apart from observing interrelationships, provide additional information on the position of each factor in relation to the system (Bradley & Meek, 1987). Such information has been explained by Messerli (2000):

- **The active sum** - The sum of each line of each key factor. It represents the total influence the factor exerts on the system (stimulation or inhibition). The higher the active sum the higher is the influence of the given impact factor on all other factors in the system.
• **The passive sum** - The sum of each column of each key factor. It represents the total influence of the system on the factor (stimulation or inhibition). The higher the passive sum the higher is the impact of all other impact factors in the system on the given impact factor.

• **The degree of interrelation** The product of the active sum multiplied by the passive sum. The higher the value, the more the factor is interrelated within the system.

• **The degree of activity** of each factor - The result of dividing the active sum by the passive sum. A small quotient (Q < 1) obviously means that the influence the factor undergoes is greater than the influence the factor exerts on other components. The opposite applies for high quotients.

Degree of interrelation and the degree of activity represent the basis for the interpretation of the role each factor plays within the system (Schlange, 1995; Vester, 2002a). This will be explained in the next section.

**Map of interactions**

The map of interactions is a diagram in which factors are positioned based on their interactions established in the cross-link matrices. The position of each factor can be depicted in a coordinate system based on its value of degree of activity (x-value) and degree of interrelation (y-value). Such coordinate system is the map of interactions.

Usually, computer programs are used to translate the cross-link matrices into a diagram. In this research, Macro based on Excel spreadsheets was used. It calculates basic statistical measures, such as row and column sums and converts the matrix into the screen graphics. The software’s framework is graph theory which offers a translation of matrix data into formal concepts and theorems. These can be directly related to substantive features of social networks (Scott, 1991).

As there are two matrices, one for stimulations and one for inhibitions, each factor is given two pairs of coordinates, one for its stimulation component
and one for its inhibition component. Thus, each factor is depicted in the coordinate system by two points, one showing its stimulation component (depicted by a dot) and the other one representing its inhibition component (depicted by a triangle). A line links the dot and the triangle.

**Figure 5.1:** Graphic illustration of the interaction

![Coordinate System Illustration]

**Source:** Messerli (2000)

The value of map of interactions is in describing the pattern of connection among the factors (Scott, 1991). By representing each row and column in a matrix by a point on the paper, graph diagrams express the qualitative patterns of connection among the points (Scott, 1991). It is worth emphasising that in the map of interactions it is the pattern of connections that is important, and the actual positioning of the points on the page. In contrast, the relative position of two points on the page, the lengths of the lines which are drawn between them, or the size of the character used to indicate the points, is not important (Scott, 1991). In addition, Richardson (2005) explained that: “Pictorial representation can be more effective than words for expressing what, in your interpretation, is going on” (p.168).

The coordinate system serves to illustrate the position of the stimulation and inhibition components of each of the factors and can be subdivided into four fields to facilitate interpretation. Table 5.5 illustrates the characteristics of factors positioned in each quadrant.
<table>
<thead>
<tr>
<th>Degree of Intereaction</th>
<th>Degree of activity</th>
<th>Position of factors in the map of interactions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Strongly interrelated and passive factors</strong></td>
<td>(Outcomes of the system)  These factors are influenced by many others, but they exert little influence on other factors</td>
</tr>
<tr>
<td></td>
<td><strong>Strongly interrelated and active factors</strong></td>
<td>(Goals of the system)  These factors are strongly interrelated within the system, but they exert more influence that they are subject to</td>
</tr>
<tr>
<td></td>
<td><strong>Weekly interrelated and passive factors</strong></td>
<td>(Trends in the system)  These factors are largely independent of the system, but they exert an active influence on a few other factors</td>
</tr>
<tr>
<td></td>
<td><strong>Weakly interrelated but active factors</strong></td>
<td>(Trends in the system)  These factors are little influenced by the system, but they exert an active influence on a few other factors</td>
</tr>
</tbody>
</table>

**Source**: Messerli (2000, p.8)

Map of interactions provides valuable information on several dimensions of the system it represents. The information contained in the map of interactions is based on the position of the factors. Because of different interactions between factors in each system, every map of interaction has different structure. There can be more factors positioned on the left hand side of the map (passive factors), which means that the system is hard to change. If there are more active factors, positioned on the right hand side of the map, the system is dynamic and easy to change. Thus, structure of the map of interaction provides initial insight into a system which it illustrates.

Factors which are the outcomes of the interactions in the system are also given in the map of interactions. Generally, these factors are passive and dynamic. Thus, any change in the system influences them in short period of time. They are positioned on the left hand side of the map of interactions.

Additional information contained in the map of interactions refers to processes which maintain the identity of the system. In other words, factors which are positioned on the middle vertical line of the map present the essence of the system. Such factors are not passive or active factors. However, they can be influenced so they become passive or active factors in the system. By doing so, the entire system would change.

Each system has its goals, and all parts of the system interact with each other in a way to realise these goals. It is useful to identify these goals in
order to understand how the system functions. Active factors, which are positioned on the right hand side of the map of interactions, are the goals of the system.

The least dynamic factors in the system, positioned in the bottom left and right quadrants in the map of interactions tell a story of the system if no change occurred in the system. Because of their low degree of interrelation, they influence the system in a long run.

All of this information will be valuable part of the analysis process of each of the three ICT systems, which will be presented in Chapter 7.

5.7 Conclusion

Research design has been presented and discussed in this chapter. Several strategies, which have been employed to achieve the validity of the research design, have been discussed. These are namely triangulation, construct validity, internal validity, reliability and external validity.

In addition, the research process, in regards to approaching companies, conducting interviews and related ethical considerations has been explained. Data collection strategies, which have been applied in this research project, have been semi-structure interviews and focus group interviews. Choice of these data collection strategies have been further discussed and justified in this chapter. In order to analyse the data, content analysis and cross-link analysis have been used for the purposes of this research project. These analysis strategies have been outlined and discussed in relation to achieving the research objective.

The analysis of each of the three case studies is presented in the following chapter. They will be described in relation to technological, individual, organisational and environmental contexts. Each factor from each of these contexts will be presented in relation to interviewee’s quotations. Based on the identified factors influencing ICT use, the analysis of the interactions between the factors and their impact on a company’s performance will be presented in Chapter 7.
Chapter 6

Factors influencing ICT use
6.1 Introduction

As noted in the previous chapter, this research was enacted in three Croatian companies. In order to protect their anonymity, the names of the companies have been given the pseudonyms Triumph, Eagle and Falcon. Their organisational setting and ICT systems are presented in this chapter. The criterion for choosing the organisation in which this research was applied, was implementation of ICT applications minimally a year before the research took place. This means that all factors identified in the content analysis, presented in this chapter, are relevant for the use stage of ICT diffusion which is the focus of this study.

In addition, there is no standard template presenting theory emerging from the case study research (Eisenhardt & Graebner, 2007). Different authors have their own preferences, but they all agree that presentation of case study research is a trade-off between theory and empirical richness. This challenge is addressed in this study by summarising the case evidence on each factor influencing ICT use in tables, which complements the story of each ICT system (Eisenhardt & Graebner, 2007). The adopted structure of this chapter is as an outcome of the content analysis, factors influencing ICT use identified in the analysis, and the complexity theory concepts that were being studied. This is presented in Figure 6.1.
Figure 6.1, presented above, outlines the research process presented in Chapters 5, 6 and 7. The action of approaching the companies and a description of the interview process has been a topic in the previous chapter (Ch5). Content analysis, also discussed in Chapter 5, was based on the transcribed interviews. The results of the content analysis identified those factors influencing ICT use, as they were relevant to a specific company. The factors are presented in this chapter in a way that tells the story of each ICT system. Thus the narrative of each ICT system was told in relation to the complexity concepts identified in Chapter 2: the enabling environment, adaptations and co-evolution. Further, description of ICT systems is supported with the quotations from the interviewees in order to present and support the evaluators analysis, which Patton (1990) strongly recommended for the research where the primary source of data are interviews, as in this research.

In this chapter, I identified and discussed how interaction between technological, individual, organisational and environmental group of factors determine the level of ICT utilisation. This is important, since ICT effects depend on the level of ICT utilisation. This was done by applying cross-link analysis. As a result of establishing a link between ICT utilisation and ICT effects, new understanding of factors which inhibit and enable ICT utilisation is provided and a contribution to the literature. This chapter
prepares the ground for introducing the discussing interactions between factors influencing ICT use and ICT effects, which is presented in Chapter 7. It is in Chapter 7 that the research objective is clearly achieved, that is, it is explained how interactions between factors influencing ICT use impacts on a company’s performance.

6.2 Case study 1: Triumph’s ICT system

Triumph had 314 employees: 230 employees worked in production, and the rest in the management and administration departments. These latter employees used Information Communication Technology (ICT) extensively in their work. Thanks to Triumph’s internal IT Division, 23 interviews were done with members of the Board of Directors (BoD) (4), middle managers (3), IT employees (4) and employees from various departments (12). The convergent views on ICT use in Triumph confirm the approach adopted in this research that, to fully understand ICT use and its influence on a company, it needs to be considered in different contexts. That is, ICT is not simply a combination of hardware and software but is a part of the organisational system, its interactions and processes.

Due to their understanding of the different perspectives on ICT use in Triumph, IT employees from Triumph’s internal IT Division were asked to estimate the intensity of the interactions between factors influencing ICT use in Triumph, that is, to fill in the cross-link matrices.

6.2.1 Triumph’s setting

Triumph operated as part of the Holding Group, together with several more companies. Alpha, as the dominant company in the Holding Group was Triumph’s major customer and influenced Triumph’s production policy. Another company in the Holding Group important for Triumph’s functioning was Neutron, a well established and recognised IT company. Neutron provided IT and IS services to Triumph and other companies in the Holding. More specifically, Neutron did “70% work for Alpha, 20% for Triumph and 10% for others” (N-IT2). Therefore, Neutron was Triumph’s external IT provider.
As a result of the expertise of Neutron’s employees, companies in the Holding Group had the latest IT/ICT applications. The IT Manager (IT-M) explained: “Holding is the leader in technology and informatics, long way ahead of others. … Mars² is fully functional here and works as a Swiss watch” (IT-M).

According to the members of the BoD, Triumph was above the Croatian industry average in utilising ICT and this is what made it competitive in the European Union market. Furthermore, as interviewee BoD1 emphasised, Triumph’s vision was to keep and increase its competitiveness; and to become European diesel engine manufacturer of choice; all this on a solid foundation of ICT provision and service.

Although there was a separate IT company in the Holding Group, Triumph also had an internal IT Division, which employed two IT employees and an IT manager. The IT Division’s main responsibility was to provide IT support for Triumph’s employees, and it was also the main communication hub between employees and Neutron. On the other hand, Neutron handled IT/ICT issues which required more resources and expertise. All interviewees emphasised their very good relationships with the internal IT Division and Neutron, their quick response time and excellent IT support service.

¹ Mars is the information system used in Triumph.
In addition, organisational goals were also identified during the interview analysis. It was found that the company’s goals were well known and shared across the organisation. Interviewee BoD3 emphasised the point: “It is all connected. Organisational strategy and vision have to be the same from the top of the organisation to the bottom; it is the same in each department”.

Additional evidence in favour of this statement is found in the fact that employees knew and accepted the organisational goals as their own. Most employees were well aware of the company’s goals and all worked toward achieving them. Triumph’s goals are presented in the table below, together with supporting interviewees’ quotations.

**Table 6.1: Triumph’s goals**

<table>
<thead>
<tr>
<th>Company’s goals</th>
<th>Quotations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of products</td>
<td>“Everything is being checked for possible mistakes because the person on the ship is not interested in knowing whose fault it is, but only how to fix the problem” (E4).</td>
</tr>
<tr>
<td></td>
<td>“We take advice from Omicron which suppliers they prefer because they buy only from certified suppliers and we are certain they provide quality products” (E2).</td>
</tr>
<tr>
<td>Lower costs and customers’ satisfaction</td>
<td>“It (product) has to be made as good and as cheaply as possible. We are doing it for money, after all, therefore the customer has to be satisfied, the product has to be high quality and it has to be cheap for us to make it...” (E6).</td>
</tr>
<tr>
<td>Definition of the performance</td>
<td>“Profit and the number of people and hours needed to produce each product” (IT-M).</td>
</tr>
<tr>
<td>ICT goals</td>
<td>“To raise our productivity while at the same time cut our costs” (E7).</td>
</tr>
</tbody>
</table>

According to the table above, Triumph’s goals have been to produce high quality products, to reduce the operational costs and enhance the customers’ satisfaction. Organisational processes were organised toward achieving these goals, and employees followed them in their everyday work.

These goals also provide insights into the purpose of Triumph’s ICT, named Mars. Based on the discussion in the previous chapters, it was established that the function of ICT emerges from organisational goals. Therefore, ICT use has to be organised in such a way that it supports the achievement of the organisational goals. Following this line of thought, the ICT goals in
Triumph were oriented toward realising strategic and transactional ICT effects (Gregor, et al, 2004). In addition, the informational goals of ICT, although they have not been explicitly stated in Table 6.1, enabled achieving the organisational goals.

Although Mars brought big “quality improvements” (IT2) and “changes to the way we do business” (IT-M) there were no measures developed to measure its effects on organisational performance. IT-M explained “we do not have any method for calculating return on investments…” and IT2’s comment was: “The effect of ICT investment is such that it can not be measured, we never thought about measuring it because we are too engaged in operational processes”.

In explaining the effects Mars brought to Triumph, interviewee N-BoD emphasised that instead of measuring ICT effects it is important to state that without ICT there would be no products. In this case, ICT is a “necessity and it is hard to say how much we earned with it, but without it we could not make it” (N-BoD). That is, the employee was quite certain that without the services of a highly efficient IT program, the company would not be in its present dominant position; indeed the company would not have survived.

6.2.2 Triumph’s ICT system

After introducing Triumph’s characteristics, systems theory has been used to further describe the ICT system. The foundation for the following description is the content analysis where factors influencing ICT use in Triumph have been identified.

Enabling environment

In order to present the ICT system in Triumph, the enabling environment is discussed first. As explained in the Chapter 2, the enabling environment refers to the social and technical conditions that influence ICT use. Therefore, organisational and technological contexts are presented in the following sections, together with IT support and ICT seminars.
Organisational context

Triumph’s organisational structure has been adjusted to the specifics of the Holding Group’s requirements for the ship building industry. The reason for the adoption of this structure was that the company coordinated different departments and sub-contractors to produce the ship engines on time. Otherwise it would pay penalties which would be “a net loss for the company” (BoD2). Furthermore, if the engines were not produced on time, Triumph’s customers could not finish and deliver the ship to their customers. This would result in considerable losses for the Holding Group.

As a consequence of its highly structured organisation, Triumph has based its operations on the foundation of labour specialisation and the efficient use of resources. Each stage of the business process is well organised and precisely documented. Furthermore, employees are well appreciated and supported in the corporate structure of Triumph. This is largely due to the highly specialised and organised work places, and these were derived from a managerial ethos of humane and imaginative directorship. In truth, the organisational culture was shared across the Holding Group, incorporating, as it does, an awareness of good business processes and goals and was oriented toward the support of employees as productive and efficient ICT users. Unsurprisingly, the turnover of labour is very low and people work at Triumph for many years (Appendix 2).

Table 6.2: Organisational specifics and culture

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Triumph</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisational specifics and culture</td>
<td>Due to high specialisation and structure, interviewee E4 stated “to a person from outside everything could seem weird; it is hard to explain our organisational specifics in a few hours of conversation, it would rather need months for that person to understand it”.</td>
</tr>
<tr>
<td></td>
<td>“We are there for the users” (IT department).</td>
</tr>
<tr>
<td></td>
<td>“We are there for the worker who produces” (E6).</td>
</tr>
<tr>
<td></td>
<td>“We offer tailored IT/IS solutions for our users” (N-M and N-BoD).</td>
</tr>
<tr>
<td></td>
<td>“ICT is nothing without data and people who use it” (N-IT1).</td>
</tr>
<tr>
<td>Organisational strategies</td>
<td>- Investing in people and technology</td>
</tr>
<tr>
<td></td>
<td>“The most important resources are the people with the knowledge and willingness to work; who see themselves as the integral part of the process; who love what they do. You can have all the machines, but if you do not have people, it is worthless” (BoD1).</td>
</tr>
</tbody>
</table>
In fact, Triumph’s main competitive advantage was its experienced and educated workforce and up-to-date technology. This reliance on expert staff was recognised by the BoD1 who emphasised the point that an investment in people and technology was a constant in the success of Triumph. The outcome of such a strategy, and the organisational culture that accompanied it, was the development and use of an up-to-date technology zone, highly educated employees, smoothly running business processes enabled by ICT, and broad market recognition for providing on time quality products.

A significant reason for Triumph’s success was the managerial support that was very much dependent on available financial resources.

Table 6.3: Trends in the market

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Triumph</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trends in the market</td>
<td>Far East market together with US dollar exchange rate and the price of steel contributed to the Triumph’s negative financial results which influence financial resources available for investing into ICT and employees’ education.</td>
</tr>
</tbody>
</table>

Since the company has suffered some losses due to market trends in the price of the dollar and the escalating price of steel, financial resources could be an important element in ICT use. A few interviewees mentioned finances as a hurdle in ICT use. For example, interviewee E1 noted: “Everything is ok, only the question of finances causes bad dreams”.

Table 6.4: Managers’ support

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Triumph</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managers’ support</td>
<td>“BoD’s attitude is the alpha and omega in this story about ICT - With the BoD support; employees have a different attitude and knowledge toward Mars, as it would be without it” (IT2).</td>
</tr>
<tr>
<td></td>
<td>“Finances are always there as a hurdle” (E7).</td>
</tr>
<tr>
<td></td>
<td>“Although we have losses, we give from our mouth to buy some machines or we do not pay for something and instead invest that money in technology because without it we would fall behind” (BoD1).</td>
</tr>
</tbody>
</table>
Apart from making investments in the technology and its people, the Board of Directors influenced ICT use in a variety of different ways. Additionally, there was also the users’ positive attitude toward ICT, and this attitudinal response from the staff seems to be directly related to the strength of the BoD’s support for ICT.

Table 6.5: BoD’s ICT knowledge

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Triumph</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board of Directors’ ICT knowledge</td>
<td>BoD3 explained the lack of managers’ knowledge of ICT. That is, from three members of Board of Directors “only one really knows” and was involved in ICT implementation (E1).</td>
</tr>
</tbody>
</table>

An example of top managers’ support was provided by BoD3. In order to further motivate employees, the manager created “internal competition between departments” which resulted “in a huge positive step toward fuller use of ICT” (BoD3). He explained that ‘stirring up’ employees maintained the system in a state of flux and creative change, while the opposite would lead to maintenance of the status quo.

ICT seminars

Formal ICT seminars and workshops were organised at Triumph at the time Mars was being implemented. Although, this development had a positive effect on younger employees, older employees found the ICT in-house training insufficient to fully understand and use Mars. However, they learned to use Mars by applying “the method of trial and error” or learning-by-doing, asking their colleagues and IT people for help (E7). Furthermore, employee E1 observed that mature colleagues needed different types of ICT seminars which would be particularly designed for them and their way of learning and doing things. Such ICT seminars would be the catalyst in making a difference in changing their attitudes toward ICT.
Table 6.6: ICT seminars

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Triumph</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT seminars</td>
<td>E7 mentioned older employees found ICT in-house training insufficient to fully understand Mars. E1 observed that ICT seminars were of little help since older employees are not happy &quot;to be having lectures and being told how to do their job because they already thought it is enough what we already know&quot;.</td>
</tr>
</tbody>
</table>

After ICT seminars, the major role in learning to use ICT had the IT Division and cooperation among employees. For example, interviewee E6 stated:

If I get stuck with ICT I ask IT Division and they help me out. Also I help my colleagues when they get stuck. We are all close and we help each other. The point is that we do not need to know everything. It is important to have the right people who do know and who we can ask for help.

Thus, IT2 connected users’ ICT knowledge with IT Division’s support. Interviewee IT2 explained that users’ ICT knowledge was related to the IT Division’s efforts in educating them. More specifically, users with negative attitudes toward ICT required IT employees to put more effort into solving their ICT issues. As a result of making users’ work easier, their attitudes toward ICT were more likely to change into a positive one. The provision of IT support is part of the enabling environment, and is therefore, discussed in the following paragraphs.

**IT support**

At Triumph, IT support was provided by the internal IT Division and an external company called Neutron which is regarded as the external IT Department of Triumph. Furthermore, Triumph had a cadre of knowledgeable and experienced IT experts who can develop software solutions quickly to users’ requests. Neutron was well established and recognised as being a very successful and efficient organisation whose IT experts were solving IT problems around the world; they even provided their services for the Olympic Games in Canada in 1976. Their expertise has also been sought at a number of Universities.
Most of the interviewed employees mentioned their satisfaction with both the IT Division and the IT Department and they explained how well the IT Department was dealing with their requests for changes, adaptations, and/or updates of Mars. More than a few interviewees expressed their satisfaction with the level of IT support, particularly with IT employees’ responsiveness to users’ suggestions and requests.

Table 6.7: IT support

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<tr>
<th>Factors influencing ICT use in Triumph</th>
<th>Supporting quotations by the interviewees</th>
</tr>
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<tbody>
<tr>
<td>IT support</td>
<td>“When the work is going ‘aside’ we call IT Division to make another screen to speed up our work” (E2). “Whenever we see something is not functioning (the way we want it) we suggest to them to do something about it” (E5). “Whenever we are not satisfied with something we ask IT Division to fix it and adapt it for us” (E7).</td>
</tr>
</tbody>
</table>

Based on these quotations, it can be concluded that IT support in Triumph was extremely good and users could always count on friendly and efficient collaboration with IT people. Interviewees called IT employees by their first names, and they addressed them with titles like “aunty” (E8) which further describes their relationships.

However, such relationships between users and the IT Division may be the reason for several issues with both IT people and on the users’ side. According to the IT Manager “we are under constant users’ pressure to do the changes they request” (IT-M). Therefore, users’ requests frequently hold them back from doing major developments of new ICT applications. In addition, due to the IT Division’s responsiveness to users’ requests, Mars had many screens and functions. Consequently, users perceived Mars as an unfriendly system.
Table 6.8: Mars’ user friendliness

<table>
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<tr>
<th>Factors influencing ICT use in Triumph</th>
<th>Supporting quotations by the interviewees</th>
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<tbody>
<tr>
<td>ICT user' friendliness</td>
<td>“I resent Mars’ complexity of use. I have to check two-three different screens to find the information I need, which is nonsense” (E10). Interviewee E10 advises “Mars should be much simpler with far fewer screens” (E10). “It was alright to make new adaptations and make new screens, but the existing screens and functions should be maintained. I would say they are valuable and they should be improved to be more efficient instead of making additional screens for something else” (E6). Interviewee E6 concludes “there is no need for new screens; I would say we have too many screens” (E6). E1 explained “people simply forget to put some information into some parts of the system because there are too many screens”. Password “is what we resent the most, everybody hates it” explained interviewee E4. Interviewee E10 was also annoyed with the password issue stating: “it is just a hurdle and it did not give us more security…it should be removed because it does not solve anything”.</td>
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</table>

Quite a few interviewees discussed Mars’ lack of user friendliness. They were complaining that Mars’ multi possibilities, functions and screens made it hard for them to use it. Interviewee E3 gave an example of Mars having a lot of screens: “more than it is needed”. In E3’s department, there are four versions of the same application screens. To open the fourth screen, which was the latest version, they had to go through the three other screens. This feature made Mars complicated to use and people complained most about it. This example explains Mars apparent user friendliness as a nuisance, rather than a serious problem.

Technological characteristics of Triumph’s ICT system

The Triumph information system Mars, provided computerised designing, manufacturing, supplies, inventories and the final products sales. Thus, Mars was providing full control over all stages of production, inventories and sales processes. It made it easier for staff to keep track of all the scheduled deadlines for purchases and deliveries, production, construction, cooperation and suppliers’ promptness. If any of those activities was not done within the planned time, the whole production process might be late and, in such circumstances, Triumph pays the penalty (which is 1% of the engine price per week). Therefore, as BoD2 emphasised: “we have to know
and calculate it so there are no delays”. Furthermore, Mars was essential for the best planning and communication flow between departments, fast access to reliable information and the decision making process.

Additionally, Mars has brought considerable informational benefits to Triumph by integrating every stage of the business process. Before the implementation of Mars, the ICT applications were not compatible; they were “islands on their own” as IT1 explained. In addition, employees were rewriting data and creating documents manually, which resulted in “a lot of mistakes and wasted time” (E2). However, by using Mars, access to all information analysis of the business process in Triumph has become more thorough and “real problems showed up” (BoD3). As a consequence, more time was devoted to solving the emerging issues, and these had been hidden before Mars was introduced. Therefore, using Mars has resulted in more efficient business processes, as well as faster, more reliable information, and greater flexibility for the manipulation of its content and format.

Apart from Mars, there was another information system used at Triumph, Burin, which organised financial and accounting aspects of production activities done through Mars. Both information systems communicate seamlessly with one another, enabling smooth business processes. In other words, Mars characteristics were enabling its full use: it was an open system, integrated with organisational processes, and all of the ICT applications were entirely compatible.

Table 6.9: Mars’ integration and compatibility

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<tr>
<th>Factors influencing ICT use in Triumph</th>
<th>Supporting quotations by the interviewees</th>
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<tbody>
<tr>
<td>Integration of ICT with business processes</td>
<td>“The system takes care of everything. It collects information…and presents it into one document and sends it to the purchase department” (E4). Furthermore, E4 stated “nothing is being done just before the deadline because there is no need for it. …Planner does not have to think about things to do, but Mars tells him what and when he should do” (E4).</td>
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<tr>
<td>ICT compatibility</td>
<td>It is compatible with its main customer’s information system. It is compatible with another information system used in Triumph-Burin.</td>
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In addition, Mars has improved the business efficiency of employees and overall business processes at Triumph. For example, BoD2 mentioned the cost savings and efficiency that had been achieved by reducing the number of employees from 505 to 230 who are now “doing double the amount of work”. Mars has also reduced the costs of production by better planning and by providing comprehensive insights into the business and production processes. BoD2 further explained that Mars was enabling planning production for several years ahead and thus frees capacities that can be outsourced to other companies.

As an illustration of better use of capacities, in the year that these interviews were conducted, Triumph concluded contracts which obligated it to produce eight engines. The ICT system, together with other innovative elements of the factory, enabled Triumph to produce 12 engines in a year which was a record level of production (BoD2). Before Mars was implemented Triumph had produced about 5-6 engines per year. Interviewee E7 stated that the ICT system Mars gave them the optimal way of organising the production, reducing time loss and allowing the maximum use of material. Furthermore, “the indirect effect of using Mars” was the reduced time of total production (IT-M). More specifically, interviewee BoD3 explained Mars reduced the time for completing a project from six to one month.

**Adaptation**

The Mars system went through several major adaptations to suit Triumph’s needs, and these changes were a critical process for its success. In the implementation stage, Mars was adapted to Triumph’s well defined requirements. During the use stage, the IT Division was adjusting it to the users’ requests. On top of that, in this process, they created new versions of the same screens again and again. According to interviewee E9, the IT Division had too many requests for Mars’ adjustments and therefore was not able to deal with the each request at the same time. As a result, Mars was considered to be complicated to use.
Table 6.10: Mars’ openness

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<tr>
<th>Factors influencing ICT use in Triumph</th>
<th>Supporting quotations by the interviewees</th>
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<tbody>
<tr>
<td>ICT openness</td>
<td>Mars was described by the interviewees as the “very open and flexible system” (IT-M). “Every system is open to adaptation and as such had been bought… All those software packages are alive and in use and people who programmed them did not know if users would or would not need certain features. It is alive and always changing system”. Mars is a great example since it was changed, at least 50% from its original version, “because using something in real life situations you realise you need to adapt it to your emerging needs” (E4). In other words, ICT use is not a static process, but it changes and evolves together with the emerging ICT needs due to internal or environmental changes.</td>
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Thus, the adaptation of ICT in this case, which was enabled by Mars’ openness and flexibility, is critical for understanding the Triumph’s ICT system. Several interviewees - BoD3, IT manager and BoD1 explained that Mars’ openness was crucial for its adjustments to the company’s specifics. The openness of an ICT application is an important characteristic, one that enables adjusting and upgrading of the ICT system as the new ICT needs and requirements emerged in the organisation.

Co-evolution

Another concept adopted from complexity theory, discussed in Chapter 2, is co-evolution. It describes the evolution of ICT development in relation to the business processes, external environment and users. It provides a better understanding of an ICT system, in relation to the systems it is part of.

Co-evolution between the business process and ICT development

Both IT and business leadership were the key factors influencing the ICT success at Triumph. In particular, the IT Manager was an expert in dealing with both ICT and business situations, and it was his expertise which resulted in the success of the ICT implementation. During that process he was responsible for the implementation, and the BoD authorised him to make all decisions concerning ICT implementation in the company.
**Table 6.11:** Alignment between ICT and organisational strategies

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Triumph</th>
<th>Supporting quotations by the interviewees</th>
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<tr>
<td>Alignment between ICT and organisational strategies</td>
<td>BoD1 emphasised “He (IT Manager) made heroic work. He knows IT very well, and knows the whole business process and people”. This influenced Board of Directors to “have trust and faith in him” and to give him free play. In relation to Mars implementation, BoD1 added “my support was basically financial...since I am not qualified in ICT field to lead such project”.</td>
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Most importantly, the IT Manager was knowledgeable about both IT and business processes, which resulted in successful ICT implementation. Simultaneously, BoD1 gave him authority to implement it as he saw fit. Such close collaboration, respect and trust resulted in a successful implementation of the ICT system. The quotations in the table above give evidence of the excellent relation and collaboration between the IT manager and the BoD.

**Co-evolution between the external environment and ICT development**

The Holding Group is an example of a process of co-evolution between each company’s business processes and Holding’s purpose. For example, Triumph specialised in producing engines, Alpha specialised in producing ships and Neutron specialised in providing IT support to them. Due to the strong ties with Holding, its influence can be seen in Triumph’s ICT development.

We had planned to implement another ICT but Neutron would then need to support both software packages, and would need to train its people for both lots of software so we decided to implement Mars as well as Alpha and to adjust it to our needs. (E3)

That is, Mars, was originally developed for the shipyard industry and was first bought and implemented by Alpha. Then, two years after its implementation in Alpha, Mars was implemented in Triumph. The implementation and adaptations to Triumph’s business processes were done very efficiently due to the experience that Neutron gained from the work done for Alpha. Therefore, Alpha, as its main customer, had an influence on the ICT development in Triumph.
Co-evolution between users and ICT development

It was discussed in the previous sections how ICT was adapted to business processes and users’ requests. In this section, the focus is on how users have been adapted to ICT and the possibilities it offered. In order to do this, users’ knowledge of ICT, and their attitudes toward ICT, as well as their human characteristics such as age and previous experience with using ICT are described.

Interviewee E2 statement explains, in a nutshell, the process of co-evolution between users and ICT:

It was hard for everybody to accept new ICT, but today a part of them are happy and content with Mars while others are conservative who are used to their way of doing things or they have never used ICT before, and it is hard for them to learn something new.

In other words, there were two groups of users at Triumph. One had a positive attitude while the other had a conservative attitude toward ICT. In addition, depending on which group interviewees belonged to, attitudes toward ICT differed.
Table 6.13: Employees’ attitudes toward Mars

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Triumph</th>
<th>Supporting quotations by the interviewees</th>
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<tbody>
<tr>
<td>Employees’ attitudes toward ICT</td>
<td>“ICT makes their work much easier than before” (E9).</td>
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<td></td>
<td>“We can not devote enough time to our work because we have to enter data into the IS” (E6).</td>
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<td></td>
<td>“How would I work if we did not have Mars? We need it… everything is in the computer... Without Mars we are nothing” (E8).</td>
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<td></td>
<td>Further, Mars was outsourced: “it is not our product, when we have skilled and qualified personnel who can do it to our taste” (E6).</td>
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The age of users and their previous experience with ICT was found to be one of the most influential factors influencing ICT use, users’ knowledge and attitudes toward ICT. Employee E9 explained that older employees ultimately accepted the new ICT, in particular when they realised that Mars made their work easier, although they did so “with a bit of resistance”.

Table 6.14: Users’ age and previous ICT experience

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Triumph</th>
<th>Supporting quotations by the interviewees</th>
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</thead>
<tbody>
<tr>
<td>Users’ age and previous ICT experience</td>
<td>Younger employees are experienced in using ICT which enables them to “use all the screens, all the possibilities Mars has, in contrast to others who know just the basic ICT skills” (E1).</td>
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<td></td>
<td>“Young people’s way of thinking is already ‘through the screens and the computers’ while ours is on paper” (E4).</td>
</tr>
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<td></td>
<td>“Younger people are more open to learn news skills and they are proactive in gaining them, while it is harder for older people to change since they worked for years in the same routine way” (N-IT1).</td>
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<td></td>
<td>“We had people who worked in one way with the previous system for years and it was very hard to get them to accept the new system. It was not hard to teach them, but they kept their own way of doing things” (E3).</td>
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<td></td>
<td>“Older colleagues had to put more effort to learn how to use Mars, but at the end of the day they did it” (E10).</td>
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These transcripts have explained a particular interpretation of the main differences between younger and older users was actually their previous experience with using ICT. The lack of previous experience in using ICT resulted in older users needing more time to learn to use ICT, to accept it, and then to use it fully in their work. In contrast, younger employees who already had gained experience in using ICT through their schooling found that they were at ease with it.

Users are more open to accept new technologies when they feel that they are a part of the implementation process; particularly when the ICT benefits are explained and shown to them. The implementation task-force clearly knew this fact when they implemented Mars in a number of sequences, “a bit of rest, a bit of learning” (E4). In doing so, the process of implementation was ‘fearless’ and gave employees time to adjust to it. During the Mars implementation period complete written documentation was transferred into digital versions which were available through the information system. Thus, the employees did not need to rewrite these documents, and this was explained as a positive by interviewee E6. This process influenced employees’ attitudes towards Mars and it resulted in a most positive and supporting response to the innovation.

Today, all employees have learned to use Mars for every day needs, and this was explained by interviewee BoD1: “you do not have to be an IT expert, but you do have to know what you need every day to work and anybody can learn that much”. The internal IT Division employee, IT2, also emphasised that users have to have at least some basic ICT knowledge; otherwise the entire system would not function.
Table 6.15: Users’ knowledge of ICT

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<tr>
<th>Factors influencing ICT use in Triumph</th>
<th>Supporting quotations by the interviewees</th>
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</table>
| Users’ knowledge of ICT              | “By experimenting on your own, you find new functions and with time you learn a lot… The most important thing is how much you work with it, how interested you are, and how much you play with it” (E5).
E6 stated: “if I get stuck with ICT I ask the IT Division and they help me out. Also I help my colleagues when they get stuck. We are all close and we help each other. The point is that we do not need to know everything. It is important to have the right people who do know and who we can ask for help”. This means that the IT Division was perceived as an important factor in users’ ICT learning process.
“We do not know all of the functions of Mars because we do not use what we do not need” (E5).
E1 explained that ICT use was influenced by the users’ knowledge of ICT: “after 2-3 years we’ve been using Mars, there are still people who need constant help with it”. |

Another view on the use of ICT at Triumph was provided by interviewee E1 in the table above, last quotation. That comment refers to the users’ lack of ICT knowledge. The member of the Board of Directors (BoD3) went further to explain how BoD3 was not satisfied with the users’ knowledge or their ability to extract the full benefit from ICT: “Everybody can get the information they need but the question is do they know how to use it? That is not the technological issue, but rather the users’ problem”.

According to interviewee E1, employees were not as motivated on their own, and therefore only a case of emergency could influence them to use Mars to its fullest extent.

Table 6.16: Users’ motivation

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<tr>
<th>Factors influencing ICT use in Triumph</th>
<th>Supporting quotations by the interviewees</th>
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| Users’ motivation                    | “The only difference between ICT users is how interested and motivated they are, which depends on their personality” (E5).
“ICT use depends on how motivated people are, and there are not many motivated people. People are ready to use ICT only as much as they have to” (E1).
“People are conservative and they hate changes and so they keep with the old way of thinking and doing things, they prefer finding information in the folders instead of searching for the information in the computer” (E7). |
Employees explained their ICT knowledge was the way it was due to the very “basic” (E5, E3, E10) and “insufficient” (E7) internal ICT seminars and workshops. In contrast to this, they highlighted the importance of IT support and cooperation with colleagues in learning to use Mars, a situation with which they were satisfied.

The discussion above can be concluded with identifying the key issue with ICT use at Triumph, and that is under usage of Mars. In IT-M’s words, there are still “some people who are not using the system to its full capacity; they are not using as much as the system is offering”.

Table 6.17: ICT utilisation

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<tr>
<th>Factors influencing ICT use in Triumph</th>
<th>Supporting quotations by the interviewees</th>
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<tbody>
<tr>
<td>ICT utilisation</td>
<td>“Mars is divided into columns, everybody has their own column they use for work…and that is how it generates all our documentation when everybody fills in their column. Every employee has authority to touch only their own column. There are three authorities: you can only watch the screens; enter the data; or you can change the data…That is what those at the top have decided” (E6). “Technology is all about improvisation. For example, I use a combination of a few softwares, instead of buying software that combines all those functions and that costs 30 000 euros”. “We only use what we need and that is what we have mastered” (E5). “To be completely honest, I use only about 10% of Mars’ possibilities and that nicely fits my work. If I needed something more, I would start using other ICT functions” (E6).</td>
</tr>
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</table>

The possible solution, according to IT-M, is to organise more ICT seminars: Because some people use ICT only for elementary things, they do not use it to its full extent. It starts to become their habit to use it in such elementary way. … So ICT seminars should be repeated and this would enable people to use all the possibilities that the ICT gives them.

Based on the previous discussion, the major issues with ICT use at Triumph is the fact that Mars is not user friendly, and it is under utilised. Thus, ICT seminars might improve the overall use of ICT applications, and may help
to improve users’ attitudes toward Mars. On the other hand, the level of IT support is a crucial factor in making Mars more users friendly.

6.2.3 ICT utilisation at Triumph

Triumph’s ICT system was described in the sections above in terms of the factors influencing ICT use and concepts from complexity: co-evolution, adaptations, and enabling environment. As a result, factors influencing ICT use relevant for the company’s context have been identified, and better understanding of Triumph’s ICT system is provided in relation to the organisational and environmental environments.

In order to further straighten the focus of these findings in relation to the research objective, the following figure was depicted, based on the cross-link matrices, presented in Appendix 4. That is, Figure 6.3 identifies factors from technological, individual, organisational, and environmental clusters which influence ICT utilisation in Triumph. Factors on the left hand side influenced ICT utilisation in Triumph, while factors on the right hand side were influenced by ICT utilisation.

**Figure 6.3: Interactions between ‘ICT utilisation’ and other factors**

![Diagram of interactions between ICT utilisation and other factors]

It can be seen in the figure above, that all technological, individual and organisational groups of factors influence ICT utilisation in Triumph. This finding supports the argument that ICT utilisation is a result of the interactions with the technological, individual, organisational and
environmental factors in the system. All of these aspects influence and determine the level of ICT utilisation in the company. It will be discussed in Chapter 7 how ICT utilisation influences ICT effects and the company’s performance.

Although, most of the factors in Figure 6.3 enable successful ICT utilisation, there is one factor which inhibits it. This factor is users’ age and previous experience. As previously established, more mature employees were less likely to have previous experience with using ICT. Therefore, as there are more such employees in Triumph, the more ICT utilisation will be inhibited. This explains that the specific issue with the ICT utilisation in Triumph arises from the users’ side. Managers’ support and ICT seminars have negative interaction with the ICT utilisation. This means that the more ICT is utilised, there is less need for managers’ support and ICT seminars.

ICT utilisation influenced other factors in the system, as well. For example, it influenced technological factor user friendliness. The more ICT applications were used in Triumph, the more users made requests to adapt them to the specifics of their work tasks. The adaptation process resulted in Mars lack of user friendliness. Furthermore, ICT utilisation influenced users’ knowledge of ICT. As users utilise ICT over a period of time, they become aware of its possibilities, functions and ways how to use it, which, as a consequence, improved their ICT knowledge. Awareness of the ICT benefits, increased users’ motivation to use ICT. It can be concluded that the time component of ICT utilisation is crucial for users to adjust and improve their ICT utilisation.

Apart from the individual factors, ICT utilisation influenced organisational strategies, organisational culture and IT support. Use of ICT in Triumph supported achieving the organisational strategies, contributing to the organisational success. Furthermore, ICT utilisation strengthened the organisational culture, and led to increased IT support, which was discussed previously.
Based on the findings and analysis of Triumph’s ICT system, it can be concluded that ICT utilisation is strongly supported by technological and organisational group of factors influencing ICT use, while the inhibiting influences arise from the individual group of factors. More specifically, the only inhibiting factor comes from the users who lack previous experience with using ICT. These users do not fully accept ICT which increases possibilities of potential errors in the system. On the other hand, due to the highly enabling environment, this inhibiting influence was reduced. It mainly demonstrated itself as underutilisation of the possibilities ICT applications offer. This makes Triumph a great example of a successful company which provides great support to its employees and ICT users, who, as a result, accept and work toward achieving the organisational goals.

6.3 Case study 2: Eagle’s ICT system

The second case study in this research is ICT in the Croatian newspaper publishing company, pseudonym Eagle in this study. Eagle was established in 1963 and today is the main newspaper agency in the Western Region of Croatia, Istria. It employed 200-300 employees; the number varying with the tourist season. The company would be classified in Croatia as a medium to large company. For this research, only full time employees who used ICT have been taken into account as possible interviewees.

Access to Eagle was made possible by gate keepers who provided access to all relevant interviewees. Fifteen interviews have been conducted with the Board of Directors (3 interviewees), IT persons from the IT Division and the IT Department (3 interviewees), Middle Managers (4 interviewees), and employees (5 interviewees). Additionally, subjects IT-M and IT1 were interviewed separately first, and then together, as a means of filling in the cross link matrices.

6.3.1 Eagle’s setting

Originally, the company had been established as a newspapers publishing company, which continues to be the focus of the enterprise, in terms of the BoD’s support. BoD3 explained: “newspapers are the primary activity in the
organisation; everything comes from there and [we all] depend on it”. In MM’s words, however, the Newspaper Department is “quite independent from the rest of the company”, and has the foundational role at the company. Other departments were established due to “necessity in doing business and they are in the early stages of their development” (BoD3).

Further, the Board of Directors realised that, by establishing the sales outlets network throughout the region, they would enhance the sales of their newspapers. Thus, Eagle established the Sales Department and pursued the expansionary organisational strategy: “which is the key to everything, the base is the newspaper” (BoD2). More specifically, the number of Eagle’s sales outlets in recent years has increased by five times from 28 in 1999 to 130 in 2007. Revenue also increased from KN 39 million (~AUD 9 million) in 1999 to KN 160 million (~AUD 35 million) in 2007. These numbers explain the importance of the sales outlets for Eagle’s competitiveness and success.

In addition, competition in the newspaper distribution market is organised around the ownership of the sales outlets. However, the competitors do not represent a big threat to Eagle since it developed its own sales outlets network (M-S). The Chief Editor and manager, IT2 agreed that competition had no affect on Eagle and its ICT due to Eagle’s monopoly position, based on its traditional cultural voice of Istria, and the regional focus of its newspapers in the market.

Another complementary business activity associated with publishing newspapers is selling advertising space in newspapers. With this purpose in mind, the Marketing Department was established in 2007, and is today the source of the highest profits for Eagle. The three main departments, newspapers, sales and marketing are geographically spread across the city, and this distribution plays a significant role in the company’s communication and information flow. The Accounting and IT Departments support the activities of the main departments. This is seen in Eagle’s organisational structure, presented in Figure 6.4.
Since Eagle is the only company which publishes daily newspapers that are focused on happenings in the Istrian region, it established a monopolistic position in the market. After becoming the most important newspaper publisher in the regional market, with the advantage of having cornered the traditional voice, it also has the benefit of a well recognised image and brand. The next proposed expansionary step is for Eagle to join with other media companies in the Holding Group. The vision of the BoD is to form an Istrian Multimedia Centre (IMC) with daily newspapers, TV and radio coverage. Such an organisational strategy will strengthen their market position by integrating all media, marketing and publishing operations under one roof and confirming its monopolistic position in the regional market.

It is inevitable that transformational changes will take place during the process of reorganising Eagle’s IT structure to be compatible with those at Holding. Therefore, transformational ICT effects are taking place together with the new organisational strategy formulation.

The ICT strategy at Eagle can be considered as being part of the organisational strategy to form a cooperative arrangement with Holding. However, the ICT strategy at Eagle has been defined by the existing ICT applications that were older and incompatible with those of the other companies entering into arrangements with Holding (IT-M). Consequently, the IT strategy of the company will now be to integrate and upgrade its IT/ICT (BoD1, BoD2, IT-M).
In order to understand the purpose of ICT applications in Eagle’s organisational setting, it is important to understand Eagle’s performance objectives. For this reason, Eagle’s performance objectives, identified by the interviewees, are discussed below.

Interviewees explained that Eagle’s success should not be measured by the financial results only, but should also include the social responsibility aspect. In fact, BoD1 emphasised that Eagle’s social responsibility is reflected in the company’s “over employment of at least 200%” and that there are “families depending on us”.

BoD1 further explained the wages are paid on time and emphasised the importance of employees’ satisfaction with Eagle’s policy: “If you take financial results as the key performance indicator than our operation is in the red, as an outcome of taking the social aspect it is successful business” (BoD1).

Following this, it can be concluded that Eagle’s objectives are oriented toward employees’ rights and satisfaction, and slightly less toward objective, financial measures of performance. The reasoning behind the strategy of taking into account social responsibility in evaluating its success was inherited from the previous political system. BoD3 mentioned this social orientation was the reason that “the key performance indicators of success are not defined”. IT2 mentioned “they do not think in terms of productivity but only to get something over with”.

BoD2 further illustrated the company’s social policy by giving an example. The investment into electronic cash registers, which would enable better control, reduced mistakes and enhanced the company’s sales and revenues, required KN 3 million. Eagle could not easily afford this because they have paid 3.8 million hours of overtime. Nevertheless, orientation to the social aspects of company’s performance has caused problems in the company. While employees are satisfied, the company’s growth and adaptation to market requirements has suffered.
6.3.2 Eagle’s ICT system

Eagle’s ICT system is discussed in this section, together with factors influencing ICT use, identified in the content analysis. The ICT system, as established in the second chapter of this thesis, is part of the organisation in which it operates. Therefore, when discussing an enabling environment, both technological and organisational contexts are introduced. In order to understand the situation in Eagle, co-evolution between ICT development, business processes, external environment and users are discussed in a separate section.

Enabling environment

An enabling environment is important for successful ICT utilisation in a company. Such an environment depends on the technological characteristics of ICT applications, like compatibility, integration and the organisational context in which ICT is being used, such as the organisational culture, IT support and ICT seminars. The approach to analysis, in this study, is taken a step further, and by using complexity theory, examines the co-evolution between ICT, users and organisational contexts. As a result, Eagle’s ICT system is presented by using several contexts, thus providing a more holistic understanding of how it is operating in connection with the contexts in which it is embedded.

Technological characteristics of Eagle’s ICT system

ICT applications used in Eagle are different for each department. This is seen from the table below.

Table 6.18: ICT applications in Eagle

<table>
<thead>
<tr>
<th>Department</th>
<th>ICT applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketing Department</td>
<td>Commercial applications (quotations and invoices)</td>
</tr>
<tr>
<td>Sales Department (Newspapers Division)</td>
<td>Distribution of newspapers applications</td>
</tr>
<tr>
<td>Retail Division</td>
<td>Retail application</td>
</tr>
<tr>
<td>Newspapers Department</td>
<td>FRED publishing application</td>
</tr>
<tr>
<td>Board of Directors</td>
<td>Human resources applications</td>
</tr>
<tr>
<td>Accounting Department</td>
<td>Financial and accounting applications (Trak Libor)</td>
</tr>
</tbody>
</table>
The table above shows that ICT applications are designed for each department’s purpose. However, the interviewees explained that those ICT applications are not integrated into the system. This situation of lack of ICT integration, together with the earlier mentioned physical dislocation of Eagle’s departments, gave rise to issues like the bottlenecks in information flow.

Table 6.19: ICT integration and compatibility

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Eagle</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT integration</td>
<td>IT1 explained that the implementation of ICT was done in stages by different companies in each department. This was the reason for the lack of ICT integration and compatibility problems between departments, as BoD2 stated. M-M emphasised “this is the reason ICT is not integrated into complete information system”. Interviewee IT-M connected the lack of ICT integration with the lack of organisational integration “everybody is here for their own sake as well as applications which are also on their own; there is no integration”. “Since integrating ICT in the whole company is expensive, we have been implementing ICT at the departmental level” (M-M). Such an approach to emerging ICT solutions added to the further disintegration of ICT in the company.</td>
</tr>
<tr>
<td>ICT compatibility</td>
<td>“The whole IT system is totally in disarray” (IT-M).</td>
</tr>
</tbody>
</table>

In addition, Eagle’s ICT applications are not compatible with one another, which created a hurdle to business processes. This is presented in the figure below.

Figure 6.5: Compatibility of Eagle’s ICT applications

Key: dotted line - incompatible software; solid line - compatible software; solid line with arrows – conditional compatibility
From the figure above, it can be seen that ICT applications are not compatible within the company, while they are compatible with the partner company and the supplier of newspapers. As supported by the interviewees, ICT compatibility issues at Eagle are further complicated by the fact that the changes in ICT applications are linked to changes in ICT applications in other departments. This is the case with the ICT application in the Marketing Department which upgrade depends on the upgrade of ICT application in the Newspapers Department. Incompatibility between these two ICT applications has lead to advertisement being placed in the inappropriate section of the newspapers. M-M concluded that better ICT integration and compatibility across departments would result in fewer mistakes and consequently greater customer satisfaction and increased revenues.

Table 6.20: Suppliers and the partner company

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Eagle</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suppliers</td>
<td>As explained by the Sales Manager (M-S), the ICT used in this department was recently implemented to be compatible with their main supplier. Therefore, suppliers do influence Eagle’s use of ICT.</td>
</tr>
<tr>
<td>Partner company</td>
<td>The partner company is very important in influencing ICT in Eagle (M-M, BoD1, BoD2). ICT upgrades in the Marketing Department depend on the Newspapers Department, which in turn depends on the partner’s ICT updates.</td>
</tr>
</tbody>
</table>

There is a need for upgrading ICT application in the Marketing Department, which is not happening due to the link with the Newspapers Departments. The marketing manager explained: “We are now in limbo until that is solved” (M-M). He further expressed concerns that: “we are coming to the edge where we have to decide if we will adopt a new version of the same ICT or implement totally different ICT”.

The reason for this is that ICT application in the Newspaper Department is linked to the Eagle partner company’s software. BoD1 and BoD2 explained the strategic reasons for IT/ICT integration and compatibility with the partner company. Their partnership enables sharing information between these two companies and providing a printing service for Eagle’s
newspapers. This explains the importance of compatibility between ICT applications in the partner company and Eagle’s Newspapers Department, as well as issues with ICT applications in the Marketing Department.

Within Eagle, compatibility of ICT applications with the one used in the Accounting Department is of great importance for Eagle’s business. ICT application in the Accounting Department is integrated with the Marketing, but only partially with that of the Sales Department. The lack of compatibility between these two ICT applications resulted in some lack of control in the sales outlets and consequently, financial losses in the Sales Department.

Problems and financial losses that emerged from the lack of ICT compatibility in Eagle were serious. For example, information about sales outlet revenues were available a month and a half after their occurrence, which diminished the control over operations in the sales outlets. Making decisions based on the old reports and analysis created blind spots for possible opportunities in the market. This issue caused the lack of information needed for proper decision making, and consequently running unprofitable businesses. Eagle missed great opportunities for making higher revenues due to the lack of ICT integration and compatibility.

The reason for this lack of information (above) may have resulted from the fact that ICT application in the Accounting Department was only partially developed, “which is the number one issue” in the company (IT-M). Due to partial development and integration of accounting software, data had to be re-entered manually in the system resulting in doubling the work and costs, as explained by M-A. Therefore, interviewee M-A explained that with the current status of ICT in their department “there are no specific ICT benefits”.

Interviewees explained that the situation in the Sales Department might be changed with the implementation of electronic cash registers in the sales outlets. The main purpose of electronic cash registers is to provide instant information about costs and inventories. The sales manager explained that
implementation of electronic cash registers would provide better control and 10-12% higher sales. Interviewee S-M described the effects of such implementation on the example of a sales outlet. After implementing electronic point of sale at the end of 2006, total revenue grew by 24%, while the costs remained the same. This example explains how much Eagle has been missing from the potential of ICT benefits, which it could have gained by implementing electronic cash registers.

On the other hand, ICT application in the retail distribution unit is old. Sales employee E-S explained the problem of integrating ICT applications in the Sales Department: “we just need to implement the software for retail. We are weak in the software for retail, since the emphasis in the company is on the newspapers”. That is, new ICT application was implemented in the unit for the distribution of newspapers. As a result, this created a lack of compatibility of ICT applications in the Sales Department.

New ICT applications in the Newspaper Distribution Division brought positive transactional ICT effects (M-M, E-S): improved productivity by reducing the number of employees and speeding up the work. According to E-M, it also helped to keep up with the increased work load and the market changes. Sales manager (M-S) proudly stated that their ICT was compatible with their major supplier of newspapers. Employee E-S further explained special applications have been developed that enable ICT compatibility and data sharing with the supplier. Otherwise, “if we were not compatible we could not function” (IT2).

In contrast, old disintegrated ICT applications in other departments have negative transactional ICT effects. That is, due to the lack of ICT integration and compatibility within the company, information is not provided on time, thus slowing Eagle’s business processes and efficient decision making. In addition, lack of integration and compatibility of ICT, discussed earlier, leads to mistakes; lack of complete and on time revenue information, and lack of inventory control - which results in fewer positive informational ICT effects.
Most of Eagle’s ICT applications were old and not compatible (IT1). Therefore, old applications, together with lack of compatibility, resulted in an inability to realise organisational strategy. When there is a mismatch between ICT possibilities and the organisational needs, that is, a sign of ICT legacy system (Mitleton-Kelly & Land, 2005; Mitleton-Kelly, 2004).

Table 6.21: Old ICT applications

<table>
<thead>
<tr>
<th>Legacy issue</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old ICT applications and ICT issues</td>
<td>“I would not mind if we would get something better” (E-J1). They were not thrilled with the ICT application but were rather used to it. This explains the ICT was not being implemented in Eagle’s Marketing and Newspapers departments for a while. Interviewee E-J2 mentioned seven times during the interview the need for the new computers which could solve the text disappearance issues. IT-M, E-M observed the company had problems with the Internet connection collapsing quite often. The company is lacking a lot of basic IT documentation, manuals, security and valuable information on IT/ICT characteristic, changes, upgrades according to IT-M. The ICT needs are being satisfied locally, that is, at the time of the event at the place and department where the bottleneck occurs.</td>
</tr>
</tbody>
</table>

On top of having old ICT applications, there is no documentation on the state of the ICT system. This led to the IT Division manager being a system expert. That is, he was the only one in the company who knew all about the ICT applications. This made him invaluable to Eagle. On the other hand, his lack of collaboration with IT manager in the IT Department created a constraint to business evolution.

Connection between the legacy system and ICT users’ friendliness was given by IT2 in Table 6.22. He emphasised that users were well acquainted with ICT application, which is an intuitive explanation when ICT applications are old. The evidence for this conclusion was provided by other interviewees. For example, E-S and E-J2 noted there were issues with the network and text disappearance, due to old applications.
Table 6.22: ICT user’ friendliness

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Eagle</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT user’ friendliness</td>
<td>“Technologically everything functions more or less, people know how to work with the tools which are available to them, so they do not have to invest their time on learning new things. They have a routine way of doing things, they do not have to do something complicated, but as simple as possible with the most effects” (IT2).</td>
</tr>
</tbody>
</table>

Although old ICT applications lead to a legacy issue in Eagle, it also resulted in ICT applications being perceived as user friendly.

This explains that the major issues in Eagle are due to the legacy issues.

Adaptations
ICT openness is an important characteristic of ICT that enables adjustments, changes and upgrades of ICT. Yet only one sales employee explained that the ICT application supporting the newspapers distribution, recently implemented, was open software. Other interviewees did not talk about other ICT applications’ openness, or recent implementation. Due to a lack of data on adaptations of ICT in Eagle, this theme is not discussed.

Table 6.23: ICT openness

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Eagle</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT openness</td>
<td>Employee E-S emphasised the most important characteristics of the ICT application in the Sales Department was its openness. Openness of other ICT applications in Eagle was not put forward by any interviewees.</td>
</tr>
</tbody>
</table>

Organisational context
The situation explained above, is closely connected to the organisational context. The underlying reason for the lack of compatibility of ICT applications at Eagle is that they were implemented in each department independently of other departments. IT-M described this situation: “everybody was working for their own benefit…everybody was adding to the problems…making problems overwhelming… instead of working on problems and creating solutions together”.

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The outcome of such an organisational context is that ICT was adapted without having in mind the bigger picture of organisational processes. The reason for this can be found in the organisational structure and activities of the company. Eagle’s departments were operating in different markets, doing different activities and having different ICT needs, which might be another reason for the lack of ICT compatibility.

Another characteristic of Eagle’s organisational context was the lack of information on the organisational strategy. BoD3 noted “there is no written or documented organisational strategy”. According to several interviewees, the BoD did not communicate their plans and strategies to the rest of the company. This contributed to managers’ confusion, lack of integration and collaboration between departments, and functions and roles of the employees not established.

Further, IT-M explained the issues in the company as “dispersion of authority” and that “there is no hierarchy”. BoD3 also noted the same when talking about “organisational infrastructure” in terms of people and authority as the main organisational issue. It can be noted there are no set rules, goals, neat organisation in Eagle, but it is rather floating, loose, and not integrated.

Table 6.24: Organisational culture and specifics

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Eagle</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisational culture and specifics</td>
<td>“The BoD works by deadlines, there is no precise, concrete communication with others so there is a lack of clear vision of where the company is heading to, nobody knows what they are supposed to do” (IT-M). “People, who should have that information to ponder on it, do not have it. Therefore, everybody has a different partial picture on the situation in the company” (IT1). “I waste a lot of time...everything is delayed until the last minute...it is a take-it-easy approach, we will take care of it later” (IT-M).</td>
</tr>
</tbody>
</table>

The organisational context at Eagle influenced the adoption and implementation of ICT applications in the Newspapers Department. Members of the BoD gave general approval for ICT implementation. It is
due to the lack of their ICT knowledge, and awareness of ICT possibilities that implementation was done: “without any strategy or planning…and the BoD had no knowledge or interest in what they were doing” (BoD3). BoD’s role in ICT implementation and use was to approve investment proposals while other managers further negotiated with IT suppliers. Employees noted that improved managers’ ICT knowledge would enhance ICT use in the company.

**Table 6.25:** Top managers’ ICT knowledge and support

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Eagle</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Top managers’ ICT knowledge</strong></td>
<td>E-M1 stated members of BoD are “older and ICT is a new thing for them…i.e. it is different from younger people to whom ICT is a part of life and it is just the way things are”. IT2 also agreed age influenced the BoD’s support to ICT: “people who did not use ICT cannot understand the importance of buying new computers and ICT”. E-S added “we cannot expect the general manager to know each software used in the company”.</td>
</tr>
<tr>
<td><strong>Top managers’ support</strong></td>
<td>E-J1 explained the BoD had great influence on ICT in the company “what they decide, that is how it is”. IT2 explained in comparison with other publishing companies, Eagle invests one tenth on ICT. According to him, this is not enough. Furthermore, he noted Eagle’s strategy to investing is to first, analyse the needs and then to find the appropriate ICT application. In doing so, he stated they are buying applications which are less expensive and provide the same effects. IT1 emphasised the BoD’s crucial role in creating organisational culture “but if they are not aware of it, there is no point for anybody to do anything”. Employee E-M1 explained people close to the BoD are interested in ICT, and they provide the BoD with information and suggestions on ICT implementation and use.</td>
</tr>
</tbody>
</table>

Due to the BoD’s lack of focus on IT/ICT issues in the company, ICT in Eagle was found to be in disarray. The ICT strategy was reduced to the implementation of *ad hoc* solutions: “so the strategy was that when the problem arose we would fix it. There is no real plan or strategy just *ad hoc* reaction to the problem” (BoD2). Interviewee BoD2 explained there was no written IT/ICT strategy but it was: “in the subconscious. It was only reaction to the requirements of the day and/or problems with existing ICT. Even then we react at the last minute when we must act”. In other words, they invested in ICT to make it functional in the short term, which is associated with high
costs and difficulty to change ICT applications to support new organisational objectives. In such a situation a gap between ICT capabilities and organisational needs increases.

IT2 noted that BoD invests in ICT only when there are new employees who need new computers and telephones. On the other hand, some people in the organisation are “buying and spending like a drunken millionaire…they purchase what they need and what they do not need” (IT1).

This explains that the lack of BoD’s support was driving ICT development in Eagle. This leads to the conclusion that their support might be a crucial factor leading to changes and improvements of ICT in Eagle.

**ICT seminars**

ICT seminars were not often mentioned by the interviewees. They were provided for a group of people in the Sales Department when new ICT was being implemented. In other parts of the company, last ICT seminars were provided years ago.

**Table 6.26: ICT seminars**

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Eagle</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT seminars</td>
<td>E-J1 and E-M1 emphasised the need for reorganising ICT seminars in the company. On the other hand, E-J2 argued there was no need for ICT seminars since there were no changes in the ICT. Chief Editor added on this discussion by explaining ICT seminars for journalists are rare due to specialisation of their profession.</td>
</tr>
</tbody>
</table>

**IT support**

IT support is part of the organisational context, and is described in this section. Due to the somewhat rare discussions about organisational strategies, it might have been difficult for IT employees to envisage business needs, and to organise the ICT system accordingly. Indeed, a closer working relationship between the BoD and IT employees could result in better understanding of ICT possibilities for BoD, and business needs for IT
employees. Consequently, the company might have achieved greater benefits if they had been using ICT.

Apart from adapting ICT applications, IT employees provided support for the employees. Employees were satisfied with IT support, although they stated that they asked for help when they could not solve ICT issues on their own, or with the assistance of their colleagues. In contrast, IT1 observed that employees called for IT support all the time, no matter how big or small a problem is. He said if the managers were aware of the costs of IT support, employees would not call them all the time and “they would have to actually learn to use ICT on their own” (IT1).

Due to the focus on producing newspapers, the IT Division was originally established in the Newspapers Department where it still exists. Its focus was, and still is, on enhancing the newspapers’ activities, instead of organisational IT/ICT issues. Furthermore, it works “totally autonomously in the Newspapers Department, as there were no other departments in the organisation” (IT-M). Consequently, BoD2 acknowledged the company has “weaknesses in ICT applications…which are not present in the Newspapers Department”.

In connection with the IT Division, IT-M explained that the biggest concern was formal education of IT employees and the level of their ICT knowledge. That is, they were educated in-house. This means that there was no professional IT support provided in Eagle. This might be the reason the Sales Department outsourced IT support.
Table 6.27: IT support

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Eagle</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT support</td>
<td>E-J1 and E-J2 explained they know how to fix their ICT problems, and therefore rarely need IT support. E-J2 explained “guys from the IT Division” keep track of trends in the market and “advise us and the Chief Editor what we could use, like the latest antivirus protection…” IT people “advise us and fix problems” (E-M1). IT employees lack formal IT education, and were educated “inside the company” (BoD2) and therefore “we did not have a skilled IT workforce” (BoD2).</td>
</tr>
</tbody>
</table>

IT-M stated there was a lack of IT leadership in the company: “There is the Chief Editor and the Board of Directors for the Newspapers Department, but there was no one in charge of IT”. This lack of leadership resulted in a number of ICT issues in the company, particularly the lack of ICT compatibility. According to BoD3, lack of IT leadership was obvious in the negotiation processes with IT companies which were offering integrated IT solutions. Eagle did not have the IT person who knew the situation with regard to ICT applications in the entire company, nor was there a single person who understood the overall ICT needs of the organisation. Therefore, each department implemented their own ICT separately and independently from the rest of the company.

In 2007 a new centralised IT Department was established with the purpose of integrating and making all ICT applications in Eagle compatible. This was part of the co-evolution process between ICT and organisational development, discussed in the following section.

**Co-evolution**

Co-evolution has played an important role in understanding the development of ICT in Eagle. In the following sections, several issues are identified. For example, there is a weak co-evolution between ICT and organisational strategies. Furthermore, Eagle’s organisational context and co-evolution with the partner company provides more understanding of the ICT issues.
Co-evolution between the business process and ICT development

ICT development and organisational strategies evolved along separate paths, which resulted in the ICT issues described earlier. Legacy issues can be understood as a result of lack of BoD’s understanding of the potential ICT benefit and a focus on other organisational strategies and a lack of communication with the IT employees.

Members of BoD stated that an earlier strategy at the organisation was to expand its sales network to achieve a better competitive position in the market. In other words, “in the last five years organisational strategy was expanding sales by over 300%” (BoD1), there was no time for keeping track of IT/ICT. Naturally, this led to implementing *ad hoc* ICT solutions, which BoD2 noted “as the company was developing so the IT/ICT problems have been fixed”.

The board of directors could not afford to have problems with ICT, or to have delays in their work since they were operating on a day-to-day basis. E-S noted “if electricity blackouts were to occur, we are helpless”. Newspapers rely on daily information, which must be conveyed as it happened. Problems with the use of ICT would damage its image (E-M1), professionalism (E-J2), reputation and satisfaction of customers (readers, newspapers suppliers and other clients).

Since there was no ICT strategy or planning, lack of ICT integration and compatibility between ICT applications emerged as an issue which members of BoD decided to solve.

**Table 6.28:** Alignment between ICT and organisational strategies

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Eagle</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment between ICT and organisational strategies</td>
<td>“BoD should know what it can get from ICT, it should know how to ask for it and there should be trust between the BoD and IT department, which is not the case here” (IT1).</td>
</tr>
</tbody>
</table>

More recently, members of the BoD have pursued another organisational strategy to achieve competitiveness in the market. They have established a
Holding Group named Istrian Multimedia Centre, in which different media companies are joining. To do this, Eagle has had to change some of its organisational processes and most importantly, to deal with the ICT issues. At the time this research was applied in Eagle, the BoD was defining its strategy of developing centralised IS, which would enable easier integration of companies into the Holding. It was for this reason that the IT Department was established, and a professional IT Manager was hired to coordinate and lead the process of ICT integration and development of the IS in Eagle.

Co-evolution between the external environment and ICT development
Co-evolution between Eagle’s external environment and ICT development within the company had already been discussed as part of the compatibility issues with ICT applications. More specifically, ICT applications in Eagle were compatible with the supplier of newspapers and the partner company which was an impediment to changes in ICT applications in other Eagle’s departments. Another important aspect of ICT development in Eagle was its response to ICT changes in the external environment and fluctuations in the market.
Table 6.29: Trends in the market

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Eagle</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
</table>
| **Trends in the market**            | ICT is being changed and upgraded only when they are forced to and the level of ICT used in the company adversely influences the processes in the company. These adjustments in Eagle are usually done *ad hoc* and without previous planning. In M-M’s words “When a bottleneck occurs, we have to do something about it”.
IT2 compared Eagle with other publishing companies in the market who are “advanced in their investing in ICT and have more integrated ICT”. Therefore “if we need something, we try to get it, and if everybody is having more advanced ICT we must have it…we do as our competitors do, it is the law of the market and we have to follow” (E-M1). This explains Eagle’s position as a strategy follower instead of a leader.
“You just have to have it, it is modus operandi, you cannot survive without it” E-M1. E-J2 said “newspapers are being redesigned and changed as competitors make new trends”. This also explains the passive approach to ICT i.e. the follower’s strategy.
E-J2 stated “we always try to get the best PCs as possible, when something new comes out to the market we try to adopt it because we know it would make our work easier” (E-J1). They mainly follow other newspapers who for example introduced colour pages and Internet posting of daily news.

As seen from Table 6.29, Eagle is taking the followers strategy instead of active leaders approach to IT/ICT in the market. An example of this passive policy was noted in BoD2’s words, when he was explaining that establishing a centralised IT Department was done “because the trends required it”.

Co-evolution between users and ICT development

Users’ evolution in using ICT is discussed in this section. There are two important demographic issues related to users, their age and lack of previous experience, and both affect their use of ICT. This was best described by the Marketing Managers, presented in Table 6.30. He referred to the fact that there were many employees who lacked IT knowledge due to their age and lack of previous experience in using ICT. In addition, IT people observed that age is the only criteria explaining how users in the Newspapers Department use ICT. They gave an example of a mature employee who was not familiar with the email function which would enable her to organise her
emails as she wanted. Therefore, she called IT support to organise emails for her.

Table 6.30: Users’ age and previous ICT experience

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Eagle</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users’ age and previous ICT experience</td>
<td>Marketing manager explained the age of the users was connected with their ICT knowledge as well: “it is easy when you have people with good IT basic knowledge...information revolution happened 10 years ago, and some of our employees have worked here for 25 years” (M-M). “People who already used ICT are managing ok, while the older users always use it in the strictly defined way. Younger users love to research and are better at using ICT which is like a body part to them” (IT2). E-J1 stated “the older the (users) colleagues are, the less they know to use ICT; which is logical to me”. E-M2 explained it was difficult for her to learn to use ICT in comparison to younger employees. “For older users ICT is a necessary evil, and a lot of them do not know how to use Internet and emails and they do not have a lot of practice and experience with it” (E-M1). “Younger journalists do not know how to write an article without using ICT” (E-J1).</td>
</tr>
</tbody>
</table>

The lack of users’ ICT knowledge was a reason for IT1’s concern: “When a person sees another person has an LCD, he also wants it – even though he does not know how to switch the power on”. His concern was that this other person will also get an LCD or other hardware which will not be used to its full extent, and will only result in a cost for the company. He went on explaining that while Eagle is earning monopoly profit, questions of costs and added value are not being raised. If the Eagle’s market position were to change, this kind of organisational culture would have to change as well.
Table 6.31: Users’ ICT knowledge, attitudes toward ICT, age and previous ICT experience

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Eagle</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users’ ICT knowledge</td>
<td>Both IT1 and IT2 agreed that employees’ ICT knowledge was very low. BoD2 mentioned there were quite a few older employees in the company who were influenced by ICT use.</td>
</tr>
<tr>
<td>Users’ attitudes toward ICT</td>
<td>Marketing manager (M-M) described his view on the general ICT attitude in the company: “Employees are reluctant to use ICT and to change their habits caused by ICT”. E-M2 emphasised “the machine is never wrong, it is usually a human mistake.” Therefore, “it is important not to panic and to ask for help” (E-M2). IT-M explained employees’ attitudes toward ICT were influenced by the lack of IT/ICT integration in the company—they were doing the double work. “They (users) accept all new things open-mindedly” (BoD1). “The brain simply can not process that much information, because humans have limited capacities. Computers can help but not write instead of us (journalists). We are humans and you can not upgrade us”. This explains his attitude toward ICT as the necessary and useful tools, especially for the creative journalists who, at the end of the day, make the difference.</td>
</tr>
</tbody>
</table>

Most of the interviewed employees were not aware of ICT issues in the company, primarily due to their work place constraints. They were generally satisfied with the ICT. E-M1 explained that ICT is a must, since they are in the industry where competitive advantage is defined by the use of ICT. Employees agreed it was impossible to imagine their work without using ICT. The Director of the Board of Directors noted that employees had no resistance toward implementing new ICT. E-J2 confirmed that the general attitude of employees towards ICT was enthusiastic.
Table 6.32: ICT utilisation

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Eagle</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT utilisation</td>
<td>Marketing employee E-M1 explained that the ICT she was using in her work was easy to use due to “habit, experience and using ICT for a long time now”. E-J2 explained the same. The Chief Editor also explained that there were some employees who had problems with ICT “maybe because they are old, or resist ICT or they do not understand the ICT possibilities and benefits…” Further, he stated the knowledge of ICT benefits and possibilities was a “small problem in his department”. “After some time of using ICT a person adopts it and works routinely, which can increase the ICT use” (E-S). Further, E-M2 added “you have to learn and use ICT every day otherwise, you fall behind”.</td>
</tr>
</tbody>
</table>

The interactions between ICT utilisation and the factors identified above are presented in the following section. This examination will provide a better understanding of how technological, individual, organisational and environmental contexts influenced ICT utilisation at Eagle. Furthermore, the discussion on these interactions builds the foundations for the analysis of ICT effects presented in the following chapter (Ch 7).

6.3.3 ICT utilisation at Eagle

The second case study, presented above, is an example of a system which is not functioning harmoniously with other systems, with the consequence that the overall results of the system are diminished. The evidence supports the systems theory argument that all parts of the ICT system are interconnected and must operate harmoniously with one another if they are to create a balanced system.

Factors influencing ICT use from multiple contexts, identified previously, have also influenced ICT utilisation at Eagle. Therefore, the purpose of the following paragraphs is to identify and discuss which factors had greatest influence on ICT utilisation, and additionally there is explanation of how ICT utilisation influences a number of other factors. In doing so, I hope to provide a better understanding of the existing enabling and inhibiting influences on ICT utilisation in Eagle. Furthermore, these insights may be
valuable in improving ICT utilisation and the company’s overall performance.

**Figure 6.6:** Interactions between ‘ICT utilisation’ and other factors

Based on the previous discussion, and the graphic representation in Figure 6.6, it can be concluded that the lack of ICT compatibility and integration at Eagle are the main inhibitors of ICT utilisation. In such an environment, users with high ICT knowledge may find new ways of dealing with such ICT situations. Additionally, employees at Eagle may be more knowledgeable about using ICT applications, simply because they have been using the same applications for years. Using old ICT applications may also prove favourable for quite a few mature employees who lack previous ICT experience.

Using the same ICT applications for years does appear to influence users’ capacity to use ICT. Furthermore, they are more open to it and accept it as they do their work. Another consequence of old ICT applications is that users perceive them as user friendly. For this reason, there is less need for ICT seminars at Eagle. On the other hand, using old ICT applications tends to put pressure on IT employees to adapt to perform new functions and operations. This is a great challenge which leads to a vicious circle in which ICT applications are more complex at Eagle, consequently they are more difficult and costly to upgrade.
As an outcome of particular organisational factors that have had a major influence on Eagle’s ICT utilisation, especially organisational culture and specifics, IT support and alignment between ICT and organisational strategies, it seems that ICT at Eagle was developed without planning; nor does it appear that there was any thought on ICT affects at the organisational level. This lack of organisation and coordination combined has its roots in the organisational culture and specifics of the company as a whole. Thus, it can be seen that the governing culture of the company has inhibited the change process because it authority is strictly centralised to the BoD, while the ICT change process requires the IT Manager to have authority to start, lead and control this process. Consequently, the IT Manager must work closely with the BoD if he is to gain their support in changing the existing organisational culture.

The situation of incompatibility of ICT applications at Eagle is primarily due to the emphasis on maintaining good relations and collaboration with the partner company and the main supplier. As a result of maintaining these good relations, ICT at Eagle is determined by the compatibility with the partner company and supplier. This, at the same time, inhibits making ICT applications at Eagle compatible within the company. Thus, although communication and collaboration with the partner company and supplier is easier and faster, the ICT at Eagle is generally internally incompatible. In addition, changes and adoptions of new ways of ICT utilisation in Eagle is a reaction to trends in the market.

ICT utilisation in Eagle is in direct relationship with the specifics of the newspaper publishing industry and the transitional situation at the company. As earlier explained, Eagle defined its ICT strategy, in relation to the organisational goal, as being intended to facilitate its entry into the Holding Group. That is, it established the IT Department with the task of solving the ICT problems of integration and compatibility. Eagle therefore, provides an example of the importance of achieving alignment between ICT and organisational strategies for the implementation of an ICT system that has some chance of success. It is the lack of alignment between ICT and
organisational strategies that created the ICT issues, and at the same time, that is what encouraged the BoD at Eagle to solve the ICT issues.

6.4 Case study 3: Falcon’s ICT system

The third and the last case study, that is, the ICT system at Falcon is presented in this section. The research was conducted in a Croatian company whose main business activity is the production of meat products and derivatives, and it has been in operation since the 1960s. The pseudonym given to this company is Falcon. The company controls the process of its meat production, from growing the animals and food for them, right through to the slaughter of the animals, the processing of meat and the sale as fresh meat or meat products in the market. The company owns its own stores and transportation. Falcon is well situated in the Croatian market, with five warehouses located in the main Croatian cities. The strategic position of the warehouses is of key importance for Falcon’s business because it enables the rapid distribution of fresh meat products outside Croatia; the company also distributes its meat products to neighbouring countries. Due to the high quality of its products, the Falcon brand is recognised outside of Croatia. At the time of this research, Falcon had approximately 500 people employed, as many as 100 were sales representatives who travelled and dealt with customers’ orders and requirements.

Physical distance between Falcon’s departments makes Information Communication Technology (ICT) very useful (MC1). Development and utilisation of ICT in Falcon contributes to this research with further insights into how ICT use influences a company’s performance.

The current research program was conducted in Falcon’s Production Department, where 200 people were employed. Due to the particular nature of the ICT system at Falcon it was not necessary to conduct the research process to the entire company. That is, the essence of the ICT system in Falcon was its production component which was used in the Production Department. It is the production component of Falcon’s ICT that determined all other processes in the company. Access to Falcon’s Production
Department was gained through personal contact with its manager, who also organised interviews with the key stakeholders. Interviewees were identified on the basis of their insights and knowledge of ICT use in Falcon.

A majority of the interviewees was employees and managers in the Production Department: top manager and middle managers, workers and warehouse workers. Apart from interviewees from the Production Department, interviews were conducted with employees from the Sales, Financial, and Controlling departments as well. In addition, the owner of company ICE (IT-M), which provides IT/ICT services to Falcon, was interviewed. He was the main source of information on development and characteristics of ICT applications in Falcon. In sum, 12 semi-structured interviews have been done with 13 interviewees from different departments and organisational levels in the company.

6.4.1 Falcon’s setting

Falcon’s Production Department, where this research was conducted, operated as a complete unit under the leadership of a top manager, that is, the Director of the Production Department (D). Falcon was situated in a small Croatian city. For this reason, its organisational culture was characterised by the fact that: “here everybody knows everyone” (MC1). Thus, the location made their communication with each other easy, and gave it a distinct element of friendliness. In addition, the inclusive nature of the internal community made ICT a very important component of the process of connecting the departments at Falcon.

The simplified organisational structure of Falcon is presented in Figure 6.7 and it is shown in order to depict the relation between the Production Department and other departments with which it communicates. First of all, the Sales Department is very important for the functioning of the Production Department because it determines the exact level of production of meat products that are needed to satisfy the customers’ orders. This information was explained as being very valuable to the Production Department and the precise costing of Falcon’s output.
The Controlling Department regulates all the processes in the company, and reports about them to the Board of Directors (BoD). Another important level of communication, for the purpose of this research, is between the Production Department and the external company ICE. This relationship between Falcon and ICE is discussed in more details in later sections.

6.4.2 Falcon’s ICT system

ICT in Falcon was used to control and connect all of its business processes. For example, it was used on the farms raising the stock animals in order to keep track of such aspects as, the different seasons, the quality of pastures and veterinary reports. By controlling all these factors, meat production quantity increases, costs are tightly controlled and consequently, profits are higher. Therefore, in this instance, better ICT means better productivity, a more competitive position in the market and, overall, higher profits. The goal of ICT at Falcon has been one of supporting, and controlling the entire business process. The purpose of this section is to discuss, in detail, how this has been done.

Complexity concepts- enabling environment and co-evolution between ICT development and organisational contexts are applied to provide better understanding of Falcon’s ICT system. In addition, such an organised description of the ICT system emphasises interconnections and the embedness of the ICT system in the social and organisational contexts. Indeed, it is this interdependency that determines the success of ICT utilisation.
Enabling environment
First, the enabling environment of Falcon’s ICT system is discussed, in terms of explaining the technological characteristics of ICT applications, organisational context, IT support and ICT seminars. All of these factors influence ICT utilisation in Falcon, and they are demonstrated below.

Technological characteristics of Falcon’s ICT system
There had been four generations of Business Intelligence Systems (BIS) implemented at Falcon. All of the ICT applications that have been developed by ICE, company which provides IT support for Falcon since 1989. As part of the IT support, ICE takes care of implementation, compatibility between ICT applications, upgrades, users’ ICT knowledge and IT support for the users.

As a result, Falcon was the first company in Croatia that connected all of its sales outlets with a WPN system and business processes using an independent ICT network. The reason for this development was that there was at that time only one ICT provider in Croatia who could provide such services. Its monopoly prices acted as an impetus for the company ICE to develop their own ICT network in 2003. Such decision was strategically very successful and the capital cost of the system was repaid in two and a half months. Since that innovative decision, the price of communications provision has decreased, so Falcon has been able to transfer its communications requirements to an outside operator network. The external provision of an ICT network has circumvented the need for a renewal of Falcon’s equipment, which has reduced costs even further (IT-M).

Today, the ISDN network is used in Falcon’s warehouses, sales and ambulant sales. This provides the company with the capacity to communicate in real time about such matters as what had been sold, the prices gained, immediate inventory, and up to the minute financial data.

Falcon was the first company in Croatia to install servers with the latest version of Windows 2003, and Microsoft base from 2007. Together with platforms, servers and their base, these form the foundation for ICT
functioning in Falcon. In order to make ICT applications more flexible and adaptable, ICE developed ICE BIS which is written in Magic program. This means that it can be applied to different platforms like Oracle and IBM.

Table 6.33: ICT integration, compatibility and openness

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Falcon</th>
<th>Supporting quotations by the interviewees</th>
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<tbody>
<tr>
<td><strong>ICT integration</strong></td>
<td>Employee E5 explained ICT was integrated and compatible “we are all connected by the network, the entire company…and ICT covers the entire process from the order to the receipt”. Manager in the Controlling Department (MC1) explained “The plant can be on its own in regards to ICT and technologically separate from other departments”.</td>
</tr>
<tr>
<td><strong>ICT compatibility</strong></td>
<td>All ICT applications are compatible with one another since they are all developed by the same company ICE, which made it compatible with one another.</td>
</tr>
<tr>
<td><strong>ICT openness</strong></td>
<td>Director of the Production Department (D) and Production manager (MP) emphasised ICT openness. MP explained ICT openness for adjustments and upgrade enables ICE to respond quickly to their emerging ICT needs.</td>
</tr>
</tbody>
</table>

The establishment of integrated and compatible ICT applications is a foundation for realising ICT benefits. Interviewee D confirmed that such ICT applications are enabling the process of production in the organisation, facilitating communication between the Production Department and the entire company, and allowing access to all of the relevant information about production and costs. Additionally, ICT provides a variety of information from usage of materials to final calculations and the cost of the Production Department needed by the Control Department and the Board of Directors. All this information forms the basis of different reports and decision making at the company.

Before ICT was introduced to the Production Department, it was impossible to control all production processes, so costs were higher. The implementation of ICT in the company introduced better control in the Production Department and the organisation, which lowered organisational costs since: “every gram of meat used in the production process is important for profitable business” (M1). Another outcome of introducing ICT, all processes became sufficiently transparent that “when and where somebody
makes mistakes” (MI) is immediately apparent. This ability to have such close scrutiny of the company has also influenced the price of the product and consequently the profitability of the company. Furthermore, ICT implementation and use brought better control, operational and cost savings, and improved business efficiency of employees and much sharper business processes. This clearly indicated that ICT applications at Falcon were successfully integrated with business processes.

The link between ICT and the provision of communication in real time between the Sales and Production Departments and warehouses is a matter of some consequence to the company. Better communication has enabled faster and more effective organisation of production and extremely rapid delivery of meat products to the customers. Therefore, the use of ICT has proved to be of considerable importance in aligning Falcon’s production with the customers’ needs.

To sum up, Falcon has the latest ICT versions which are fully integrated, compatible, and open for upgrade. The Production Department is technologically well equipped and capable of satisfying its various needs. Thus, usage of ICT at Falcon has resulted in the company being at the technological forefront of trends in the market, and the company rightly claims to be a market leader in its field.

IT support
The reason for state of the art ICT applications at Falcon is its IT support, provided by the external company ICE. This has been a particularly fruitful and successful collaboration, and is described in Table 6.34, showing the collaboration between Falcon and ICE which started in 1989. Since then, ICE employees have gained invaluable knowledge of Falcon’s business processes and operations. Based on this information, ICE employees knew exactly which ICT applications might be improved in Falcon’s operations, and what adaptations they needed to made to existing ICT applications to make them even more applicable to Falcons specific activities.
Table 6.34: IT support

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Falcon</th>
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</thead>
<tbody>
<tr>
<td>IT support</td>
<td>D and MP emphasised they had good collaboration with ICE who are always available and listen to Falcon’s needs: “We always find mutual ICT solution” (MP). MP further acknowledged “Employees give suggestions and comments to us (managers) and in collaboration with ICE we find the optimal ICT solution in communication with employees”. MP described ICE “had a vision of ICT development in Falcon, but they also adapted to our needs from the very beginning following ICT’s possibilities. Afterwards, they suggested a new ICT version that they made and which they again adapted to our demands”. MC was also satisfied with ICE and their collaboration: “they were always there for us, we worked together and developed know-how, and they even organised presentations and seminars for us”. Interviewee E6 explained “through working with ICT I know what its weaknesses are and we call the IT company more and more…” E6 explained ICT needs are emerging through daily work.</td>
</tr>
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</table>

The fact that one company designed, maintained and upgraded the ICT applications at Falcon, resulted in a compatible and integrated ICT network which operated flawlessly. Another domain of ICE has been the provision of Falcon’s employees with ICT seminars. This is discussed in the following section.

ICT seminars

ICT seminars at Falcon were organised by ICE during the period of the new installation of the network and this was done at the BoD’s request. However, there have been no recent seminars because the transfer of such information has more recently been achieved internally through person to person mentoring. This situation is described by interviewee MS in the table below.
Table 6.35: ICT seminars

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Falcon</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT seminars</td>
<td>Interviewee MS, explained since “people are changing together with the organisational structure, it (ICT seminars) should be repeated”. Another reason MS gave, to emphasise the need for new ICT seminars, was that “not everybody has mastered ICT…they are not educated to use ICT, and the problem is that they are not even interested in it”. MP explained “users do not use ICT fully and are not aware of ICT potentials”. Therefore, ICT seminars have been provided a long time ago, and there is need for providing new ICT seminars. ICT education is usually provided for the persons who are moving higher up the organisational rank ladders (ICE IT-M). Employee E6 attended private ICT seminars; E4 was taught to use ICT by her bosses; while E3 learned to use ICT by attending internal ICT seminars. She was not too satisfied with these seminars “it was short”.</td>
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</table>

Nevertheless, several interviewees emphasised the need for repeating ICT seminars, thus acknowledging their value. Indeed, the provision of ICT seminars might be of great help to users, by enhancing their ICT knowledge, increasing their motivation to fully use ICT applications, and increasing their awareness of potential ICT benefits. In addition, the Director of the Production Department (D) emphasised that there was a need to improve employee’s ICT knowledge.

The need for new ICT seminars, which were no longer being provided at Falcon, might be evidence that there has been some lack of communication between users in the Production Department and Board of Directors. This outcome of some reduction in the level of internal communication is analysed in the following section, as part of the organisational context.

Organisational context

The Relationship between the BoD and the Production Department was not perfect. For example, the Director of the Production Department (D) and MP did not know the overall internal organisational strategy and was not able to explain the company vision. Furthermore, the innovations manager, interviewee MI, talked about a lack of leadership in the company. Interviewee D explained that organisational strengths were not being fully
utilised due to leadership issues in the company which resulted in some divisions of the company making financial losses.

Furthermore, at the time this research was done (January 2008), Falcon was in the process of changing its owner. Interviewees stated the company was in a state of anticipation of further development that could lead to new organisational strategies and changes. This caused anxiety to Falcon’s employees, since this information had not been confirmed by the Board of Directors. Employees had quite a few questions and worries about the new owner’s plans and policies, and nobody was giving them the answers.

The Director of the Production Department expressed his views on organisational strategies. He explained that the main issue at Falcon was its strategic orientation to selling low profit products to big supermarket chains. In addition, products that were not sold were being returned to Falcon; the company then incurred additional costs by having to dispose of those waste products. Additionally, the company had to bear the production and transportation costs of these waste products. It was because of this that the overall company’s performance tended to be somewhat negative: “There is talk about a loss of kn 5 million last year due to that [process of dealing with unconsumed meat products]” (D). In contrast to the rest of the company, the Production Department had positive performance results. Thus, interviewee D suggested that exporting their products to the EU might be a key to the long term success of the company. However, this had not been done because of a small number of requirements, the most important of which was changing Falcon’s strategic orientation and creating “a whole new range of products, adapting some of the existing products and developing a new way of thinking” (D).
Table 6.36: Managers’ knowledge of ICT and BoD’s support

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Falcon</th>
<th>Supporting quotations by the interviewees</th>
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<tbody>
<tr>
<td>Managers' ICT knowledge</td>
<td>Falcon’s Board of Directors’ ICT knowledge was explained by the interviewee MP: “they are trying to keep up with ICT, and I am trying to present to them that it is not as easy to keep track of all the data, and data should be used. The goal is not collecting data, but using data in the best way”. Interviewee ES, explained the age of the managers and BoD influences their ICT knowledge.</td>
</tr>
<tr>
<td>BoD’s support</td>
<td>Interviewees MP and E1 said how BoD did not invest into ICT up to year 2000 and there was no interest for ICT. Since then, there have been huge steps with investments in hardware and software, which BoD supported. According to interviewee MP, there should be more investments into ICT. Interviewee MS explained the BoD in the company supports ICT. Interviewee E5 concluded “you have to know what you need, how much you need, and how it will look like once it is done…and the money needed for that”. Interviewee D noted personal dissatisfaction with the CEO’s support so far, in terms of product development and strategies. MP noted “we do not know the organisational strategy only that we are tight with finances which restrain our possibilities in the market”. Interviewee D explained they had the people and developed programs and “we only need finances for investments into production reorganisation”.</td>
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The main hurdle that impeded the introduction of change at Falcon was the lack of the BoD’s support in terms of finances and leadership (D, M1). For example, the Production Department developed new production programs with delicatessen products which had not been produced anywhere else in Europe. Such innovativeness on the part of the people in the Production Department emphasised their quality, vision and expertise. Interviewee D explained that these products were oriented toward customers who were aware of the need for healthy products. That is, the production program was oriented toward different market from the one decided by the BoD. Therefore, the BoD had not approved or supported the new production programs. As a result, the managers in the Production Department felt disappointed at the lack of the BoD’s support.

My research revealed that there were some differences between the Production Department’s capabilities and the organisational leadership of the company. They were not working together as closely together as they
might towards achieving the same goal. Thus, a lack of strategic orientation and leadership were strongly emphasised by key personnel in the Production Department as key factors influencing the organisation as a system. Interviewee D explained: “we only need a really responsible owner and things will become clear”. In another words, they needed the BoD’s financial support to realise their capabilities and innovativeness.

On the other hand, the BoD supported ICT investments which resulted in “top Mercedes level of ICT” (D). On the other hand, due to the financial losses in the company: “the situation right now is not allowing big ICT investments” (D). Thus, the financial situation in the company influenced the BoD’s support of ICT investments, utilisation and ICT seminars.

There was evidence to show that the utilisation of ICT in Falcon had improved the organisational structure and processes of the company. MI emphasised that ICT integrated organisational processes, and increased productivity of the Production Department. Together these changes brought security, quality, and speed to the production process (E2). As a result, the culture in the Production Department changed positively as well (M1).

Table 6.37: Organisational culture and specifics

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Falcon</th>
<th>Supporting quotations by the interviewees</th>
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<tbody>
<tr>
<td>Organisational culture and specifics</td>
<td>MI explained “people got withdrawn into their shells, as there was no leader that was into ICT trends or that supported changes. Therefore every change caused fear and stress in the organisation”. The change in employees’ mindset that happened due to ICT implementation resulted in “everything being controlled and documented” (MI). That is, monthly reports that keep track of deviations from norms of input and output quantities in each department showed fewer mistakes are being made. Further, interviewee IS explained ICT implementation and its benefits influenced employees to do their work “more responsible and conscientiously”. Employee E3 noted “there is no concrete leadership…and I do not even know who the owner of the company is”. MI explained “domination of BoD’s director is obvious in this company”. This is reflected in the lack of organisational vision and non defined organisational goals and the company’s shaken direction of development (MI, D).</td>
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</table>
The innovations manager, interviewee MI, explained that the organisational culture changed from “sleepy atmosphere” and “resistance to the smallest changes”, to high levels of collaboration and communication in the plant and a greater sense of responsibility towards work by employees. Another view supporting the interviewee MI’s view was given by interviewee E3: “[now] it is much easier to find a mistake or gaps in business process…there is much better control of everything”. Interviewee E2 explained: “you have to react constantly, and in the right time, react…you have to do everything on time”. As an outcome of the new ICT system everything had become transparent and documented and that had changed employees’ attitudes and the organisational culture.

Adaptations

As Falcon implemented and used different ICT applications, it constantly adapted the ICT system and its business processes to realise the maximum ICT benefits. Thus, in this section, the adaptations of ICT applications used in Falcon are discussed.

The ICT applications at Falcon have been fully adapted to Falcon’s business operations. The IT provider, the company ICE, had developed a range of ICT applications that had been implemented at Falcon. They were made with an underlying characteristic, and that was their openness to upgrades and adaptations to Falcon’s emerging needs. The degree of openness of ICT applications is a very important characteristic for ensuring smooth running of manufacturing and business processes in a changing environment. This is especially important in terms of changes in the legal framework which alters constantly in the food industry. The Croatian meat industry has very strict legal regulations, primarily due to the possible risk of contamination and the perishable nature of meat products. As well as applying Croatian laws, Falcon had adopted European Union regulations. Thus, changes in legislation and standards of production led to a requirement that ICT applications could be easily and quickly adapted to these changes. In other words, the ICT applications needed to be open to change.
Co-evolution
Discussion about adaptations of ICT applications at Falcon is better understood when is the changes are connected with the social and organisational contexts in which the ICT system is embedded. This is done in the following sections, which describe the co-evolution between ICT development, business processes, users and the business environment. As discussed in Chapter 2, co-evolution is a concept adopted from complexity theory and used in this study to describe ICT development in relation to the business processes, external environment and users.

Co-evolution between the business process and ICT development
Since ICT was introduced to Falcon, it has influenced the whole business process. As a result of changes in business processes, the ICT applications were adapted to these changes. Thus, both, ICT and business processes evolved in interaction with each other. This is best described through the alignment between the ICT system and organisational strategies. It is important to note that ICE, the company which provides IT support to Falcon, is responsible for developing the ICT strategy which is in line with Falcon’s organisational strategy and goals. Therefore, collaboration between ICE managers and Falcon’s managers explained the evolution of the business processes and the development of the ICT system.

Table 6.38: Alignment between ICT and organisational strategies

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<tr>
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<th>Supporting quotations by the interviewees</th>
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<tbody>
<tr>
<td>Alignment between ICT and organisational strategies</td>
<td>Falcon’s managers meet with ICE once a year, depending on their needs to discuss IT plans and issues. Although, the BoD decides on IT/ICT investments, ICE employees are those who suggest what and when it should be done in the ICT area. Interviewees emphasised ICE was the major factor influencing decisions about ICT implementation and ICT upgrades, and the second factors were employees’ needs.</td>
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</table>

Collaboration between Falcon and ICE had developed gradually since 1989. Since then, ICE employees learned all of the specifics of Falcon’s business processes. MC1 explained the reason for their good and long collaboration was that both ICE and Falcon learned to collaborate and adjust to each other.
Knowledge of both the internal ICT system and the company’s business processes resulted in ICE making the best decisions about which ICT applications that Falcon should adopt to improve Falcon’s business processes. As a consequence, ICE developed an ICT strategy that was aligned with Falcon’s organisational strategy, and made sure that the ICT applications at Falcon were integrated, compatible and open.

Co-evolution between the external environment and ICT development

In the case of Falcon’s Production Department, references to the external environment indicate other departments at Falcon, as well as the company’s external environment: customers, competitors, and trends in the market.

The most immediately important department for the Production Department’s functioning was the Sales Department. Indeed, their capacity for communication had considerable influence on Falcon’s business processes and financial results, and this was achieved through the feedback loop between customers’ orders and the production process; resulting in an adequate supply of meat products. Producing exactly the right quantity of product is very important for the financial viability of Falcon. A lack of production resulted in customer dissatisfaction, while an over abundance of production, on the other hand, imposed significant costs for Falcon, as explained previously. Therefore, ICT applications in both departments were specifically designed to enable instant communication between them.

Table 6.39: Other departments

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Falcon</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other departments</td>
<td>- influence development of ICT applications which have strong communication characteristic</td>
</tr>
</tbody>
</table>

Although communication between the Sales and the Production Department was good, interviewees emphasised some issues. For example, employee E5 made a joke saying was satisfaction with the communications with the Sales Department “but not with problem solving.” He explained “we are fighting with the Sales Department” over customers returning products that result in
costs for the company. In other words, the Sales Department was blamed for making unprofitable arrangements.

In addition, interviewees with the employees in the Sales Department brought contradictory findings. They were not satisfied with the IT support, users’ ICT knowledge, and ICT applications in Falcon. Sales Department interviewees talked about difficulties in implementing a new ICT “when you are used to using one ICT application it takes effort to change to a new ICT…but every system that is faster, more accurate is handy to us” (MS). They explained their customers have SAP, while Falcon does not. On the other hand, ICE owner explained ICT applications in Falcon already have characteristics of intelligent systems like SAP, and for that reason it was not adopted so far.

Table 6.40: Customers

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Falcon</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers</td>
<td>They have SAP, Falcon does not</td>
</tr>
</tbody>
</table>

Apart from customers, there were also trends in the market that influenced Falcon’s operations. Additionally, MC1 mentioned that a lack of Government trade barriers towards Falcon’s competitors was another hurdle, perhaps this was left-over in the minds of some employees from the days of the closed market that had existed in Croatia. At the same time, the price of inputs, such as food for animals, are growing in the Croatian market, and this occurs at the same time that some of Falcon’s competitors compete with them from a subsidised environment. Falcon builds its competitive advantage on its foundation of up-to-date ICT, its long tradition of good service which has contributed to its image, reputation, and quality of its products. Furthermore, competition does not have great influence on ICT in Falcon, simply for the reason that Falcon is the market leader in technology.
Table 6.41: Trends in the market and competitors

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Falcon</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trends in the market</strong></td>
<td>Trends in the market like changes in legislation influence ICT needs and adjustments greatly, according to MP. Also, Falcon’s specific ICT requirements were reported by IT-M, MP, D, MS arising from “industry specifics and environment conditions, organisation and technology and how it is all connected” (MP).</td>
</tr>
<tr>
<td><strong>Competitors</strong></td>
<td>Interviewee E5 explained competitors influenced them to implement scanners in the warehouse, since that was becoming the trend in the market: “we had to manage, otherwise competition runs you over. Everybody today has it”. On the other hand, he explained every company has different ICT so “it cannot be copied from other companies but you have to make it according to your needs, because nobody will tell you how other companies do it. Each company has its own way of working and products and market”. MP explained competitors do not influence ICT use in Falcon since “we do not know which ICT they have and how”.</td>
</tr>
</tbody>
</table>

Indeed, trends in the market influenced Falcon to adapt its ICT applications. This was especially the case with changes in legislation, which has happened quite regularly for industries that deal with perishable products, like meat.

**Co-evolution between users and ICT development**

The process of co-evolution between ICT development and its users at Falcon has a long history, going back to 1989. It was because of this that users have accepted the use of ICT and have had positive attitudes toward it. However, a few interviewees raised the issue of mature employees who lack previous ICT knowledge.
Table 6.42: ICT user friendliness, users’ age and previous ICT experience, ICT attitudes, and knowledge of ICT

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Falcon</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT user friendliness</td>
<td>Interviewee E3 explained ICT was easy to use since “once you get into it, it is not any kind of a problem”.</td>
</tr>
<tr>
<td>Users’ age and previous ICT experience</td>
<td>“Older employees were still afraid of ICT.” E3 Interviewee MS observed younger employees use ICT better and they learn to use ICT much quickly, while older employees do not manage it and “they do not even try”.</td>
</tr>
<tr>
<td>Users’ ICT attitudes</td>
<td>E4 had proactive approach to ICT “I want to use ICT fully to its maximum”. MC and MC1 explained their view on general ICT attitude in the company “there is no resistance; it is not even being talked about”. E3 said overall attitude toward ICT was positive since everybody “understands ICT makes their work easier and more accurate”. E5 noticed “at first, people resisted ICT implementation and use, while now they all want to have their own wireless scanner”.</td>
</tr>
<tr>
<td>Users’ ICT knowledge</td>
<td>Employee E6 concluded the best way to learn to use ICT is to use it daily in her work. Further, MP stressed the data ICT provides is not being sufficiently used and “perhaps users have not been introduced with ICT possibilities”. According to him, ICT issues are employees’ lack of ICT education, lack of ICT knowledge, lack of awareness of ICT benefits and taking the easy way out.</td>
</tr>
</tbody>
</table>

As a result of the mature users’ lack of previous ICT experience, the great ICT potential at Falcon had not been fully realised. There was still room for ICT improvement and better ICT utilisation in the production process. Interviewee MP argued strongly that ICT was being underused at Falcon. According to his view, the users’ lack of knowledge about ICT and their limited awareness of the potential benefits of ICT were the main reason why ICT was being underused in the production department. MP noted: “it is not the point to simply collect data and enter it in the system, but it should be used as well. ICT has to be used in the work process on the spot, otherwise it is useless”.

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Table 6.43: ICT utilisation

<table>
<thead>
<tr>
<th>Factors influencing ICT use in Falcon</th>
<th>Supporting quotations by the interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT utilisation</td>
<td>Interviewee D also stated that people use about 30-40% of possibilities ICT provides, “and we should see if we even need more than that”. MP strongly argued ICT is being underutilised in Falcon. “We are not satisfied since ICT we have had greater potential and possibilities that are not used…ICT is not being used enough…users do not use it fully and are not aware of ICT potentials”. According to his view, the users’ knowledge of ICT and awareness of ICT benefits is the reason ICT is being underutilised in the production unit. For example, E4 uses ICT “as much as I need for work”.</td>
</tr>
</tbody>
</table>

The Director of the Production Department (D) mentioned that there was feedback from their IT supplier to the effect ICT at Falcon was underutilised. He explained: “The users in the plant are maximally informed on ICT benefits; the problem is that we can not suggest to other departments in the company how to do something”. Here, he was referring to the under use issue emerging in other departments. And, “we cannot suggest to another department what they should do…that is up to the managers who should decide who does what” (D).

On the other hand, interviewee MP stressed the idea that the data ICT provides was not being sufficiently used, and “perhaps users have not been introduced to ICT possibilities”. According to MP, there are other ICT issues such as the lack of employees’ ICT education, lack of awareness of ICT benefits and taking the easy way out, by not doing anything. He suggested one of the solutions could be taking: “the fresh blood” in the organisation and concentrating on their development, that is, the new and young employees who would introduce new ideas and suggestions.

The description of Falcon’s ICT system and identification of factors influencing ICT use, presented in the sections above, are the foundation for the analysis of ICT effects presented in Chapter 7.
6.4.4 ICT utilisation at Falcon

As part of the analysis of Falcon’s ICT system, interactions between ICT utilisation and identified factors influencing ICT use are discussed in this section. Factors which influence ICT utilisation are illustrated in the left-hand side in Figure 6.8, and factors which are influenced by ICT utilisation are on the right-hand side.

Figure 6.8: Interactions between ‘ICT utilisation’ and other factors

Figure 6.8 above, is intended to emphasise the finding that ICT utilisation is influenced by all technological factors derived from the description of Falcon’s ICT system. More specifically, ICT integration and compatibility can enable the smooth running of ICT applications in supporting the business and manufacturing processes. ICT openness enables easy adjustments and the introduction of a variety of changes to the ICT system. Furthermore, ICT applications were also perceived by the users as easy to use. Consequently, the technological characteristics of ICT applications at Falcon enabled successful ICT utilisation.

Users’ age and previous ICT experience have had a major influence on ICT utilisation. Indeed, mature employees who lacked ICT experience did not realise the full potential of ICT and, therefore, were not able to use it for
basic operations. Their lack of ICT knowledge played an important role in
the under use of ICT. However, those users, who were confident with ICT,
realised the potential benefits and used it in a proactive way, resulting in
fuller utilisation of ICT.

As an outcome of the fact that ICT applications had been used for a
considerable period of time at Falcon, users’ motivation, knowledge of ICT,
as well as attitudes toward the ICT technology had slowly improved.
Indeed, it was the time component of ICT use that was crucial if users were
to realise the potential increase in ICT benefits and learn to fully understand
all of the functions of ICT, and consequently accept using it as a key
component of their work.

Falcon’s ICT use had been aligned with achieving the organisational goals.
And it was because the ICT goals had been established on the basis of the
company’s organisational goals, that Falcon was able to use ICT with the
purpose of achieving those goals. Furthermore, the IT provider, the
company ICE, provided strategic upgrades, adjustments and new
implementations of ICT according to Falcon’s needs and objectives.
Falcon’s organisational culture and the specific influence of ICT use
produced an underlying culture that was tolerant of the technology, but once
the company executives realised its potential and had accepted ICT, they
began to use it with more enthusiasm.

At the same time, ICT utilisation resulted in greater transparency in the
business process and this level of openness supported the organisational
culture which became more open to technological changes and became
more focused on the efficiency of its business processes. Another
organisational factor, influenced by ICT utilisation was the acceptance of
the need for IT support. As users become more acquainted with the ICT and
its functions, the role of IT employees becomes more oriented to minor ICT
adaptations. Furthermore, as Falcon used ICT applications in a way which
supported its organisational goals, those ICT goals were further
strengthened by the organisational strategies. On the other hand, there was a
need for more ICT seminars, because the induction of new staff revealed a
need to provide more ICT seminars to maintain the level of users’ ICT knowledge.

From the environmental group of factors, it appeared that customers influenced ICT utilisation at Falcon, by demonstrating a need for more accurate, faster sale records and invoicing processes. In order to provide an answer to these needs, Falcon developed a computerised delivery system which positively influenced customers and raised their level of satisfaction with Falcon’s collaboration.

### 6.5 Conclusion

The current research project was conducted in three Croatian companies which operated in different industries: a shipyard, newspapers publishing and the meat industry. As a result, they each had different organisational strategies, organisational cultures, and used ICT applications differently. Insights into such different companies and their ICT systems, has been described in this chapter. This study has revealed rich insights into users’ practices in utilising ICT, their organisational contexts and their ICT needs. Furthermore, the particular technological characteristics of ICT applications and the external environmental influences of these technologies have been made clear.

The concept of an ICT system was developed in Chapter 2, and it was based on systems theory. In addition, the concepts of an enabling environment, ICT adaptations, and co-evolution were applied to describe each ICT system. The concept of an enabling environment was described in terms of the technological characteristics of ICT, organisational contexts, IT support and ICT seminars. The focus on ICT adaptation demonstrated how ICT was adapted to organisational specifics. Interdependency between ICT, organisational context, users and external environment was described by applying the concept of co-evolution. This perception of interdependency demonstrated that when ICT is developed as a reaction to changes in other contexts, they can, in turn, change and reflect the changes occurring in ICT. In sum, ICT, users and business processes evolve through these interactions. As a result of the discussion on the co-evolution of ICT systems, I have
provided a better understanding of this dynamic feature of an ICT system, which is the reason that each ICT system develops differently; the particular environmental influences within each company will influence the evolution of its ICT system.

It has been shown in this chapter that each ICT system is interdependent with the technological, individual, organisational and environmental contexts. In fact, an ICT system can be defined as a process of interactions between these contexts. Therefore, it has both tangible (e.g. hardware) and intangible components (e.g. organisational culture), and consequently, tangible and intangible outcomes. This finding is supported in the literature but it also offers an explanation for the confusion in the literature about the precise value of ICT in a business enterprise. This confusion has largely been due to the dual nature of an ICT system, I have been able to show that its impact on a company’s performance depends largely on interdependencies between ICT, users and their organisational contexts.

Thus, ICT systems were analysed by identifying factors relevant for their functioning.

As a result of such a process of analysis, I have identified factors influencing ICT systems in the use stage of ICT diffusion. These factors are summarised in the figure below. The focus of this research was on the use stage of ICT diffusion, and it is because of this condition that only companies in which ICT was implemented in the year before the study were able to participate in this research.
Figure 6.9: Factors influencing ICT system in the use stage of ICT diffusion

Figure 6.9 above depicts factors which influence the ICT system in each of the companies in which this research was applied. The realisation that these factors were relevant for different ICT systems, in different industries and organisational settings, allowed the understanding that these factors could explain any ICT system. In addition, although an ICT system can be described in terms of the same factors as other ICT systems, it is due to the different interdependencies between these factors that each ICT system is unique. This was shown in this chapter, when each ICT system was demonstrated as being different from others, although they were described by using the same concepts.

The understanding explained in the previous paragraph confirms the point that conceptualising ICT as an ICT system results in a holistic understanding of ICT in relation to the contexts in which it is embedded. Such a view does indicate that most of the existing studies, focusing as they
do on one or two contexts are limited and, consequently, their results can not fully explain the full ICT impact on a company’s performance.

In summary, in this chapter the research has shown that ICT utilisation depends on a number of factors from four contexts. For example, in the Triumph case study, all technological, individual, and organisational factors, as well as ICT effects, were found to influence ICT utilisation. In the Falcon case study, all technological factors and ICT effects influenced ICT utilisation. In the Eagle’s ICT system most environmental factors were found to influence ICT utilisation. There was not found to be a particular emphasis on duration, frequency, and intensity of use (Venkatesh et al., 2008), as found in the literature, determining ICT utilisation.

In addition, the findings of the present study revealed that the application of ICT utilisation was different in each company. It appeared that usage was highly dependent on the factors of organisational goals, organisational context and users’ ICT knowledge in each company. A principle focus of this research project was on an ICT system in the use stage of ICT diffusion, and it was found that the factors just mentioned did have a profound impact on ICT utilisation in each of the three companies.

Interactions between factors influencing ICT systems in the use stage of ICT diffusion, identified in this chapter, and the four groups of ICT effects, will be analysed in Chapter 7. This analysis will support the argument that interactions between these factors have the potential to create ICT effects. The outcome of this analysis will establish which factors support, and which factors inhibit achievement of each group of ICT effects. Furthermore, the interaction between ICT utilisation and ICT effects are also analysed in Chapter 7. Based on this analysis, the relevancy of ICT utilisation for achieving ICT effects will be explained in more detail.
Chapter 7

Analysis of interactions in ICT systems
7.1 Introduction

The research objective in this thesis is to explain how interactions between factors influencing ICT use impact on a company’s performance. In order to achieve this research objective, several steps have already been carried out and presented in Chapters 5 and 6. More specifically, the research has been conducted in three Croatian companies, and semi-structured interviews, which were part of data collection strategies, have been analysed. As a result of this analysis, 23 factors relevant for each of the three ICT systems have been identified and described in the previous chapter (Chapter 6). The next step towards reaching the research objective is to analyse the interactions between these factors. This will be done in this chapter.

Interactions between each of 23 factors which influence ICT use, results in 529 interactions that take place in each of the three ICT systems. The focus of this chapter is on the interactions between factors influencing ICT use, as well as their impact on four groups of ICT effects. These are informational, strategic, transactional and transformational ICT effects. The analysis of interactions between factors influencing ICT use and ICT effects will result in achieving the research objective. The result of this analysis will explain which factors enable, and which inhibit achievement of each group of ICT effects, that is, a specific aspect of company performance.

The interactions between factors influencing ICT use have been established by means of cross-link matrices. More specifically, each interaction has been described in terms of the strength (strong, medium, weak or no interrelation) and the direction of relation (‘+’ or ‘-’). Since the interactions between factors can be either positive or negative, two matrices were used: stimulation matrix for positive interactions, and inhibition matrix for negative interactions between the factors. Both of these matrices have been established for each of the three ICT systems, and presented in Appendices 4, 5 and 6. For the purposes of this study, only interactions with strong and medium strength have been analysed and presented in the following discussion. Low impact interactions will not be discussed, for a simple reason that they do not add to the findings of the study.
The outline of this chapter is as follows. Three ICT systems are presented in regards to the interactions of 23 factors, which influence ICT use. First, based on the interactions between these factors, the position of each factor in a coordinate system, named map of interactions will be established and discussed. Analysis of map of interactions results in valuable information regarding the ICT system’s goals, outcomes, processes and trends, as explained in Chapter 5 (Table 5.5). Secondly, impact of factors which influence ICT use on four groups of ICT effects will be analysed. Thirdly, the impact of each group of ICT effects on these factors will be analysed. As a result of analysis of each of the three case studies, I will employ cross-case analysis strategies, in order to identify factors which influence ICT effects in each ICT system. Such generalised findings might be valuable for other organisations in improving their ICT value.

The position of each factor in the system will be established based on the influence that each factor receives from other factors (degree of interrelation), and the influence which each factor exerts on other factors (degree of activity). This will be done by using the MS-Excel macro function. As explained in Chapter 5, the degree of activity is on the x-axes and degree of interrelation is on the y-axes of the map of interactions. By focusing on the position of ICT effects, a better understanding of their role in the system will be provided.

**7.2 Analysis of interactions in Triumph’s ICT system and their impact on Triumph’s performance**

In the following section Triumph’s ICT system will be analysed as a whole by means of map of interactions. Position of each factor in the ICT system, illustrated in the map of interactions, will give valuable information on the influence of each factor on the ICT system. After analysis of Triumph’s map of interactions, factors interacting with informational, strategic, transactional and transformational ICT effects, will be identified and analysed in the subsequent sections.
7.2.1 Position of factors in Triumph’s ICT system

In this section, Triumph’ map of interactions is presented in Figure 7.1 and discussed in subsequent subsections. The map of interactions, as explained earlier, is based on the cross-link matrices. Additionally, factors influencing ICT use are positioned in the system, based on their interactions with other factors in the system. Analysis of the map of interactions will provide valuable information on the ICT system and understanding of ICT effects in Triumph.

Figure 7.1: Triumph’s map of interactions

Legend: zunehmende Aktivität- Degree of Activity; zunehmende Vernetzung- Degree of Interrelation
In order to unpack the information contained in the figure above, it will be analysed in the next subsections. This analysis will identify the structure of Triumphs’ map of interactions, drivers as well as the outcomes of the interactions in Triumph’s ICT system, and factors which determine its essence. More detailed explanation on interpretation of map of interactions is provided in Chapter 5, and summarised in Table 5.5.

**Structure of Triumph's map of interactions**

The structure of the map of interactions gives information on Triumph’s ICT system, based on the degree of activity (x-axes) and degree of interrelation (y-axes) of each factor, which has been explained in Chapter 5. Triumph’s map of interactions, is well differentiated by the degree of interrelation and less by the degree of activity. This is seen in Figure 7.1, in regards to a number of factors which are positioned around the middle line which divides the map to the left and the right side. Triumph’s ICT system has more active factors, which are positioned on the right hand side (13), in comparison to 10 passive factors positioned on the left hand side. This can be interpreted that the ICT system can be influenced and changed, but to a lesser degree.

**Outcomes of Triumph’s ICT system**

The second dimension of the map of interactions deals with the outcomes of Triumph’s ICT system. These are factors which are passive and dynamic, and are positioned on the left side of the map of interactions. In Triumph’s ICT system these factors are ICT utilisation (Factor 5), informational ICT effects (F20), and ICT integration (F1). Less dynamic outcomes of the system are ICT compatibility (F2), users’ ICT knowledge (F8), and transactional ICT effects (F22). The fact that they are passive factors means that these factors are mainly influenced by other factors. Therefore, they change in response to any change in the system. Consequently, these factors can be used as indicators of a change in the system.

The fact that ICT utilisation is highly related to all factors in the system is a plausible finding. It means that ICT utilisation in Triumph is not static, linear, but on the contrary, it is a dynamic process influenced by constantly
changing interactions in the system. Another outcome of Triumph’s ICT system is realisation of informational ICT effects. This factor is a very important factor in the system which has a profound impact on other factors in the system.

Factor users’ ICT knowledge is another outcome of the Triumph’s ICT system. However, that factor is an inhibitor, which prevents the system to realise its full capabilities. Consequently, by enhancing users’ ICT knowledge the performance of Triumph’s system might improve as a result. This indicates that inhibiting factors should be managed in an attempt to improve the system’s performance.

Another passive and moderately interrelated factor in the system is transactional ICT effects. This finding implies that interactions in Triumph’s ICT system result in efficient business processes. This has been explained in Chapter 6 in more detail. However, this factor does not influence the system as much.

Processes maintaining the identity of Triumph’s ICT system
The third dimension of the map of interactions shows the processes which maintain the identity of Triumph’s ICT system. In other words, the essence of the ICT system is defined and characterised by these factors. Additionally, they are positioned on the middle vertical line which divides the map of interactions on the left and right side. Based on Figure 7.1, factors which create the essential identity of Triumph’s ICT system, are, namely organisational strategies (F12), informational ICT effects (F20), managers’ support (F11), and strategic ICT effects (F21).

It is understandable that organisational strategies guide and influence the rest of the system, since strategies at Triumph are strictly followed by the whole system. In addition, managers highly support all activities related to achieving the organisation’s goals. Thus, based on the organisational strategies, managers invest and allocate the resources with a purpose to achieve them. Since one of the most important priorities in Triumph is using
ICT in a way to support organisational processes, Triumph’s managers have invested a lot of money, time and efforts in it.

In addition, informational and strategic ICT effects proved to be very important factors for Triumph. In fact, it determines the specific nature of its ICT system. For example, instant availability of reliable, accurate information supports efficiency of business processes as well as achievement of organisational goals. Furthermore, strategic ICT effects, such as relationships with customers and suppliers, characterises Triumph’s business philosophy and objectives. That is, structured and highly organised information flow supports fast consideration of customers’ orders and requirements.

Goals of Triumph’s ICT system
The fourth dimension identifies the initial long-term and actual short-term drivers of the system. These drivers are active factors, which exert more influence on the system than the system influences them. The short-term drivers at Triumph are active and dynamic factors which are positioned in the top right quadrant in the map of interactions: managers’ support (F11) and organisational strategies (F12). These factors can potentially change the system in a short time period, if they were impacted upon. This means that Triumph’s ICT system could change very quickly with the change in organisational strategies, and with the change in focus of managers’ support.

Factors which could potentially change the system, although in a longer time period are active and moderately dynamic. They are positioned in the middle of the map of interactions on the right-hand side: alignment between ICT and organisational strategies (F15) and IT support (F14).

Furthermore, the long term drivers in Triumph’s ICT system are active factors which are less interrelated. They are positioned in the bottom right quadrant in the map of interactions. They are identified as, namely organisational culture (F13), ICT openness (F3), and managers’ ICT knowledge (F10). This can be interpreted in a way that highly specialised organisational culture; ICT openness that resulted in a flexibility and
adaptability of the system; as well as managers awareness of ICT potential have been driving the system towards achieving its goals. Furthermore, by influencing any of these factors, the effects on the rest of the ICT system would be seen over a longer period of time. Therefore, influencing these factors, with a purpose to change the system, may be favourable to the decision makers, since they can control the change process easily.

Trends in Triumph’s ICT system
The fifth dimension of Triumph’s map of interactions considers what would happen if no changes occurred in the system. The focus of this analysis is on the least interactive factors, which are positioned in the bottom of both left and right quadrants in the map interactions. They are, namely transformational ICT effects (F23), trends in the market (F19), suppliers (F18), customers (F17), ICT seminars (F16), users’ attitudes toward ICT (F9), users’ motivation (F7), users’ age and previous ICT experience (F6), and ICT user friendliness (F4). In other words, environmental and individual group of factors would greatly influence the system if there were no changes in it. These factors work behind the scenes at Triumph’s ICT system.

The position of transformational ICT effects, in the system, implies that it influences the system to a lesser degree. As mentioned earlier, Triumph’s system goal was not intended to be transformational in nature.

Another factor, age and previous ICT experience, is the most interrelated inhibiting factor at Triumph’s ICT system. The result of a higher degree of activity of an inhibiting factor is a lower performance of the system, and vice versa. Based on this fact, this factor influences, not only the users and their ICT use, but it also inhibits the whole system. Lack of ICT seminars also inhibits the system. If users have not been provided with ICT seminars, they could not fully use ICT applications, which would again have a negative impact on the rest of the system.

The last factor to be considered from this perspective is ICT user friendliness. Although it is weakly interrelated with other factors, it
influences the system. Furthermore, if no changes occurred in the system, lack of user friendliness would inhibit the system.

As a result of interactions between factors in Triumph’s ICT system, intended ICT goals, namely informational, strategic and transactional ICT effects have been achieved. This is further explained in the table below, and supported with interviewees’ quotations.

Table 7.1: Realised ICT effects at Triumph

<table>
<thead>
<tr>
<th>ICT effects</th>
<th>Explanation</th>
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<tbody>
<tr>
<td><strong>Informational</strong></td>
<td>“Mars makes everything faster and more efficient. It provides an efficient communication and information sharing portal” (BoD1). Mars “gives us new possibilities and is a base for the improved data analysis” (IT-M). “Many improvements are introduced with Mars: we are all networked, there is no rewriting and therefore less errors, documents are done automatically and much faster. It improved our productivity” (E2).</td>
</tr>
<tr>
<td><strong>Strategic</strong></td>
<td>“Mars is a tool that provides more quality; it gives us data about the trend of costs, where we should take actions, so we can make faster decisions” (IT-M). “We are satisfied with it because we have instant access to data about costs in real time which helps top managers to make decisions... they can analyse trends in business what gives us a whole range of new possibilities” (IT-M). Mars “gives quality to our financial and physical information about the product and enables us to do some predictions and comparisons or contrasts with others” (IT1). BoD2 explained “we use Mars maximally for planning, control and offering free capacities to achieve higher revenues”.</td>
</tr>
<tr>
<td><strong>Transactional</strong></td>
<td>IT-M “faster in getting the documentation done and therefore we can finish each product sooner”. Mars improved business efficiency of company’s resources by planning and selling free capacities “three years ahead” (BoD3). “Mars entirely covers the whole production process and completely satisfies all the needs in that process” (E9). BoD1 stated Mars “is efficient and reliable and enables better overall control. All this gives us advantage in doing our work. That is big improvement of our organisation and efficiency and I do not know how we would manage without it anymore”.</td>
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</table>
| **Transformational** | BoD1 concluded “The most important changes have happened in people's heads and work methods”.

Based on the table above, it can be concluded that achieving the transformational ICT effects did not play a significant role at Triumph. This
might be a result of highly efficient business processes and organisational culture which was open to utilisation of ICT before implementation of ICT. Thus, there was no need for further changes in any of those areas.

In the following sections the interactions between ICT effects and factors influencing ICT use will be analysed and discussed in more detail.

### 7.2.2 Factors influencing ICT effects in Triumph

Factors influencing each group of ICT effects are outlined in the table below with regards to their impact on each group of ICT effects. Discussion on the interactions between ICT effects and factors influencing ICT use is presented in the subsequent paragraphs.

#### Table 7.2: Factors influencing ICT effects at Triumph

<table>
<thead>
<tr>
<th>Groups of factors</th>
<th>ICT effects</th>
<th>ICT effects</th>
<th>ICT effects</th>
<th>ICT effects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Informational</td>
<td>Strategic</td>
<td>Transactional</td>
<td>Transformational</td>
</tr>
<tr>
<td>Technological</td>
<td>ICT integration, ICT compatibility, ICT openness, ICT user friendliness</td>
<td>ICT integration, ICT compatibility, ICT openness</td>
<td>ICT integration, ICT openness</td>
<td>ICT integration, ICT openness</td>
</tr>
<tr>
<td>Individualistic</td>
<td>ICT utilisation, Users’ ICT knowledge, Managers’ ICT knowledge, Managers’ support</td>
<td>ICT utilisation, Managers’ ICT knowledge, Managers’ support</td>
<td>ICT utilisation, Users’ ICT knowledge, Managers’ ICT knowledge, Managers’ support</td>
<td>ICT utilisation, Managers’ support</td>
</tr>
<tr>
<td>Organisational</td>
<td>Organisational strategies, Organisational culture, IT support, Alignment between ICT and organisational strategies</td>
<td>Organisational strategies, IT support, Alignment between ICT and organisational strategies</td>
<td>Organisational strategies, Alignment between ICT and organisational strategies</td>
<td>None</td>
</tr>
<tr>
<td>Environmental</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>ICT effects</td>
<td>Strategic, Transactional and Transformational ICT effects</td>
<td>Informational, Transactional and Transformational ICT effects</td>
<td>Informational Strategic and Transformational ICT effects</td>
<td>Informational ICT effects</td>
</tr>
</tbody>
</table>

*Source: Cross-link matrices (Appendix 4)*
Based on the table above, the following discussion is arranged into five subsections, with a purpose to make it more reader friendly. In each of the subsequent sections a specific group of factors is analysed in terms of its influence on ICT effects.

**Technological group of factors influencing ICT effects at Triumph**

As it can be noted in Table 7.2 two technological factors are important for achieving all four groups of ICT effects in Triumph. These factors are ICT integration with business processes, and ICT openness, which allows further adaptations and upgrades of ICT applications. Apart from these factors, compatibility of ICT applications influences realisation of informational and strategic ICT effects in Triumph. That is, ICT compatibility enables efficient communication and data sharing between ICT applications, which are the foundation for realisation of informational and strategic ICT effects. ICT user friendliness is important for achieving informational ICT effects. Since ICT in Triumph is perceived as not a user friendly system, users forget to put some data in the system, or do it inappropriately. This leads to the errors in the system and diminishes informational ICT effects.

**Individual group of factors influencing ICT effects at Triumph**

ICT utilisation, which has been discussed in Chapter 6, influences achievement of all four groups of ICT effects at Triumph. Additionally, managers’ ICT knowledge and managers’ support influences realisation of ICT effects, by investing in technology and complementary ICT investments. Realisation of informational and transactional ICT effects at Triumph is influenced by users’ ICT knowledge. In other words, users with higher ICT knowledge are able to utilise ICT to a greater extent which consequently, leads to realisation of ICT effects.

**Organisational group of factors influencing ICT effects at Triumph**

Two organisational factors, which influence informational, strategic and transactional ICT effects at Triumph, are organisational strategies and alignment between ICT and organisational strategies. This finding supports the argument developed in the literature review (Ch 3) that organisations with a developed plan for utilising ICT achieve higher ICT effects. It also
supports the underlying argument of a contingency approach that alignment between ICT and organisational goals results in achieving higher ICT value. In addition, IT support influences realisation of informational and strategic ICT effects at Triumph. As discussed in Chapter 6, adapting ICT to users’ requests has both an enabling and inhibiting impact on informational ICT effects. It improves users’ ICT knowledge on one hand, and on the other hand, it creates more screens, which makes ICT less user friendly. Organisational culture enables achieving informational ICT effects at Triumph by facilitating users to learn to use ICT and to use it to a greater extent.

As seen in Table 7.2, transformational ICT effects are not influenced by any of the organisational factors. In other words, the interaction between factors in Triumph’s ICT system does not result in realisation of this group of ICT effects. This finding implies that organisational context at Triumph is efficient, structured, organised, and for this reason, there is no need for any changes in regards to organisational structure, processes, culture or work methods.

Environmental group of factors influencing ICT effects at Triumph
ICT effects at Triumph are not influenced by the environmental group of factors. This might be due to Triumph’s proactive approach towards investments into technology and people.

Interactions among each group of ICT effects at Triumph
Apart from interactions with other factors, ICT effects interact with each other as well. It can be seen from Table 7.2 that informational ICT effects enables achieving other groups of ICT effects. It is the foundation for keeping track of all the scheduled deadlines for purchases and deliveries, better planning and comprehensive insights into business and production processes. Similarly, transformational ICT effects at Triumph support achievement of other groups of ICT effects. This can be interpreted in a way that creation of ICT value requires changes in business processes, and work methods. Additionally, realisation of transactional ICT effects further strengthens both informational and strategic ICT effects. On the other hand,
strategic ICT effects enable achievement of transactional and informational ICT effects. In summary, fast access to accurate information and realisation of organisational goals reduces costs, time and improves efficiency of Triumph’s business processes.

7.2.3 Influence of ICT effects on other factors in Triumph

As explained in Chapter 2, ICT system is characterised with feedback. Change in one part of a system leads to changes in other parts of the system. Thus, it is not only that factors influence ICT effects, but ICT effects influence other factors in the ICT system as well. Therefore, the purpose of this section is to identify and discuss which ICT effects influence which factors (Table 7.3). The discussion is organised into four subsections focusing on each group of ICT effects and their influence on other factors.
Table 7.3: Influence of ICT effects on other factors in Triumph’s ICT system

<table>
<thead>
<tr>
<th>ICT effects</th>
<th>Technological</th>
<th>Individual</th>
<th>Organisational</th>
<th>Environmental</th>
<th>ICT effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Informational</td>
<td>ICT integration, ICT compatibility, ICT user friendliness</td>
<td>ICT utilisation, Users' ICT knowledge, Managers' support</td>
<td>Organisational strategies, Organisational culture, ICT seminars (-)</td>
<td>Customers, Supplier</td>
<td>Strategic, Transactional and Transformational</td>
</tr>
<tr>
<td>Strategic</td>
<td>ICT integration, ICT compatibility, ICT openness</td>
<td>ICT utilisation, Users' ICT knowledge, Managers' ICT knowledge, Managers' support</td>
<td>Organisational strategies, Alignment between ICT and organisational strategies</td>
<td>Customers</td>
<td>Informational and Transactional</td>
</tr>
<tr>
<td>Transactional</td>
<td>None</td>
<td>ICT utilisation, Users' ICT attitudes, Managers' support</td>
<td>Organisational strategies, Alignment between ICT and organisational strategies</td>
<td>None</td>
<td>Informational and Strategic</td>
</tr>
<tr>
<td>Transformational</td>
<td>None</td>
<td>ICT utilisation, Managers' support</td>
<td>Organisational strategies, Organisational culture, IT support (-)</td>
<td>None</td>
<td>Informational, Strategic and Transactional</td>
</tr>
</tbody>
</table>

Source: Cross-link matrices (Appendix 4)
Informational ICT effects at Triumph

As seen in the table above, informational ICT effects influence all groups of factors. They influence ICT applications to be even more integrated and compatible. However, achievement of informational ICT effects leads to issues with ICT user friendliness at Triumph. That is, enhanced and faster information flow in the organisation, with the current organisation of ICT applications (having many screens), perpetuates the users’ perception of ICT as not being user friendly. Additionally, informational ICT effects influence ICT utilisation, lead to better ICT knowledge of users, and managers’ support. It is because of the fact that informational ICT effects improve users’ ICT knowledge that there is less need for ICT seminars. This is illustrated with a negative relationship between these two factors in Table 7.3.

This group of ICT effects is also a foundation for achieving organisational strategies and strengthening of the organisational culture. As a result of a high level of informational ICT effects at Triumph, relationships with customers and suppliers are even better. Communication with them is fast and effective. Furthermore, all other groups of ICT effects are enhanced as a result of realised informational ICT effects.

Strategic ICT effects at Triumph

Strategic ICT effects, such as competitive positioning, influence all other factors in Triumph’s ICT system, especially, ICT integration, compatibility and openness.

In addition, they determine ICT utilisation at Triumph; enhance managers’ support and knowledge of ICT, as well as users’ ICT knowledge. Realised strategic ICT effects imply achieving of organisational strategies and better alignment between ICT and organisational strategies. Furthermore, as a result of achieving strategic ICT effects, informational and transactional ICT effects are enhanced.
Transactional ICT effects at Triumph

In contrast to informational and strategic ICT effects, transactional ICT effects do not influence any of the technological and environmental factors. Achieving transactional ICT effects at Triumph has been identified as one of the company’s goals. Therefore, managers at Triumph put great emphasis on ICT, and support its utilisation. As a result of realisation of transactional ICT effects, ICT is utilised in a way to reduce the costs, and time of business processes; and users are more ready to utilise ICT in their work. This group of ICT effects directly influences users’ awareness of ICT benefits, which makes them more inclined toward accepting ICT. Transactional ICT effects also influence achievement of organisational goals, and alignment between ICT and organisational strategies. Furthermore, they enhance informational and strategic ICT effects.

Transformational ICT effects at Triumph

The main transformational ICT effects at Triumph are related to work methods and users’ attitudes. Improvement in these areas influenced users to be more accepting toward ICT utilisation. This group of ICT effects influenced Triumph’s managers to invest more into ICT, and it increased users’ ICT knowledge. Furthermore, it supports better relations with customers and suppliers. However, transformational ICT effects do not influence any of the technological factors. This might be simply due to state of the art technology which supports any changes. On the other hand, this group of ICT effects influences organisational strategies and organisational culture. In other words, it is because of strict control of any eventual change that take place at Triumph, that both organisational culture and strategies are further supported. Furthermore, the limited changes at Triumph are the reason that IT seminars are not being rerun. Thus, the relationship between these two factors is a negative one, as seen from Table 7.3. There is simply no need for changing ICT utilisation. Any additional question in terms of ICT utilisation that employees might have, are answered by the IT Division. Transformational ICT effects influence achievement of other groups of ICT effects, since realisation of these groups of ICT effects requires some form of change in regards to the organisational processes and structure.
Concluding remarks

The analysis of Triumph’s map of interactions provides more insights into how the interactions between factors influencing ICT use impact on Triumph’s organisational performance. The position of each factor in the map of interactions, helped in answering the research question. Interactions between factors influencing ICT use at Triumph resulted in achieving informational, strategic and transactional ICT effects. In addition, it is the organisational culture open to changes technology; as well as constant adjustments and co-evolution between ICT and business processes which ultimately, influenced Triumph’s success with utilising ICT applications.

They enable better communication, data sharing and collaboration with customers and suppliers. It is due to the realisation of these ICT effects, that Triumph has such a highly organised and efficient ICT system. These three groups of ICT effects are simply the result of the interactions in the ICT system. It can be concluded that ICT applications in Triumph indeed improve the organisational performance. That is, the interactions between factors influencing ICT use impact the organisational performance by improving its informational, strategic and transactional aspects.

7.3 Analysis of interactions in Eagle’s ICT system and their impact on Eagle’s performance

After identifying factors influencing ICT use at Eagle, presented in Chapter 6, their interactions with ICT effects are analysed in this section. The interpretation of their interactions transforms the understanding of Eagle’s ICT system, presented in the previous chapter, into more focused information in regards to how ICT impacts the company’s performance.

7.3.1 Position of factors in Eagle’s ICT system

Factors influencing Eagle’s ICT system will be discussed in this section. Map of interactions, presented in Figure 7.2, positions each factor in relation to other factors in the system. The information on Eagle’s ICT system, contained in the map of interactions, will be analysed in the subsequent sections.
**Legend:** zunehmende Aktivität- Degree of Activity; zunehmende Vernetzung- Degree of Interrelation

Eagle’s map of interactions will be discussed below in terms of five different dimensions, namely structure of the map of interactions, drivers, outcomes, identity and trends of Eagle’s ICT system. These dimensions have been explained in more detail in Chapter 5, and specifically in Table 5.5.
Structure of Eagle’s map of interactions

It is seen in Eagle’s map of interactions, presented above, that majority of factors are positioned on its left side. This means that these factors are passive. The map of interactions is well differentiated by the degree of interrelation but less by the degree of activity. This means that the system is not very easy to steer. Furthermore, there is a gap in the middle of the map on the right side, in terms of factors. This indicates that the system has only small negative feedback, meaning the system is a dynamic one. This implies that the system can be influenced either by enforcing the positive development- integrating ICT and making it compatible; or lowering the negative one- reducing the impact of organisational culture, users’ ICT knowledge.

The striking characteristic of the map of interactions is that there is actually only one real activator for positive dynamic in the system. That factor is ICT compatibility, which therefore, should be given priority in the problem solving process. The lack of ICT compatibility has been discussed in Chapter 6. Compatibility of ICT applications would result in fewer mistakes, faster sharing of information, easier communication, and access to relevant, accurate and timely information. This will be discussed later.

Outcomes of Eagle’s ICT system

The second dimension of the map of interactions encompasses the outcomes of the system. More specifically, the outcomes of the system are highly and moderately interactive passive factors. Based on the Eagle’s map of interactions, these are, namely ICT integration (F1), ICT utilisation (F5), organisational culture (F12), informational ICT effects (F20), strategic ICT effects (F21), transactional ICT effects (F22) and transformational ICT effects (F23). As passive factors, they are influenced by the system as a whole and consequently, they change in reaction to any change in the system. Therefore, they are important as indicators for monitoring the transformational processes at Eagle.
ICT integration is the most interrelated passive factor at Eagle’s ICT system. This means that lack of ICT integration, although it is a passive factor, constrains the rest of the system.

Another highly interrelated passive factor in the system is transformational ICT effects. This means that it is influenced by many factors in the system. Moderate interactions of transactional ICT effects with the other factors in the system imply that this factor is not emphasised as much as it should be at the Eagle’s ICT system. Informational and strategic ICT effects are also passive factors at Eagle’s ICT system. This means that realisation of all four groups of ICT effects is determined by the interactions in the system. Thus, realisation of ICT effects at Eagle will depend on the factors on the active factors which are positioned on the right-hand side of the map. This will be discussed in more detail, in the subsequent subsection.

ICT utilisation, organisational culture and transactional ICT effects are moderately influenced by the system. In addition, the way ICT is being utilised at Eagle is inhibiting the rest of the system. More specifically, ICT utilisation is determined by the lack of ICT integration and compatibility. Due to this, employees have to do extra work, and spend a lot more time transferring information from one system to another. As a result, there is a lack of automation in ICT utilisation which inhibits the organisational processes.

However, the organisational culture at Eagle is a factor which inhibits the ICT system the most. This is because organisational culture at Eagle is characterised by a lack of organisation and planning. Additionally, each department at Eagle differs in terms of activities, market focus, and ICT applications. That is, ICT applications have been developed separately in each department. As a result of such organisational culture, the IT Department is presented with a challenge in regards to integrating ICT applications and making them compatible with one another, at the organisational level.
Processes maintaining the identity of Eagle’s ICT system

The factors which are positioned on the vertical middle line of the map of interactions, or close to it, maintain the identity of Eagle’s ICT system. These factors are: organisational culture (F12), IT support (F13), alignment between ICT and organisational strategies (F14), suppliers (F17), informational ICT effects (F20), and transformational ICT effects (F23). By changing any of these factors, the Eagle’s ICT system would have to change as well. It can be explained that Eagle’s ICT system is characterised by strong organisational culture which supports separateness, lack of organisation and planning. Another characteristic of the ICT system is a lack of informational ICT effects, which is linked to the emphasis at Eagle on compatibility of ICT applications with the suppliers’ ICT. However, establishment of the IT Department aligns organisational and ICT strategies, and supports transformational ICT effects.

Goals of Eagle’s ICT system

The fourth dimension captured by the map of interactions, identifies the initial long-term and actual short-term drivers of the system. Drivers of the system are those factors which are active, that is, which influence the system more that the system influences them.

The short-term drivers of Eagle’s ICT system are active and dynamic factors. They are positioned in the top right-hand quadrant in the map of interactions: ICT compatibility (F2), managers’ support (F10), and organisational strategies (F11). It is a lack of ICT compatibility at Eagle that has a strong influence on realisation of ICT effects. Factor ICT compatibility alone has a potential to enhance the ICT performance effects at Eagle, by improving informational ICT effects, which are the base for realisation of all other groups of ICT effects. As explained in Chapter 6, change in the BoD’s support and change in the organisational strategies toward ICT acted as a driver in the system- the IT Department was established with a purpose to make ICT integrated and compatible. Based on these two factors, ICT system at Eagle might be transformed, and improved for the better, in the near future.
Additional drivers of Eagle’s ICT system are moderately dynamic factors IT support (F13) and alignment between ICT and organisational strategies (F14). It is due to newly established IT Department at Eagle that the ICT system is being changed in terms of making ICT applications integrated with the business processes and most importantly, compatible with each other. This is not only the IT Department’s goal, but also a foundation for achieving the organisation’s goal, that is, joining the Holding Group. The results, however, will be seen after a period of time, since IT support is a factor which needs more time to influence the system.

Long term drivers in the system are factors employee’s ICT knowledge (F7), trends in the market (F18) and partner company (F19). The effects of these factors on the system are noticed over a long period of time. For example, the influence of a relationship with the partner company resulted in the problems with lack of ICT compatibility at Eagle. Additionally, a passive ICT strategy, which Eagle adopted, makes factor trends in the market important in driving Eagle’s ICT system. Effects of a lack of users’ ICT knowledge, displayed by the mature users who lack ICT experience, can also be noted at Eagle. By improving their ICT knowledge, positive effects would be experienced at the system in the long run.

Although, Eagle’s ICT system is not very easy to change, the driving factors, discussed above, could potentially start the change process. For example, by improving ICT compatibility alone, the entire system would be positively changed, and ICT effects might be realised to a greater extent. A change at Eagle’s ICT system has already started, with managers’ support towards ICT, and establishment of IT Department.

Trends in Eagle’s ICT system
The fifth dimension considers what would happen if no changes occurred in the system. Without changing the factors and their interactions at Eagle’s ICT system, the following factors would determine its functioning: ICT user friendliness (F4), users’ age and previous experience (F6), employees’ ICT knowledge (F7), employee’s ICT attitudes (F8), managers’ ICT knowledge (F9), ICT seminars (F15), and customers (F16). ICT is perceived
as user friendly and users have positive attitudes toward using ICT, which positively influences the system. However, potential lack of ICT seminars, lack of users’ previous ICT experience and consequently ICT knowledge might inhibit the system. Such a situation might influence customers, since this is the most passive factor in the system with a very low interrelation.

Realised ICT effects at Eagle are summarised in the table below.

**Table 7.4: Realised ICT effects at Eagle**

<table>
<thead>
<tr>
<th>ICT effects</th>
<th>Explanation</th>
</tr>
</thead>
</table>
| Informational| E-J1 and E-J2 mentioned technological problems they were encountering—text disappearance, which E-J1 described as “it is the hell for us”!  
IT-M explained employees in the Accounting Department work 15 days to re-enter data from one application to another, while with integrated ICT it could be done in three minutes. |
| Strategic     | Marketing manager (M-M) explained decisions in Eagle “are not based on appropriate and on time information, but on the past period’s analysis”. 
Employee E-S stated ICT application in the newspapers distribution division of the Sale Department provides them with on time information which is the base for decision making processes. 
ICT is compatible with Eagle’s main supplier of newspapers which enables faster and easier communication between Eagle and the main supplier. 
M-S further explained the benefits of integrating newspapers and retail softwares would be on time and accurate data and better control for each sales outlet. |
| Transactional | Positive transactional ICT effects are reported by Marketing manager and employee E-S with the Sale Department’s ICT application supporting the newspapers distribution. Marketing manager explained it reduced the time needed for doing their work “things we use to do in eight days, we are now doing in three days” (M-M). 
In contrast, Sales manager (M-S) explained that not adopting and implementing electronic cash registers created several issues—the lack of control of sale outlets, old information and consequently higher costs: “It is hard to have control over something when it is disintegrated” (M-S). M-S concluded: “Without this software it would be hard for us to achieve the results”. |
| Transformational | N/A |

In order to explain how interaction between factors influencing ICT use impact on Eagle’s performance, their interaction is analysed in the following two sections.
7.3.2 Factors influencing ICT effects in Eagle

The existing problematic situation at Eagle, in terms of the lack of ICT integration and compatibility, inhibits realisation of ICT effects. This will be analysed in this section. For this purpose, factors which influence ICT effects at Eagle have been summarised in the table below.

**Table 7.5: Factors influencing ICT effects at Eagle**

<table>
<thead>
<tr>
<th>Group of factors</th>
<th>ICT effects</th>
<th>Informational</th>
<th>Strategic</th>
<th>Transactional</th>
<th>Transformational</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological</td>
<td>ICT integration, ICT compatibility</td>
<td>ICT integration, ICT compatibility</td>
<td>ICT integration, ICT compatibility</td>
<td>ICT integration, ICT compatibility</td>
<td></td>
</tr>
<tr>
<td>Individualistic</td>
<td>ICT utilisation (-), Managers' ICT knowledge, Managers' support</td>
<td>ICT utilisation (-), Managers' ICT knowledge, Managers' support</td>
<td>ICT utilisation (-), Managers' ICT knowledge, Managers' support</td>
<td>Managers' ICT knowledge, Managers' support</td>
<td></td>
</tr>
<tr>
<td>Organisational</td>
<td>Organisational strategies, Organisational culture (-), Alignment between ICT and organisational strategies</td>
<td>Organisational strategies, Organisational culture (-), Alignment between ICT and organisational strategies</td>
<td>Organisational strategies, Organisational culture (-), Alignment between ICT and organisational strategies</td>
<td>Organisational strategies, Organisational culture (-), IT support, Alignment between ICT and organisational strategies</td>
<td></td>
</tr>
<tr>
<td>Environmental</td>
<td>None</td>
<td>Partner company</td>
<td>None</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>ICT effects</td>
<td>None</td>
<td>Informational, Transactional and Transformational</td>
<td>Informational</td>
<td>Strategic</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Cross-link matrices (Appendix 5)*

Based on Table 7.5, the following section is organised into five subsections, each analysing the influence of one group of factors on ICT effects.

**Technological group of factors influencing ICT effects at Eagle**

Based on Table 7.5, it can be noted that two technological factors influence realisation of all four groups of ICT effects at Eagle. These factors are ICT integration and ICT compatibility. It has been discussed in Chapter 6 that ICT applications at Eagle are not compatible with each other, and consequently, they are not integrated with the business processes. As a
result of the lack of ICT integration and ICT compatibility, all ICT performance effects at Eagle are limited. For example, information sharing in the company occurs with a time lag, resulting in financial losses, and errors in doing business activities. Based on this finding, it can be concluded that by making ICT applications compatible, they would bring significant changes to the organisations performance.

**Individual group of factors influencing ICT effects at Eagle**

As seen from Table 7.5, ICT utilisation has a negative impact on informational, strategic and transactional ICT effects. However, it is not ICT utilisation alone that inhibits these ICT effects. It is inhibited by technological issues, namely the lack of ICT integration and compatibility, which makes ICT utilisation challenging for employees.

Managers are the key to improving ICT issues and achieving ICT effects at Eagle. More specifically, managers’ ICT knowledge, and awareness of ICT possibilities influences them to provide more support in relation to the ICT system. By increasing their awareness of ICT benefits, they might invest more into ICT and manage smooth running of the ICT system.

As explained earlier, it was due to lack of focus of mangers on ICT that ICT had become a legacy system, which did not support organisational strategies. This is evidence of a lack of co-evolution between the organisational and ICT strategies. However, managers at Eagle changed their strategic focus, became aware of ICT benefits, and are working toward solving ICT issues.

**Organisational group of factors influencing ICT effects at Eagle**

Three organisational factors are identified to influence all ICT effects at Eagle: organisational strategies, organisational culture and alignment between ICT and organisational strategies. Eagle is an excellent example of how changes in regards to organisational strategies influence ICT effects. During the period of Eagle’s expansion in terms of its sales outlets, ICT potential at Eagle was disregarded, which resulted in a lack of alignment between ICT and the organisation’s strategy. Change in the organisational
strategy, that is, to join the Holding Group, brought the awareness that ICT is a tool which could be used with a purpose to support organisational strategy.

The only organisational factors which act as an inhibitor in Eagle’s ICT system is organisational culture. More specifically, this factor inhibits realisation of the four groups of ICT effects. It is because of the lack of the well defined roles and functions, as well as independent operations of every department that presents a challenge to solve issues with ICT integration and compatibility at Eagle, and consequently inhibits ICT effects.

Apart from the factors discussed above, IT support influences transformational ICT effects. This is a result of the IT Department’s attempt to solve the ICT issues, which change business processes, users’ way of doing their work, and ICT utilisation.

**Environmental group of factors influencing ICT effects at Eagle**

As shown in the previous table, the partner company is the only environmental factor which influences strategic ICT effects at Eagle. Since the partner company provides printing services for Eagle’s newspapers, it supports Eagle’s monopolistic position in the market.

**Interactions among each group of ICT effects at Eagle**

Based on Table 7.5, informational ICT effects are not influenced by any other group of ICT effects. However, lack of informational ICT effects at Eagle, inhibits realisation of strategic and transactional ICT effects. Fragmentation of information flow at Eagle, increased operation costs and limit communication with customers. In contrast, all groups of ICT effects influence strategic ICT effects. That is, lack of informational, transactional and transformational ICT effects inhibits achievement of Eagle’s goal. Furthermore, strategic ICT effects influence the transformational group of ICT effects. This can be interpreted in a way that strategic position in the market is an impetus for change of organisational plans and business processes at Eagle.
7.3.3 Influence of ICT effects on other factors in Eagle

In this section, ICT effects influence on other factors is analysed. This gives a complementary view to the discussion in the previous section. Factors which are influenced by ICT effects are listed in Table 7.6.

Table 7.6: Influence of ICT effects on other factors in Eagle’s ICT system

<table>
<thead>
<tr>
<th>ICT effects</th>
<th>Technological</th>
<th>Individual</th>
<th>Organisational</th>
<th>Environmental</th>
<th>ICT effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Informational</td>
<td>ICT compatibility</td>
<td>ICT utilisation</td>
<td>IT support</td>
<td>Partner company</td>
<td>Strategic and Transactional</td>
</tr>
<tr>
<td>Strategic</td>
<td>ICT compatibility</td>
<td>ICT utilisation, Managers’ support</td>
<td>Organisational strategies</td>
<td>Partner company</td>
<td>Transformational</td>
</tr>
<tr>
<td>Transactional</td>
<td>ICT integration, ICT compatibility</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Strategic</td>
</tr>
<tr>
<td>Transformational</td>
<td>ICT integration, ICT compatibility</td>
<td>Managers’ support</td>
<td>Organisational strategies, IT support, Alignment between ICT and organisational strategies</td>
<td>None</td>
<td>Strategic</td>
</tr>
</tbody>
</table>

Source: Cross-link matrices (Appendix 5)

Based on the organisation of the table above, the following discussion, in regards to influence of ICT effects on other factors at Eagle’s ICT system, will be structured in the four sections, each discussing a group of ICT effects.

Informational ICT effects at Eagle

The level of realised informational ICT effects at Eagle is low. Due to its interrelation with ICT compatibility, lack of this group of ICT effects influences lack of ICT compatibility. In addition, disintegrated information flow at Eagle has a strong effect on utilisation of ICT. Users have to rewrite data and do double amount of work in order to support information flow. Such a situation puts pressure on IT employees, to solve various emerging ICT issues in order to enable users to do their work. Thus, informational ICT effects inhibit realisation of transactional ICT effects as well. It brings financial losses and lack of efficiency of business processes at Eagle. On the other hand, information flow at Eagle is such that it enables easy
communication with the partner company, sharing articles and consequently, daily printing of Eagle’s newspapers. Therefore, informational ICT effects enable Eagle to maintain its monopolistic position in the market.

**Strategic ICT effects at Eagle**
Change in Eagle’s strategic focus, that is, joining the Holding Group, influenced other factors in the ICT system. As a result, strategic ICT effects influence ICT compatibility, as shown in Table 7.6. More specifically, it puts pressure on Eagle to make ICT applications more compatible. This request is further supported by increased managers’ support in relation to ICT. Additionally, strategic ICT effects at Eagle influence ICT utilisation. Apart from increasing managers’ support, strategic ICT effects also enable realisation of organisational strategies. This group of ICT effects has a strong influence on Eagle’s long and successful relationship with the partner company. Thus, strategic ICT effects brought changes to Eagle’s ICT system. As such, strategic ICT effects lead to realisation of transformational ICT effects.

**Transactional ICT effects at Eagle**
Transactional ICT effects do not influence any of the individual, organisational or environmental group of factors. The reason for this might be that this group of ICT effects is not the company’s priority. Perhaps, it is because of Eagle’s monopolistic position in the market that it is less concerned with financial losses which occur due to lack of transactional ICT effects. This emphasises the point that Eagle is not entirely motivated by financial gain, but with its strategic position in the market. Such a situation further strengthens the lack of ICT integration and ICT compatibility at Eagle. As a result, it inhibits strategic ICT effects.

**Transformational ICT effects at Eagle**
Transformational ICT effects at Eagle are not strong. However, there is a need for change in terms of organisational processes and integrating information flow. As a result of a lack of transformational ICT effects, issues with ICT integration and compatibility are not being solved. On the
other hand, need for change at Eagle is enhanced by managers’ support for ICT. This impetus for organisational change resulted in establishing the IT Department with a purpose to make ICT applications in Eagle compatible and integrated. Thus, transformational ICT effects enable realisation of organisational strategies and alignment of ICT and organisational goals. In summary, this group of ICT effects enables realisation of strategic ICT effects at Eagle.

**Concluding remarks**

Discussion above clarifies the importance of ICT compatibility as the key factor for achieving ICT effects, and improving organisational performance. It is the lack of ICT compatibility at Eagle that resulted in diminishing the informational, strategic and transactional ICT effects. Information is not provided on time, slowing Eagle’s business processes and efficient decision making. In addition, this situation leads to mistakes, lack of complete and on time revenue information, lack of inventory control, which results in fewer ICT effects and financial losses. Eagle misses great opportunities for making higher revenues due to its lack of ICT compatibility.

Due to a lack of compatibility between the ICT applications, ICT effects did not take place at Eagle, and consequently, the company’s performance is not improved. On the contrary, strategic aspect of the company’s performance is inhibited due to the legacy issue with the ICT applications. That is, there is a mismatch between ICT possibilities and organisational vision to join the Holding Group.

By improving ICT compatibility, information at Eagle would become instant, reliable, and easy to share with the rest of the company. This would improve ICT business processes and financial resources. In addition, stronger transactional and transformational ICT effects lead to ICT applications more integrated with organisational processes. In order for Eagle to achieve the strategic and transformational ICT effects, managers’ support is of vital importance.

Eagle’s organisational performance is affected by the interaction between factors influencing ICT use, which has been discussed in the previous
sections. Based on the analysis of Eagle’s map of interactions, it is seen that the interactions in Eagle’s ICT system are not oriented toward achieving any ICT effects. This means that the functioning of Eagle’s ICT system in reality needs to be changed and stirred to reorganise itself toward achieving ICT effects. Findings in the interviews are evidence that the Board of Directors started changing the system toward achieving ICT effects. Based on the structure of Eagle’s map of interactions, this will be a long and painful process. That is, the system is hard to change since each department in Eagle maximises the utilisation of existing ICT applications, adding to the lack of ICT informational ICT effects. Although ICT applications at Eagle differ in terms of how old they are and what they are used for, they are not being underutilised. Since each department has a way to utilise existing old ICT applications, they are not willing to change and upgrade them. Additionally, great interconnectedness of ICT applications in Eagle, as well as the imperative on their compatibility with the partner company and the main supplier, creates a hurdle for changes in the system.

**Figure 7.3: Interconnectedness of Eagle's ICT system**

The figure above depicts how ICT impacts the company’s performance. Since ICT is not integrated and compatible there are low informational ICT effects for Eagle. This group of ICT effects result in low strategic and transactional ICT effects. In turn, all this impacts the organisational processes negatively. At the same time, ICT integration and compatibility are influenced by the organisation’s vision and strategy to join the Holding Group. In order to achieve this, Eagle has to improve transformational ICT effects, by integrating ICT and making it compatible. When this is achieved, Eagle will benefit in realising all groups of ICT effects and improved overall performance.
As it was already explained, organisational strategies and culture influence how the ICT system is performing. IT support at Eagle is focused toward integrating ICT applications with the organisational processes and making ICT applications compatible with one another. These ICT goals at Eagle are part of the organisation’s strategies. It is the alignment between ICT goals and organisational strategies that is the key factor making and breaking the Eagle’s ICT system.

### 7.4 Analysis of interactions in Falcon’s ICT system and their impact on Falcon’s performance

The focus of the following analysis is on the interactions between factors influencing ICT use and the four groups of ICT effects at Falcon. In the first section, position of each factor in the ICT system is analysed in regards to their influence on the rest of the system. The focus in the second section is on the factors which influence ICT effects. The feedback process, that is, influence of ICT effects on other factors in the ICT system is analysed in the third section.

#### 7.4.1 Position of factors in Falcon’s ICT system

In order to describe the ICT system at Falcon in terms of the interaction between factors influencing ICT use, map of interaction was created based on the cross-link matrices. By doing so, each factor is positioned in the system based on their interaction with the system. Discussion on interpretation of the position of each factor in the system has been provided in Chapter 5 as summarised in Table 5.5.
**Figure 7.4:** Falcon’s map of interactions

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**Legend:** zunehmende Aktivität- Degree of Activity; zunehmende Vernetzung- Degree of Interrelation

The diagram presented above will be analysed and discussed in the subsequent subsections, in terms of its structure, as well as outcomes, drivers, identity and trends of ICT system at Falcon.
Structure of the map of interactions

The first dimension of the map of interactions explains its structure. Falcon’s map of interactions is well differentiated by the degree of activity, and less by the degree of interrelation (as seen in the figure above, the pointy outliner part). In other words, there are 12 active and 9 passive factors in the system. This means that the system could be easily influenced and changed.

Outcomes of Falcon’s ICT system

The second dimension of the map of interactions is dealing with the outcomes of the system, that is, passive and dynamic factors. The outcomes of the interactions between the factors influencing ICT use at Falcon’s ICT system are: transactional ICT effects (F22), strategic ICT effects (F21), and alignment between ICT and organisational strategies (F15). Furthermore, less dynamic passive factors (outcomes) are managers’ support (F11) and users’ ICT knowledge (F8).

These factors are passive, which means that they are influenced by the system as a whole more than they exert their influence on the system. Since these factors are changed as a consequence of any change in the ICT system, they are important indicators for monitoring the transformational processes at Falcon.

Processes maintaining the identity of Falcon’s ICT system

The third dimension of the system shows the processes which are maintaining the identity of the system. The factor which are the closest to the middle line of the system, which divides the map of interactions to the left and the right-hand side, maintain the identity of the system. In the case of Falcon, these factors are namely managers’ support (F11) and ICT compatibility (F2). This indicates that compatibility of ICT applications across the organisation enables real communication between customers’ requirements, production and warehouses around Croatia. This is the core of Falcon’s business. Furthermore, the position of the factor managers’ support, in the map of interactions, provides understanding that it is very
Organisational culture (F13) is a factor, which is positioned near the middle vertical line, important for this discussion. Relaxed and somewhat passive organisational culture influences the entire system to become less efficient and unorganised. However, this influence is not apparent in the company, due to managers’ impact on the system. In addition, factors ICT utilisation (F5), informational ICT effects (F20) and transactional ICT effects (F22), which are also positioned close to the middle vertical line in the map, add to this discussion. In other words, it was ICT utilisation, transparency of organisational processes, and awareness of ICT benefits that reduced the influence of the organisational culture on the system. Efficiency and transparency of the business processes, which was a result of instant availability of reliable and accurate information, is what made it impossible for the employees to continue supporting such passive organisational culture. Instead, they accepted their share of responsibility in terms of efficiency of organisational processes, which supports more efficient organisational culture. Therefore, these factors determine the essential identity of the ICT system at Falcon.

Goals of Falcon’s ICT system
The fourth dimension captured by Falcon’s map of interactions, identifies the initial long-term and actual fast-term drivers of the system. The difference between the time impacts of the drivers is determined by the degree of activity of the factors in the system. Factors which are more active need less time to influence the system. The short-term drivers at Falcon are active and dynamic factors, positioned in the top right quadrant in the map of interactions: informational ICT effects (F20), ICT utilisation (F5). Additionally, organisational culture (F13) and IT support (F14) are moderately dynamic factors, and consequently, they would need more time to change the system.

Factors which need more time to influence Falcon’s ICT system are namely other departments (F18), ICT integration (F1), organisational strategies
(F12), trends in the market (F19), and ICT openness (F3). This can be interpreted in a way that relationship between the Sales and Production Departments influence on the system will be evident in a few years time. Trends in the market and even organisational strategies need a long time to influence the system. This finding might reflect bureaucratic organisational structure. Furthermore, the findings imply that technological characteristics, namely ICT integration and openness, influence the system to be the way it is.

Identification of these factors might be of great importance for the management of the company, due to its practical role. That is, these factors influence the rest of the system, as well as realisation of transactional and strategic ICT effects. In order to change the outcomes of the ICT system, identified earlier, the management of the company could influence any of the factors which have been identified as the drivers of the system.

**Trends in Falcon’s ICT system**

The fifth dimension of the map of interactions considers what would happen if no changes would occur in the system. That is, without the impact of the drivers on the system, the least interactive factors would influence the system. Thus, the trends in Falcon’s ICT system are determined by the factors which are positioned in the bottom of the map of interactions. These are: transformational ICT effects (F23), customers (F17), ICT seminars (F16), managers’ ICT knowledge (F10), users’ attitudes toward ICT (F9), motivation (F7), users’ age and previous ICT experience (F6) and ICT user friendliness (F4).

Based on the above identified factors, the trends in the system can be identified as follows. The system is aiming toward better relationships with customers, low level of changes and more ICT seminars. Furthermore, unique individual factors, such as managers’ ICT knowledge, users’ positive attitudes toward ICT, motivation and previous experience with using ICT, explain the trend in Falcon’s system in regards to accepting technology. ICT user friendliness enhances this trend.
The analysis of Falcon’s map of interactions identified that realisation of the strategic and transactional ICT effects is the outcome of the system. The actual goal of Falcon’s ICT system is strengthening the informational ICT effects. Furthermore, informational and transactional ICT effects are key factors which determine the essential identity of Falcon’s ICT system. On the other hand, transformational ICT effects influence the system in the long run. ICT effects which took place at Falcon are identified in Table 7.6.

Table 7.7: Realised ICT effects at Falcon

<table>
<thead>
<tr>
<th>ICT effects</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Informational</td>
<td>E5 emphasised “there is no rewriting of data”. The major ICT benefit is that information on production and sales is available immediately. He also said “it all costs, a lot”. MC stated “It would be impossible to organise production processes without it. It enables better communications between departments, sharing of information and instruction and plan circulation…in every moment we know what is going on in each department…every turkey and its weight is in the system”.</td>
</tr>
<tr>
<td>Strategic</td>
<td>Most importantly, ICT is of great importance in achieving the strategic ICT effects by aligning Falcon's production with the customers' needs.</td>
</tr>
<tr>
<td>Transactional</td>
<td>ICT introduced better control in the Production Department and the organisation which lowered organisational costs since “every gram of meat used in the production process is important for profitable business” (M1). MI noted ICT integrated organisational processes, resulting in the reduction of the organisational costs which improved the Production Department’s productivity.</td>
</tr>
<tr>
<td>Transformational</td>
<td>MI and M5 noted ICT integrated organisational processes, improved the efficiency of employees and changed the organisational culture.</td>
</tr>
</tbody>
</table>

It will be explained in the next section which factor influence realisation of ICT effects.

7.4.2 Factors influencing ICT effects in Falcon

In this section, factors which influence each group of ICT effects are identified and analysed. The purpose of that analysis is to provide understanding and insights into how the interaction between these factors influences the company’s performance. Factors, according to their influence on each group of ICT effects, are identified and presented in the following table.
Table 7.8: Factors influencing ICT effects at Falcon

<table>
<thead>
<tr>
<th>Group of factors</th>
<th>Informational</th>
<th>Strategic</th>
<th>Transactional</th>
<th>Transformational</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological</td>
<td>ICT integration, ICT compatibility, ICT openness and ICT user friendliness</td>
<td>ICT integration, ICT compatibility</td>
<td>ICT integration, ICT compatibility</td>
<td>None</td>
</tr>
<tr>
<td>Individualistic</td>
<td>ICT utilisation, Managers’ ICT knowledge</td>
<td>ICT utilisation, Managers’ support</td>
<td>ICT utilisation, Managers’ support</td>
<td>Managers’ support (-)</td>
</tr>
<tr>
<td>Organisational</td>
<td>Organisational strategies, Organisational culture, IT support, Alignment between ICT and organisational strategies, Other departments</td>
<td>Organisational strategies, Organisational culture, IT support, Alignment between ICT and organisational strategies, Other departments</td>
<td>Organisational strategies (-), IT support, Alignment between ICT and organisational strategies</td>
<td>None</td>
</tr>
<tr>
<td>Environmental</td>
<td>None</td>
<td>None</td>
<td>Customers (-)</td>
<td>None</td>
</tr>
</tbody>
</table>

Source: Cross-link matrices (Appendix 6)
The most visible finding in the table above is that none of technological, organisational and environmental factors influences transformational ICT effects. This means that organisation of Falcon’s ICT system does not lead to realisation of this group of ICT effects. Thus, it can be concluded that Falcon’s aim is not to achieve transformational group of ICT effects.

In each of the following five sub-sections, each group of factors influencing ICT use will be discussed in relation to their impact on ICT effects.

**Technological group of factors influencing ICT effects at Falcon**
Based on the findings, illustrated in Table 7.8, integrated and compatible ICT applications at Falcon enable realisation of informational, strategic and transactional ICT effects. In addition, ICT openness positively influences informational and strategic ICT effects. This ICT feature enables adaptations of ICT applications to various requirements from both the external and organisational environments. Furthermore, ICT user friendliness at Falcon, together with fully integrated, compatible, and open ICT applications results in seamless information flow. Such flow of information has been enabling realisation of informational ICT effects at Falcon. In contrast, technological factors do not influence transformational ICT effects in Falcon.

**Individual group of factors influencing ICT effects at Falcon**
ICT utilisation is an impetus for achieving informational, strategic and transactional ICT effects. In other words, efficient and effective utilisation of ICT at Falcon is the foundation for realisation of three groups of ICT effects. This finding explains that ICT utilisation in Falcon leads to realisation of ICT effects. In addition, factor managers’ support influences realisation of strategic and transactional ICT effects. This indicates that managers at Falcon are aware of these ICT effects and utilise ICT with a purpose to achieve those effects. Thus, ICT goals, as well as its utilisation, are related to supporting Falcon’s position in the market, reducing operational costs and improving efficiency of business processes.
Additionally, the level of managers’ ICT knowledge and awareness of potential ICT benefits, influence informational ICT effects. This finding implies that realisation of this group of ICT effects, is related to managers understanding ICT possibilities in relation to business needs. However, factor managers’ support is found to have a negative relationship with transformational ICT effects at Falcon. This can be interpreted in a way that the focus of managers efforts are related to strengthening the existing nature of business processes and organisational culture. They are not supporting changes to organisational structure, processes or culture.

Organisational group of factors influencing ICT effects at Falcon
Realisation of informational, strategic and transactional ICT effects at Falcon is enabled by IT support, organisational strategies and alignment between ICT and organisational strategies. As discussed in the previous chapter, successful collaboration between Falcon and the company ICE, which is IT service provider, has several benefits for Falcon. For example, it resulted in implementation of those ICT applications, which are most beneficial for Falcon’s business processes. Consequently, ICT at Falcon supports realisation of the company’s strategies, and aligns ICT with organisational strategies.

Furthermore, factor other departments is a strong enabler of informational and strategic ICT effects. Due to efficient organisation of business process, instant communication between the Sales and the Production Departments determines successful and efficient operations. Their collaboration also determines customers’ satisfaction, and consequently, Falcon’s position in the market. Additionally, organisational culture, which has been discussed earlier, supports realisation of informational ICT effects.

However, Falcon’s organisational strategies inhibit realisation of transactional ICT effects. As previously discussed, Falcon produces low profit products and sells them to supermarket chains, with the option for the customers to return the products within the expiry date. Such strategy results in financial losses and consequently, diminishes transactional ICT effects.
Additionally, it does not lead to full utilisation of the expertise and innovativeness of the Production Department team.

Environmental group of factors influencing ICT effects at Falcon Customers, is the only environmental factor which influences realisation of ICT effects at Falcon. More specifically, it negatively influences transactional ICT effects. As explained in the previous subsection, Falcon provides its customers with the possibility of returning the meat products back to Falcon, within the expiry date. Such collaboration creates benefit for the customers. However, Falcon incurs huge costs of disposing of the products. This diminishes the transactional ICT effects at Falcon.

Interactions among each group of ICT effects at Falcon
Strengthening of the transactional ICT effects leads to realisation of transformational ICT effects, as identified in Table 7.8. This finding means that the costs which Falcon incurs, as a result of its collaboration with customers, gives rise to changes at Falcon. The only impetus for organisational change is improvement of financial results.

On the other hand, all groups of ICT effects influence realisation of transactional ICT effects. This finding implies that the source of the organisational financial viability is identified, not only outside the company, but also in regards to efficiency of organisational processes and reduction of operational costs. In addition, strategic and transactional ICT effects result in strengthening of informational ICT effects, that is, seamless informational flow at Falcon.

Informational, as well as transformational ICT effects, at Falcon, support realisation of strategic ICT effects. In other words, access to accurate and timely information in the system, as well as improvements in the organisational culture have strengthened strategic ICT effects.
7.4.3 Influence of ICT effects on other factors in Falcon’s ICT system

Influence of ICT effects on other factors in Falcon’s ICT system will be analysed in this section. It has been identified which factors are influenced by specific group of ICT effects, and listed in Table 7.9.
Table 7.9: Influence of ICT effects on other factors in Falcon’s ICT system

<table>
<thead>
<tr>
<th>ICT effects</th>
<th>Group of factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Technological</td>
</tr>
<tr>
<td>Informational</td>
<td>ICT integration, ICT</td>
</tr>
<tr>
<td></td>
<td>compatibility</td>
</tr>
<tr>
<td>Strategic</td>
<td>None</td>
</tr>
<tr>
<td>Transactional</td>
<td>ICT integration</td>
</tr>
<tr>
<td>Transformational</td>
<td>None</td>
</tr>
</tbody>
</table>

Source: Cross-link matrices (Appendix 6)
Informational ICT effects at Falcon

Informational ICT effects at Falcon significantly influence the ICT system. As presented in Table 7.9, this group of ICT effects strengthens integration and compatibility of ICT applications at Falcon. In addition, it influences utilising ICT smoothly, enhancing users’ ICT knowledge and positive attitudes toward ICT, as well as focusing managers’ efforts and support to ICT area. Furthermore, information flow and instant access to data greatly influenced the organisational culture. As discussed in Chapter 6, employees become more open for changes, as well as more active in utilising ICT.

Informational ICT effects enhance alignment between ICT and organisational strategies and supports communication between the Production and Sales Departments, which had positive benefits for their customers. The high level of realised informational ICT effects, as well as Falcon’s adoption and utilisation of the newest ICT applications, influences trends in the market. This means that Falcon’s proactiveness in utilising ICT influences other companies in the market to follow its example. In summary, informational ICT effects enable realisation of strategic and transactional ICT effects.

Strategic ICT effects at Falcon

In contrast to the other ICT effects, strategic ICT effects do not influence technological group of factors. The reason for this might be that ICT characteristics already support realisation of the strategic ICT effects.

On the other hand, strategic ICT effects influence utilisation of ICT. This means that ICT at Falcon is utilised in a way to achieve the organisational goals. IT support is provided in accordance to strategic ICT effects. As discussed in previous chapter, IT support at Falcon is provided based on the company’s needs. When the company needs to adjust ICT in order to achieve strategic ICT effects, it employs IT services from the company ICE. In addition, this group of ICT effects is reflected on customers, who benefit from fast response to their requests. Strengthening of strategic ICT effects leads to further strengthening of informational and transactional ICT effects.
Transactional ICT effects at Falcon

Realisation of transactional ICT effects influences further integration of ICT applications with business processes. Thus, integration of ICT applications results in higher transactional ICT effects. This group of ICT effects positively influences ICT utilisation at Falcon, by increasing users’ ICT knowledge, their positive attitudes toward ICT, as well as increasing managers’ support in regards to ICT. Additionally, it also enhances the alignment between ICT and organisational strategies.

Realisation of this group of ICT effects influences relations with other departments. That is, the Production Department holds the Sale Department responsible for the financial losses which occur when customers return the products with the expiry date. Thus, by reducing financial loss, the relation between these two departments might be even better. In summary, transactional group of ICT effects enhances realisation of informational and transformational ICT effects.

Transformational ICT effects at Falcon

This group of ICT effects does not influence any of the technological and environmental factors. On the other hand, it influences users’ ICT knowledge and attitudes toward ICT. For example, changes in business processes and organisational culture, which took place with the ICT implementation, improved users’ knowledge of utilising ICT. Furthermore, transformational ICT effects resulted in transparency of business processes and defined responsibility of employees. As a result, the passive organisational culture has been changed into a more dynamic one. This, in turn further enhances realisation of strategic and transactional ICT effects.

Concluding remarks

The purpose of analysing the interactions between factors influencing ICT use was to answer the research objective, which is how interactions between factors influencing ICT use impacts on company’s performance. The interactions between factors influencing ICT use at Falcon, impacts the company’s performance in several ways. By utilising integrated and compatible ICT applications, Falcon has achieved all groups of ICT effects.
In summary, utilisation of ICT applications at Falcon brought informational, strategic, transactional and transformational ICT effects. Up-to-date ICT, together with Falcon’s tradition, image, reputation, and quality of its meat products create its competitive advantage.

7.5 Cross-case analysis

The purpose of the cross-case analysis, which is presented in this section, is to enable generalisation of findings from each case study. Therefore, I have identified which factors are in common to all case studies in regards to their influence on ICT effects. As a result of the cross-case analysis, the findings in this study can be applied to other companies and ICT systems. The contribution of this study is consequently, theoretical as well as practical. Furthermore, the interaction between factors influencing ICT use was found to be different in each case study, as well as its impact on organisational performance. This provides evidence for the uniqueness of each company, creation of their strategic goals in response to changes in their markets and utilisation of ICT applications. After each company was presented and analysed as a unique system in previous sections, the findings in each company are compared and contrasted in the following sections.

ICT utilisation

It was identified in Chapter 6 how factors, identified as having influence on an ICT system at the use stage of ICT diffusion, tend to interact with ICT utilisation. In other words, interaction between these factors determines the level of ICT utilisation. Thus, ICT utilisation in each company was influenced by different factors, which supports the argument that each ICT system is unique, and that ICT is used differently in each company.

For example, all technological, individual and organisational factors influenced ICT utilisation at Triumph. This clearly demonstrates and reflects the level of technological acceptance, proactiveness and knowledge in utilising ICT in that company. Largely due to the organisational culture, oriented as it was toward technology, the entire company and its ITC system were organised in a way that enabled full ICT utilisation.
However, at Eagle, it was only the level of ICT integration and compatibility that influenced ICT utilisation. These were at the centre of the problematic issues that beset the company. The complex range of different ICT applications, used in each department, were not compatible with each other, and consequently, could not support integration of business processes. It was because of this that individual factors, apart from users’ ICT knowledge, were not relevant in influencing ICT utilisation. The reason for the situation that existed at Eagle was primarily due to the organisational culture, the lack of IT support, and lack of alignment between ICT and the organisational strategies that did not recognise the value of a fully integrated, cohesive environment.

The utilisation of ICT at Falcon was influenced by many different technological factors, and as a consequence of many users’ lack of previous ICT experience there was, therefore, a distinct lack of ICT knowledge in the company. The same organisational factors which influenced ICT utilisation at Eagle were also an influence at Falcon. In contrast to Eagle, Falcon had great IT support, aligned its ICT and organisational strategies, and the organisational culture was accepting of ICT use as a means to improving business processes.

Nevertheless, factors interacting with ICT utilisation each case study were compared to identify factors which were the same in each case study. Thus, based on this analysis, factors which influenced ICT utilisation in each company are identified and illustrated in Figure 7.5, which is presented below.
It can be concluded that ICT utilisation is determined by integration and the compatibility of ICT applications, users’ ICT knowledge and the following factors from the organisational context: organisational culture, IT support, and alignment between ICT and organisational strategies.

The finding that ICT integration and ICT compatibility did influence ICT use in all three case studies implies that if a company is to achieve successful ICT utilisation and consequently realise ICT effects, ICT applications have to be integrated with organisational processes, and they need to be compatible with each other. Such an approach to ICT applications enables organisations to use ICT to support organisational processes and therefore reduce costs and improve efficiency. Furthermore, the examples used in this research also demonstrated their capacity to use the ICT applications to enable instant access to accurate, reliable information, a critical factor in their successful operation.

Furthermore, in all three case studies, employee’s ICT knowledge was found to influence ICT utilisation. This factor was found to be a particularly important factor which determined either full ICT use, or its underutilisation. That is, employees used ICT in their daily work according to their ICT knowledge. Thus, users’ age and previous ICT experience were found to be important factors at Falcon and Triumph. As explained earlier, mature employees were more likely to lack ICT experience, and consequently their ICT knowledge tended to be limited. In such situations,
organisational factors played an important role in helping them to gain ICT knowledge from company provided ICT seminars and IT support.

In each of the three case studies, it was found that ICT utilisation influenced employees’ ICT knowledge. This meant that with ICT use, users gained more experience and knowledge. Furthermore, at Eagle and Falcon, employee’s ICT attitudes were positively influenced, and in the case of Triumph and Falcon users’ motivation were improved with ICT use. Therefore, it may be concluded that ICT applications in a company are used to a greater extent over time, when users become accepting of the technology and become accustomed to using ICT in their work.

Organisational factors found to influence ICT utilisation in each of the three cases are organisational culture, IT support, alignment between ICT and organisational strategies. In other words, for successful ICT use, the ICT goals must be aligned with the organisational strategies. By doing so, ICT enabled achievement of organisational goals. Furthermore, IT support had a great influence on ICT utilisation, in terms of adjusting it to the users’ needs, helping them to learn to use it, and enhancing users’ confidence in using ICT. The factor of organisational culture was found to be an enabler and resulted in greater ICT use at Triumph. However, the factor proved to be an inhibitor at Eagle, suggesting that organisational culture should be a matter of concern in considerations of ICT use.

The organisational factor that was influenced by ICT utilisation, in all three case studies, was IT support. That is, when ICT was being used on a daily basis in an organisation, IT support became very important in terms of adjusting ICT to users’ requests and those adjustments helped users to discover and use other ICT functions. At this stage of ICT diffusion, the IT support personnel had a mentoring role. Furthermore, with increased ICT use, there was less need for basic ICT seminars, but a greater demand for advanced ICT seminars. This increase in demand for technical education was evident at both Falcon and Eagle. Consequently, if organisational leaders recognise and fulfil the need for professional development then ICT use becomes fully used, new ICT possibilities are discovered and the
combination of these developments have the potential to enhance organisational processes and ICT effects.

In each case study, ICT utilisation was influenced by a range of different environmental factors. At Triumph, trends in the environment influenced ICT utilisation. Apart from this factor, ICT utilisation at Eagle was influenced by suppliers and the partner company. On the other hand, the only factor from the environmental context which influenced ICT utilisation at Falcon was its customers. These different factors might reflect the range of organisational goals, market strategies and environmental conditions. Therefore, no conclusion can be established about the influence of specific environmental factors on ICT practice.

Factors influencing ICT effects
Factors interacting with ICT effects, which are found to be in common to three case studies, are presented and discussed in this section. Based on this, the findings in the case studies, presented in the previous sections, can be generalised and applied to other companies. This section consists of the two subsections: one deals with the factors influencing ICT effects, while the second one focuses on the influence of ICT effects on other factors.

Factors influencing ICT effects, which are in common in three case studies, are identified in Table 7.10. The interaction of each group of factors with the ICT effects is analysed in each of the following subsections.
### Table 7.10: Factors influencing ICT effects

<table>
<thead>
<tr>
<th>Groups of factors</th>
<th>Informational</th>
<th>Strategic</th>
<th>Transactional</th>
<th>Transformational</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological</td>
<td>ICT integration, ICT compatibility</td>
<td>ICT integration, ICT compatibility</td>
<td>ICT integration</td>
<td>N/A</td>
</tr>
<tr>
<td>Individualistic</td>
<td>ICT utilisation, Managers’ ICT knowledge</td>
<td>ICT utilisation, Managers’ support</td>
<td>ICT utilisation, Managers’ support</td>
<td>N/A</td>
</tr>
<tr>
<td>Organisational</td>
<td>Organisational strategies, Organisational culture Alignment between ICT and organisational strategies</td>
<td>Organisational strategies, Alignment between ICT and organisational strategies</td>
<td>Alignment between ICT and organisational strategies</td>
<td>N/A</td>
</tr>
<tr>
<td>Environmental</td>
<td>None</td>
<td>N/A</td>
<td>N/A</td>
<td>None</td>
</tr>
<tr>
<td>ICT effects</td>
<td>N/A</td>
<td>Informational and Transformational ICT effects</td>
<td>Informational ICT effects</td>
<td>N/A</td>
</tr>
</tbody>
</table>
It was not possible to identify some factors influencing ICT effects for the reason that they were not in common to all three cases. For example, each company had a different attitude toward transformational ICT effects. Triumph and Falcon did not work toward achieving these effects, while Eagle wanted to achieve them to realise its organisational strategy. In such cases, the sign ‘not applicable’ (N/A) was used in the table above. The findings presented in Table 7.10 are discussed in the following subsections.

**Technological factors influencing ICT effects**

ICT integration with business processes are the foundation for achieving informational, strategic and transactional ICT effects in each case study. Only ICT applications organised and adjusted to the organisational processes can be used in relation to the organisational goals, and as a result, influence its performance. Integration with the business processes happens in the use stage, where both business processes and ICT applications have been adjusted to each other. In addition, ICT compatibility influences informational and strategic ICT effects in each case study. Compatibility of ICT applications enables seamless information flow between them, and thus, informational and strategic ICT effects.

Informational infrastructure in a company, evident in integrated and compatible ICT applications enables data sharing instantly among the ICT applications (informational ICT effects). Furthermore, it is the foundation for establishing good relations with customers by quickly responding to their requests and trends in the market, consequently achieving the competitive advantage in the market (strategic ICT effects).

**Individual factors influencing ICT performance effects**

ICT utilisation was identified as a key factor influencing realisation of ICT benefits. In all three case studies ICT utilisation influenced informational, strategic and transactional ICT effects. At Triumph and Falcon, ICT utilisation supported realisation of these ICT effects. On the other hand, ICT utilisation at Eagle inhibited realisation of ICT effects. This means that the actual utilisation determines realisation of ICT effects in a company. This
finding supports the argument adopted in this study that it is the actual utilisation of ICT applications that is crucial for achieving the ICT value.

Managers have the most influential role in realisation of ICT effects, among individual group of factors, according to Table 7.10. Their ICT knowledge was found to influence informational ICT effects in all three case studies. This means that knowledgeable managers successfully organise information flow in the system. In addition, managers’ support, in terms of investments into ICT, employees’ education and complementary ICT investments influenced achieving the strategic and transactional ICT effects in all three case studies. Such support results in competitive advantages, reduced costs and improved efficiency of business process in the company. In addition, managers are those who lead and determine utilisation of ICT which leads to the realisation of organisational goals.

Organisational factors influencing ICT performance effects

Organisational strategies determine which ICT effects will be achieved. Informational and strategic ICT effects present a critical component of each organisational strategy. For example, it is in the organisational interest to achieve seamless information flow. Thus, organisational strategies in each case study influence realisation of these ICT effects. Organisational strategies at Eagle were focused on goals other than ICT development, integration and compatibility, resulting in the independent evolution between ICT development and the organisational strategies. Thus, ICT effects were lacking at Eagle.

Furthermore, alignment between ICT and organisational strategies was found to influence realisation of informational, strategic and transactional ICT effects in all three case studies. Only ICT which supports organisational goals can contribute to organisational performance. If it does not contribute to achieving organisational goals, either due to its capabilities or utilisation, ICT is considered not to benefit the company.

Although IT support was not in common in all case studies, but only to Triumph and Falcon, it is discussed here. As noted before, in these case
studies, IT support is provided by professional IT companies, with which the companies have collaborated for more than a decade. As a result of such collaboration, the IT companies knew very well the organisational processes as well as the ICT needs. Thus, they organised and developed ICT applications which are closely aligned to organisational goals. Due to such IT support, ICT was integrated and compatible which enabled realisation of ICT effects.

Environmental factors influencing ICT performance effects
As was identified in Table 7.10 there is no environmental factor in common for all case studies which influences realisation of ICT effects.

Interactions among ICT effects
Informational ICT effects influence realisation of strategic and transactional ICT effects in all three case studies. This means that instant access to reliable information is the foundation for strategic decision making as well as for improving efficiency of business processes. In addition, changes in organisational structure, business processes, work methods, that is, transformational ICT effects influence realisation of strategic ICT effects. This can be interpreted that realisation of strategic ICT effects, which are tightly connected to the market and its changes, requires changes within the organisation. Transformational ICT effects like improved skill levels and expanded capabilities lead to improved strategic ICT effects (e.g. competitive advantage providing new products, improving relationships with customers).

Influence of ICT effects on other factors in ICT system
After discussing which factors influence ICT effects in all three case studies, in this section follows the discussion on how ICT effects influence other factors in the system. The following table identifies factors which are influenced by ICT effects in all case studies.
Table 7.11: Factors influenced by ICT effects

<table>
<thead>
<tr>
<th>ICT effects</th>
<th>Technological</th>
<th>Individual</th>
<th>Organisational</th>
<th>Environmental</th>
<th>ICT effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Informational</td>
<td>ICT compatibility</td>
<td>ICT utilisation</td>
<td>N/A</td>
<td>N/A</td>
<td>Strategic and Transactional ICT effects</td>
</tr>
<tr>
<td>Strategic</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Transactional</td>
<td>ICT integration</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Transformational</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
As seen in Table 7.11, ICT effects influence different factors in each case study. Therefore, the influence of ICT effects on other factors could not be identified. This fact explains the uniqueness of each case study. That is, due to different interconnectedness in their ICT systems, ICT effects had a unique influence in each ICT system.

Realisation of informational ICT effects leads to higher compatibility of ICT applications in all three case studies. Information flow in each case study influenced ICT utilisation. For example, instant access to information led to effective utilisation of ICT and business processes at Triumph. On the other hand, lack of such information at Eagle resulted in users doing double the amount of work, rewriting data from one system to another. Influence of informational ICT effects on strategic and transactional ICT effects was already discussed in the previous section.

Realisation of transactional ICT effects influences better ICT integration with business process in each case study.

It was interesting to find that all ICT effects influenced ICT utilisation at Triumph and Falcon. However, only informational and strategic ICT effects were found to influence ICT utilisation at Eagle. This can be interpreted in a way that different organisational goals lead to different ICT use. For example, Triumph and Falcon aimed at achieving full ICT effects. On the other hand, the focus at Eagle was on achieving informational and strategic ICT effects, since the organisational leadership was focused on other issues. Such a finding suggests that organisations achieve the level of ICT effects which is part of their organisational goals.

7.6 Conclusion

The interactions between factors influencing ICT use and ICT effects have been established and discussed in this chapter. Thus, the research objective, establishing how interactions between factors influencing ICT use impact on a company’s performance, has been achieved. Based on the finding of the current research project, it can be concluded that the company’s performance is indeed influenced with the actual utilisation of ICT.
applications. However, ICT utilisation itself depends on a range of factors from technological, individual, organisational and environmental contexts. This finding implies that ICT utilisation is determined only with the duration, frequency, and intensity of use (Venkatesh et al., 2008).

The findings of this study will be further outlined and discussed in the next chapter. Additionally, the contributions to theory and practice will be discussed as well.
Chapter 8

Summary and Conclusion
8.1 Introduction

The aim of the present research project has been to assess the ICT impact on a company’s performance by evaluating interactions between factors influencing ICT use. This has been done by taking different approaches and conceptualisations of ICT from the ones commonly found in the ICT literature.

It has been emphasised in the current thesis that ICT is not a value itself, but in interaction with its users and organisational context. In addition, ICT has been conceptualised as a complex system, characterised with interactions between the company, users and ICT. Focus on these interactions has been enabled by application of case study and systems theory research methods. It has been established by the present research that the interactions between ICT, users and organisational context create ICT value in the use stage of ICT diffusion.

By applying systems theory as a research method the current research overcame inadequate analytical tools and consequently mismeasurement of ICT and brought new insights to ICT value literature. Thus, this chapter is developed with a purpose to emphasise and enumerate the findings and contributions of the research project. Summary of the research project is outlined in the first section of this chapter, findings of the study are synthesised into an overall conclusion of the study in the second section, followed by contributions to theory and practice. Finally limitations are recognised, and suggestions for the future study are made in the last section.

8.2 Summary of the research project

Summary of the research project is presented in this section with a purpose to explain how the research objective of the present study has been achieved. The main research objective has been conducted to establish how interactions between factors influencing ICT use impact a company’s performance. In doing so, four contexts which influence this process have been identified: technological, individual, organisational and environmental.
context; as well as four groups of ICT effects: informational, strategic, transactional and transformational ICT effects.

A starting point in the present research project has been conceptualisation of ICT as a system, and adoption of systems theory. As a result, it has been identified that ICT is inextricably linked to the organisation. For example, the goals of an ICT system are determined according to the organisational goals. Consequently, the greatest ICT value is achieved when ICT is utilised in such a way to support the realisation of organisational goals. Thus, it has been pointed out that the organisational context has to be taken into account in order to fully understand the impact of ICT on a company’s performance.

However, there are different organisational contexts in terms of organisational strategies and organisational culture which give rise to different ICT systems. Consequently, ICT in each organisation is being used differently, which in turn, produces different outcomes of ICT use.

As explained in the Literature Review, ICT impact on company performance, or ICT value is created in the use stage of ICT diffusion. This process of ICT value creation process is known as conversion effectiveness. A number of authors have identified different factors which influence transformation of ICT value in every company. For example managers with their support and skills can influence transformation of ICT value, use process, organisational culture (previous company’s experience with IT, ICT planning, training), and competitors which are adopting new ICT.

A number of other factors have been identified in the Literature Review to influence creation of ICT value. These factors have been grouped into four contexts: technological, individual, organisational and environmental. By taking into account all four contexts, as it has been done in the present research project, a multidimensional view of ICT value has been gained. More specifically, in this study, ICT has been conceptualised as a system in which the identified four contexts interact with each other. Systems theory straightens the argument that ICT has no value itself, by emphasising that
ICT value is a result of interactions between factors from the four contexts, which in turn determine ICT impact on a company’s performance.

After conceptualising ICT as a system, and identifying factors which potentially influence ICT value creation, the next corner stone of the research project has been conceptualising organisational performance. Construct of organisational performance can be defined differently depending on the focus of a study. Due to specific nature and focus of the current study, organisational performance has been conceptualised as sum of four groups of ICT effects. Classification of ICT effects has been adopted from Gregor et al. (2004): informational, strategic, transactional and transformational ICT effects. These ICT effects also represent the four areas of organisational performance which are impacted by ICT.

Each of the four groups of ICT effects indicates a different impact of ICT on a company’s performance. As a result of considering all four groups of ICT effects, the holistic picture of ICT impact on a company’s performance is provided in this research project.

**Figure 8.1:** Process of achieving the research objective

<table>
<thead>
<tr>
<th>Contexts of an ICT system</th>
<th>Areas of ICT impact on company performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological</td>
<td>Informational</td>
</tr>
<tr>
<td>Individual</td>
<td>Strategic</td>
</tr>
<tr>
<td>Organisational</td>
<td>Transactional</td>
</tr>
<tr>
<td>Environmental</td>
<td>Transformational</td>
</tr>
</tbody>
</table>

An informational group of ICT effects refers to data sharing, communication flow and the manipulation of data. Strategic ICT effects encompass a company’s relations with customers, competitive advantage, and its effort in achieving organisational goals. Transactional ICT effects, such as reduction of costs, and improvement of efficiency of business processes, have been the focus of majority studies. ICT also has the
potential to influence changes in the organisational structure, plans and processes. All of these changes are part of transformational ICT effects.

However, ICT effects do not occur all at the same time, but over a period of time (Brynjolfsson, 1993), after organisational processes have been adjusted to the ICT possibilities, as well as after users have accepted ICT and learned to use ICT. It has been revealed in the Literature Review (Chapter 3) that ICT value is created in the use stage of ICT diffusion, where the full ICT effects are taking place.

In order to achieve the research objective of the current study, it was necessary to develop the research plan. Since such plan is based on the philosophical nature of a study, philosophical assumptions have been discussed in Chapter 4, as part of the methodology. This research is based on critical realist ontology, modified objectivist epistemology, and analytic induction methodology. These philosophical assumptions have determined that the most appropriate research methods for this research project are case study and a systems approach. Both research strategies have been applied with a purpose to provide an in depth understanding of an ICT system, and to identify factors influencing ICT use.

The plan for conducting the in-field research has been presented and discussed as the research design in Chapter 5. Data were collected based on a set of semi-structured interviews, which have been conducted with several different groups of stakeholders in each company. They are employees, managers, Boards of Directors, and IT employees.

This research has been conducted in three Croatian companies, which were given the pseudonyms Triumph, Eagle and Falcon. The focus has been placed on their ICT systems, and interactions between ICT, users and an organisational context. Each of these three Croatian companies operated in a different market, Triumph has been operated in the shipbuilding industry, Falcon operated in the meat product industry, and Eagle published daily newspapers in the Istrian region. Because of the differences regarding operations and organisational strategies, each company utilised different
ICT applications. This understanding supports Weill’s (1992) observation that ICT is used for different management objectives. For example, both Triumph and Falcon used ICT in order to reduce operating costs, improve quality, and increase productivity. On the other hand, Eagle used ICT for both operational and strategic benefits.

More specifically, Triumph and Falcon are operation-focused companies, and Eagle is a dual-focus company (Tallon, Kraemer & Gurbaxani, 2000; Miles & Snow, 1978). However, before management altered the organisational strategy of Eagle, it was a company which had no clear ICT goal. This resulted not only in inefficient IS, but also mismanagement of ICT, and failure to realise ICT potential (Brynjolfsson, 1993). So although Eagle had invested in ICT, it had failed to take advantage of the potential benefits offered by ICT.

The analysis of data has been completed by means of both content analysis and cross-link analysis. The outcome of applying content analysis has been the identification of themes, namely factors which influence each ICT system in the use stage of ICT diffusion. These factors have been presented in Chapter 6, were they have been organised in such a way as to tell the story of each ICT system. Each ICT system has been described in terms of, firstly, the enabling environment (organisational context, IT support, ICT education); secondly, the ICT adaptations, and thirdly, the coevolution between ICT development and users, organisational, and environmental contexts. In total, 23 factors regarding technological, individual, organisational and environmental contexts have been identified in each ICT system, together with four groups of ICT effects.

As explained earlier, each ICT system is characterised with interactions between these factors. Thus, these interactions have been established and analysed by applying a systems approach tool, named cross-link analysis. This has been the focus of Chapter 7, where interactions between factors influencing ICT use and ICT effects have been analysed. As a result of such analysis, factors which either stimulate or inhibit the realisation of each group of ICT effects have been identified. The interactions between factors
in each ICT system have been graphically depicted in the map of interactions. More specifically, the map of interactions depicts each factor in a coordinate system on the basis of interactions with other factors in the system. The map of interactions has been presented for each ICT system, and analysed in Chapter 7.

As a result of having collected data from different members of the three organisations, and after having analysed interactions between factors influencing ICT use, a holistic picture and deep insight into the ICT value creation process has been established. It has also been found how interactions between factors influencing ICT use have an impact on a company’s performance. In doing so, the objectives of this research have been achieved.

The next section takes up the findings which are discussed in relation to the objectives and research questions.

8.3 Findings and discussion

As a result of having described and analysed three ICT systems, a holistic and in-depth explanation has been provided on how interactions between factors influencing ICT use have an impact on a company’s performance. Having in mind the literature reviewed, this is the only research project in which the conceptualisation and analysis of an ICT system has produced such a deep understanding of the ICT value creation process. This is due to the reason that 23 factors have been considered in relation to ICT value in each ICT system.

The main findings in this research project are illustrated in Figure 8.2.
Based on the figure above, it can be seen that the research objectives, which have been established in Chapter 1 (Section 1.3), are now, in fact, the outcomes of the present research project.

**8.3.1 Structure of an effective ICT system**

A total of 23 factors, which influence an ICT system in the use stage of ICT diffusion, have been identified. Those 23 factors are associated with technological, individual, organisational, and environmental contexts, as well as four groups of ICT effects. In the reviewed literature, no study has considered all of these contexts together, or taken into account as many as 23 factors in relation to the impact of ICT on a company’s performance. For example, Zhu and Kraemer (2005) have considered only six factors in attempting to explain the use and value of e-business; while Gregor et al. (2004) have taken into account organisational level influences, industry and the external environment. Each of those studies has failed to take into account users and individual context. In addition, Davern and Kauffman (2000); Soh and Markus (1995); and Weill and Olson (1989) have considered only a few factors regarding any influence on conversion effectiveness. However, in this study, 23 factors have been identified to influence the process of ICT value creation.
8.3.2 Analysis of an ICT system

Each ICT system has been explained in relation to drivers, outcomes, trends and factors which determine the essence of each system. This has been established on the basis of map of interactions, which has been discussed in Chapter 7. Interactions between factors have been different in each ICT system, due to different interdependencies. Furthermore, this was the reason that each system had a different identity, as well as drivers and outcomes. This point explains that that each ICT system is unique.

For example, factors which have determined the characteristics of Triumph’s ICT system have been organisational strategies; informational and strategic ICT effects, managerial support. Essential identity of Eagle’s ICT system has been determined by the organisational culture, IT support, the alignment between ICT and organisational strategies, suppliers, informational and transformational ICT effects. In the case of Falcon, managerial support and ICT compatibility have maintained the characteristics of its ICT system.

Factors which drive each system have been identified as the most active and dynamic factors in the Map of Interactions. For example, managerial support and organisational strategies have significantly influenced Triumph’s ICT system. The same driving influences have been identified regarding Eagle’s ICT system, together with ICT compatibility. In Falcon’s ICT system, the identified driving influences have been informational ICT effects, ICT utilisation, organisational culture and IT support. Change in relation to any of these factors would bring change to the rest of the system.

It is also because of different interdependencies between factors influencing ICT use that each ICT system has produced different outcomes. Triumph’s ICT system has resulted in ICT utilisation; realised strong informational ICT effects; and ICT integration. The outcome regarding Eagle’s ICT system has been ICT utilisation, organisational culture, lack of ICT integration, as well as a lack of all four groups of ICT effects. The outcome of interactions between factors influencing ICT use in relation to Falcon’s
ICT system has been a number of realised transactional and strategic ICT effects, as well as an alignment between ICT and organisational strategies.

On the other hand, the realisation of ICT effects has had a different effect on each particular ICT system. Thus it was not possible to identify which factors, common to each case study, have been influenced by each group of ICT effects (see Table 7.10). This confirms the uniqueness of both interdependencies and interactions in each ICT system.

Interactions between 23 factors have indeed influenced the realisation of ICT effects in each case study. The explanation, as to how interactions between factors influencing ICT use have an impact on company performance, has contributed further to an understanding of ICT value creation. An additional contribution, regarding this research project, has been to identify which factors influence each group of ICT effects (see Table 7.9). This contributes to the literature, since there has been no other study, according to the reviewed literature, which has explained and identified the process of conversion effectiveness in such details.

### 8.3.2 Factors influencing ICT utilisation

It has been found in the present thesis that ICT utilisation impacts realisation of all four groups of ICT effects. In addition, ICT utilisation as a factor in investigated ICT systems has an important role in influencing these systems. Therefore, it is of great importance to identify factors which influence it, as it has been done in the current research project (Chapter 6, section 6.5).

The most important technological factors, which were found to influence ICT utilisation in each of the three ICT systems, are ICT integration and ICT compatibility. These two factors provide essential requirement for smooth and easy ICT utilisation. When this is not the case, users may need to invest more time into completing their work, rewriting data, and generally, having more difficulties with utilising such ICT system. This was the case in Eagle. Lack of ICT compatibility in Eagle resulted in users doing double amount of work, which caused their frustration.
Users’ ICT knowledge is another factor determining the utilisation of ICT. For example, users with a high level of ICT knowledge have utilised ICT to a greater extent. On the other hand, users whose ICT knowledge was lower needed more time to learn and to utilise ICT, which might have lead to bottle-necks in information flow, thus hindering business processes. In addition, such users needed more IT support, which presents higher costs for a company.

IT support has been found to influence ICT utilisation as well. This finding can seem logical when knowing that IT experts support ICT users, in terms of giving them advice and practical support in utilising ICT. Such IT support provides enabling environment for experimenting with ICT use. In addition, professional and knowledgeable IT experts, at both Triumph and Falcon, have made their ICT applications virtually flawless, and well integrated with organisational processes. By contrast, IT support within Eagle has been provided by employees who have learned about ICT in-house. Due to their lack of IT expertise, and ICT issues in the company, they could not support all ICT applications. Thus, it can be concluded that IT support might be a critical factor in influencing ICT utilisation. Clearly, companies with strong IT support, like Triumph and Falcon, have excellent and highly efficient ICT systems, while lack of IT support might be a reason for ICT issues in Eagle.

Organisational culture has been found to influence ICT utilisation in all three case studies. At Triumph, organisational culture has been characterised with openness to ICT, and orientation toward enjoying all of the ICT benefits. Thus, organisational culture acted as a strong facilitator of ICT utilisation. At Eagle, however, organisational culture has indirectly inhibited ICT utilisation, due to less emphasise on ICT benefits in business processes and managers’ support in integrating ICT. In both cases, organisational culture was the factors which strongly influenced ICT utilisation.

According to the findings in the present study, another factor which influence ICT utilisation is alignment between ICT and organisational
strategies. When such alignment is achieved, ICT is utilised in a way which supports realisation of organisational goals, which contributes to organisational performance. When this is not the case, ICT utilisation created problems, as it happened at Eagle.

Based on the findings of the current research project, it is demonstrated that ICT utilisation depends on factors from technological, individual and organisational contexts in which ICT is embedded. It is not only duration, frequency, and intensity of use that determine ICT utilisation (Venkatesh et al., 2008), but also the characteristics of ICT itself, users, and the organisational supporting environment. By considering a larger picture of ICT utilisation, it becomes clear that ICT alone does not necessarily create ICT value for a company.

8.3.3 Impact of ICT utilisation on ICT effects

It has been established in the literature review (Chapter 3) that ICT utilisation is a bridge connecting ICT and ICT value (Zhu & Kraemer, 2005; DeLone & McLean, 1992). This argument has been adopted in this study. Thus, ICT utilisation is regarded as being a factor in an ICT system.

One of the findings has been that ICT utilisation has influenced realisation of ICT effects in all three companies; even though each company has used different ICT applications, and has had different ICT goals. The utilisation of ICT has affected each company as a whole, as well as its position in the environment (Weill, 1992).

ICT has been utilised both at Triumph and Falcon in such a way as to support organisational goals. As a result, it improved organisational performance. This finding is in line with D’Apprix (2005) and Prahalad and Krishnan (2002). However, ICT at Eagle has been utilised in such a way as to support only short-term business processes in each department. Due to the limited ICT capabilities, ICT has not been able to support the realisation of Eagle’s organisational goals. On the contrary, it inhibited the realisation of ICT effects. This has occurred mainly due to lack of ICT compatibility and integration. Thus, even if Eagle had utilised ICT more often than it
already had, valuable ICT compatibilities would not have been developed there.

8.3.4 Factors influencing ICT effects

Another important finding of the present research project is identification of factors which lead to realisation of ICT effects. Furthermore, realisation of each group of ICT effects is influenced by different factors. Therefore, factors which influence a specific group of ICT effects are identified in the following sections.

Informational ICT effects

Realisation of the informational group of ICT effects is a necessary requirement for managing a company. It provides informational infrastructure for the management of a company, in terms of control, planning and decision making. Efficient informational infrastructure in an organisation is achieved when ICT applications are integrated and compatible with one another. Other factors, found in the current study to influence realisation of informational ICT effects, are: ICT utilisation; managers’ ICT knowledge; organisational strategies; and an alignment between ICT and organisational strategies.

In other words, smooth information flow in an organisation does not depend only on technological factors like ICT integration and compatibility. It can be supported or hindered by the actual ICT utilisation as well. Furthermore, managers who are knowledgeable in ICT area organise and lead organisational processes in a way to contribute to free flow of information in an organisation. Managers who lack in ICT knowledge can not manage organisational processes in such an efficient manner, which creates a potential for bottlenecks in ICT system. On the other hand, organisational strategies can be unintentionally created in a way which hinders informational ICT effects. However, it is most probable that the major hurdle to realisation of informational ICT effects would be lack of alignment between ICT and organisational strategies. A mismatch between ICT and organisational strategies can happen in the short run when new strategies are made, and ICT has not yet been upgraded to support these
strategies. If ICT applications are old and can not be upgraded, they physically could not support organisational strategies. Such a mismatch could be, in the long run, catastrophic for the company.

Due to their essential role in a company, in terms of informational infrastructure, informational ICT effects provide foundation for realisation of strategic and transactional ICT effects.

**Strategic ICT effects**

Organisations which achieve strategic ICT effects report improved relationships with customers, ICT support for achieving organisational goals, as well as for sustaining a competitive advantage. For example, successful utilisation of ICT at Triumph has contributed to its competitive advantage in the market. Falcon has adopted and used the latest versions of ICT, and has thus benefited from its technological leadership in the market. Carr’s (2003) argument that ICT does not create strategic ICT value has not been supported by the findings of this study. Furthermore, achieving strategic ICT effects has been an impetus for Eagle to change its ICT system as well as organisational structure.

On the basis of the findings in this study, summarised in Table 7.10, it can be seen that the realisation of strategic ICT effects has been influenced by the same factors that have influenced informational ICT effects. Integration and compatibility of ICT applications seems a logical prerequisite for realisation of strategic ICT effects as well. Without this, many bottlenecks and problems would occur in an ICT system, resulting in lack of ICT support for realisation of organisational strategies and relationship with customers and suppliers. However, utilisation of ICT which supports an organisation to achieve its strategies is the best recipe for realisation of strategic ICT effects. In addition, managers’ support plays an important part in orchestrating such ICT utilisation which is in line with organisational strategies. Achieving some organisational strategies can, on the other hand, present a challenge in utilising ICT when there is a mismatch between ICT possibilities and organisational strategies. For this reason, it is advisable to pay particular attention to the alignment between ICT and organisational
strategies. In order to grasp the full strategic ICT benefits, companies might need to introduce some changes in their way of doing things, in order to adapt to possibilities ICT offers. This means that transformational ICT effects enable realisation of strategic ICT effects.

**Transactional ICT effects**
The most emphasises by the companies in terms of ICT impact on company performance is usually put on achieving transactional ICT effects. Example of such ICT effects are improvement of efficiency of organisational processes and reduction of costs. In order to realise such transactional ICT effects, companies need to use ICT to establish automation of business processes, as Triumph and Falcon did. Due to this fact, both companies have achieved a reduction in costs, amount of time taken to complete business processes, and consequently increased efficiency.

Due to its financial impact on company performance, transactional group of ICT effects might seem more important then other groups of ICT effects. However, it is important to note that realisation of transactional ICT effects depends on informational ICT effects, integration of ICT applications, ICT utilisation, managers’ support and alignment between ICT and organisational strategies. As established earlier, each component of a system depends on all others, and focus on only one aspect of a system causes blind spots. Missing to consider interrelations in a system could be underlying reason for management short sight and inefficient business decisions.

Thus, focus on achieving transactional ICT effects implies special consideration of factors identified in the current research project, and stated in the previous paragraph.

**Transformational ICT effects**
Transformational ICT effects relate to changes in business processes, and organisational structure, among others. Since each organisation implements changes which are specific to its operations, this group of ICT effects has been influenced by different factors in each case study. Triumph and Falcon have had no motivation to achieve transformational ICT effects, since both companies had well organised business processes. Those companies have
not used ICT to drastically change their business processes, or their organisational structures. Furthermore, the utilisation of ICT at Falcon has resulted in a change in the organisational culture, even though this has been an unintended effect. As a result, factors influencing transformational ICT effects, which are in common to each case study, cannot be identified.

8.3.5. Generalisability of the findings

Although generalisability of the findings has been discussed in Chapter 5, it is further discussed in this section in order to distinguish between the findings which can be applied to other companies and findings which are specific for each case study.

Based on specifying interview questions for each of the three groups of stakeholders, 23 factors have been identified as relevant for each of the three ICT systems. Such comprehensible insight into each ICT system provided information on several levels of an ICT system: technological, individual, organisational, environmental as well as four levels of a company’s performance. Thus, application of the research design, developed for the purpose of the current thesis, in other companies will result in deep insights into an ICT system, its functioning, areas of strengths and weaknesses, as well as possible solutions for improving its performance.

On the other hand, each ICT system, investigated in the present thesis, had different interactions and interrelations between the factors. For this reason, findings which relate to the specific ICT system can not be replicated to other ICT systems. In other words, each system is unique, and consequently each ICT system contributes to organisational performance in a unique way. Thus, solutions which work in one system can, and usually do, bring no changes or even negative ones when implemented into other systems. This conclusion alone supports the essential argument presented in the thesis that an ICT system is a complex system which cannot be understood by taking into account only few variables, as it has been done in the previous studies.
8.4 Contributions of the research project

Based on the findings of the current research project, which have been identified above, the contributions of this research project to the theory and practice are identified and presented below.

8.4.1 Contributions to theory

The findings of this research project contribute to theory in multiple ways. The key contributions to theory, which have been achieved in this research project, are:

- The identification of 23 factors regarding technological, individual, organisational and environmental contexts, including the four groups of ICT effects, which influence an ICT system during the use stage of ICT diffusion;
- The application of both systems theory and case study research methods;
- Establishing and explaining how the 23 factors interact with each other and influence an ICT system;
- Establishing interactions between factors and ICT effects, and identifying which elements influence each group of ICT effects;
- Identifying which factors influence ICT utilisation;
- Explaining how ICT utilisation influences the realisation of each group of ICT effects;
- A holistic, multi-level understanding of the ICT value creation process.

The contributions, which have been outlined above, suggest that the process of ICT value creation is a complex phenomenon which occurs at multiple levels of analysis, and is determined by a number of factors regarding four contexts. By applying system theory, conceptualising ICT as a system, and focusing on interactions between technological, individual, organisational and environmental contexts, this study has provided a different approach in relation to, as well as, arguments for, the proper assessment of ICT value. This alone is a valuable and important contribution to theory. It has the potential to have a great impact on both existing studies and future research.
It is the combination of systems theory and case study research methods, in relation to this research project, that constitutes an original contribution to the existing research methodology literature. This combination of research methods is rarely seen in the literature, especially the ICT Management area literature. It seems that the only study that has used this combination of methods is that of Anaf, Drummond and Sheppard (2007). In their particular study that combination of research methods was used to develop a theoretical heuristic model in relation to the health care sector. Therefore, this present study would appear to be unique, in terms of the applied research methods, regarding the ICT value literature.

This study has also demonstrated that the productivity paradox might be the result of complex interactions and interdependencies between technological, individual, organisational and environmental contexts. On the basis of the findings of this study, the productivity paradox may indeed be the result of an inadequate conceptualisation of ICT; and consequently a mismeasurement of ICT effects.

This research project has demonstrated that ICT not only results in productivity gains, but it also provides communication and data sharing, better relationships with customers, and strategic decision-making. ICT can also enable the realisation of organisational goals, as well as bringing change to business processes and the organisational culture. These ICT effects do not occur as a result of investing in ICT. They are the result of utilising ICT in such a way as to support the achievement of organisational goals.

8.4.2 Contributions to practice

The findings of the present research project can be applied in practice to improve both the utilisation of ICT and company performance. This can be done on the basis of:

- Understanding the ICT value creation process, and factors which influence the realisation of each group of ICT effects;
• ICT co-evolving with both the organisational and users’ contexts, and taking both of these into account when creating an ICT value;

• Understanding that the enabling environment, such as ICT education, IT support, and organisational culture are important for the realisation of ICT effects;

• Understanding that every ICT system is characterised by interactions and interdependencies, and that therefore, a change in any part of a system results in change in other parts of that system;

• Understanding that ICT utilisation, not ICT investment, influences the realisation of ICT effects, and that therefore, managers should focus their support on ICT utilisation and related investments.

Realising ICT value is not about having state-of-the-art technology. It is about utilising the capabilities of ICT in such a way that it is most attuned to organisational needs, organisational culture, and business processes. On the basis of the findings in this study, managers can gain a better understanding of the ICT value creation process. Furthermore, by understanding the multiple aspects of ICT value, namely the technological, individual, organisational and environmental aspects, managers are provided with a wider picture as to how they can improve organisational performance. By understanding the creation of ICT value as a complex phenomenon, as well as the role of users and the organisational supporting environment, managers can make more effective decisions in facilitating these processes.

Helping managers and company leaders to understand the importance of ICT systems, as well as interdependencies within an organisational context, will hopefully enable them to adopt a more reflective and holistic understanding of their businesses. Such change might influence business operations, and the prosperity of the business community.

8.5 Limitations of the study and directions for future research

Although this study has resulted in multiple findings, which contribute to theory regarding ICT value, it still has limitations. They are noted and discussed in this section.
The findings in this research project are based on over 50 interviews which have been conducted with different stakeholders, namely employees, IT experts, managers and the Board of Directors. However, this study has been limited by the fact that the access to financial data, in regards to the performance of each company, was not available. For this reason, ICT effects, in each case study, have been explained based on the interview findings. On the other hand, the use of perceptual measures, that is, perceptions of business executives on ICT impact, have been justified and accepted in the literature (Tallon, Kraemer & Gurbaxani, 2000; DeLone & McLean, 1992; Venkatraman & Ramanujam, 1987).

There are several avenues of the possible future research which can be done to complement this study. Possible research in future might include:

- Experimenting with research methods;
- Developing systems theory and complexity further, in regards to the ICT value creation process;
- Focusing on a holistic picture, not just a partial view, of the impact of ICT on a company’s performance;
- Establishing a robust statistical relationship between factors and ICT effects.

The last suggestions to the future research can be explained in more detail. It might be beneficial to use statistical methods, such as structural equation modelling, to establish statistically sound interactions between factors influencing ICT use, and compare them with the findings in this study. In doing so it would be possible to find differences which might be associated to the different methodologies applied.

It would be also useful to extend the research to the economy as a whole and compare results for different levels – micro, individual firms, regions and macro level. However, time and other resource constrains, in particular having in mind the objectives of the research do not necessitated conducting such an analysis.
8.6 Conclusion

This research has been conducted in three companies in Croatia and focused on their ICT systems. Based on over 50 interviews, factors influencing ICT value, in each of the three ICT systems have been identified. Furthermore, interactions between these factors and four groups of ICT effects have been analysed. As a result of analysing these interactions, it has been established how interactions between factors in each ICT system impact on a company’s performance. Thus, the research objective has been achieved.
Appendices

Appendix 1: Charles Sturt University Ethical Committee Approval

Dear Ms Ceric,

Thank you for submitting your research proposal to the Ethics in Human Research Committee. The Committee has considered your proposal entitled “Empirical evaluation of ICT adoption factors in the post-adoption period: Systematic approach”.

Based on the guidelines in the National Statement on Ethical Conduct in Research Involving Humans the Committee determined to approve your proposal subject to the following matters being addressed to the satisfaction of the Presiding Officer:

• the principal investigator providing a response in section 3.1 of the application form.

Integrity, Respect for Persons, Beneficence and Justice section One 1.1- 1.6 pp 11-12 and Research Merit and Safety section One 1.13-1.15 pp 13

• the principal investigator clarifying the anomaly between section 2.2 and 2.3 of the application form. That is; the use of a database; and

• the principal investigator providing a response to section 1.4 of the application form. The time taken in interviews is an example of a burden.

Consent section One 1.7-1.12 pp 12-13

• the principal investigator clarifying if interviews are to be audio taped and if so please include this information on the Information and Consent forms; and

• the principal investigator clarifying what information regarding other members of the company will be given to company managers.

Please don’t hesitate to contact the Executive Officer on telephone (02) 6338 4628 or email ethics@csu.edu.au if you have any enquires.

You should forward your response to the Executive Officer, Ethics in Human Research Committee, Academic Secretariat, Charles Sturt University, Private Mail Bag 29, Bathurst NSW 2795.
Yours sincerely,

Julie Hicks

Administrative Officer
Department of the Academic Secretary
Charles Sturt University
Panorama Ave
Bathurst 2795
Ph: 02 633 84628
Fax: 02 633 84194
juhicks@csu.edu.au
www.csu.edu.au

The Commonwealth Register of Institutions and Courses for Overseas Students (CRICOS) Provider Number is 00005F for Charles Sturt University and the Charles Sturt University Language Centre.
Appendix 2: Characteristics of the interviewees

Table A1.1: Interviewees in Triumph

<table>
<thead>
<tr>
<th>Position</th>
<th>Code</th>
<th>Gender</th>
<th>Age</th>
<th>Employed with Triumph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director of BoD</td>
<td>BoD1</td>
<td>M</td>
<td>50s</td>
<td>N/A</td>
</tr>
<tr>
<td>Member of BoD</td>
<td>BoD2</td>
<td>M</td>
<td>50s</td>
<td>N/A</td>
</tr>
<tr>
<td>Member of BoD</td>
<td>BoD3</td>
<td>M</td>
<td>30s</td>
<td>N/A</td>
</tr>
<tr>
<td>Sales Executive manager</td>
<td>*</td>
<td>F</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Environment Executive manager</td>
<td>*</td>
<td>M</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>IT manager</td>
<td>IT-M</td>
<td>M</td>
<td>50s</td>
<td>N/A</td>
</tr>
<tr>
<td>IT employee</td>
<td>IT1</td>
<td>F</td>
<td>40s</td>
<td>N/A</td>
</tr>
<tr>
<td>IT employee</td>
<td>IT2</td>
<td>M</td>
<td>40s</td>
<td>N/A</td>
</tr>
<tr>
<td>Sales employee</td>
<td>E1</td>
<td>M</td>
<td>40s</td>
<td>15 years</td>
</tr>
<tr>
<td>Purchase employee</td>
<td>E2</td>
<td>M</td>
<td>30s</td>
<td>14 years</td>
</tr>
<tr>
<td>Purchase employee</td>
<td>E3</td>
<td>M</td>
<td>30s</td>
<td>2 years</td>
</tr>
<tr>
<td>Construction employee</td>
<td>E4</td>
<td>M</td>
<td>40s</td>
<td>20 years</td>
</tr>
<tr>
<td>Construction employee</td>
<td>E5</td>
<td>M</td>
<td>50s</td>
<td>20 years</td>
</tr>
<tr>
<td>Technical employee</td>
<td>E6</td>
<td>M</td>
<td>40s</td>
<td>10 years</td>
</tr>
<tr>
<td>Technical employee</td>
<td>E7</td>
<td>M</td>
<td>40-50s</td>
<td>2,5 years</td>
</tr>
<tr>
<td>Warehouse employee</td>
<td>E8</td>
<td>M</td>
<td>50s</td>
<td>2 years</td>
</tr>
<tr>
<td>Plan and preproduction</td>
<td>E9</td>
<td>M</td>
<td>30s</td>
<td>2,5 years</td>
</tr>
<tr>
<td>Plan and preproduction</td>
<td>E10</td>
<td>M</td>
<td>40s-50s</td>
<td>13 years</td>
</tr>
</tbody>
</table>

Neutron- External IT department’s interviewees

<table>
<thead>
<tr>
<th>Position</th>
<th>Code</th>
<th>Gender</th>
<th>Age</th>
<th>Employed with Neutron</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director</td>
<td>N-BoD</td>
<td>M</td>
<td>50s</td>
<td>N/A</td>
</tr>
<tr>
<td>IS manager</td>
<td>N- IT1</td>
<td>F</td>
<td>40s</td>
<td>24 years</td>
</tr>
<tr>
<td>IT manager</td>
<td>N- IT2</td>
<td>M</td>
<td>60s</td>
<td>30 years</td>
</tr>
<tr>
<td>Financial administrator</td>
<td>N-M</td>
<td>F</td>
<td>40s</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Key: BoD-Board of Directors; *-not available
<table>
<thead>
<tr>
<th>Position</th>
<th>Code</th>
<th>Gender</th>
<th>Age</th>
<th>Employed with Eagle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director of BoD</td>
<td>BoD1</td>
<td>M</td>
<td>60s</td>
<td>40 years</td>
</tr>
<tr>
<td>Member of BoD</td>
<td>BoD2</td>
<td>M</td>
<td>40s</td>
<td>5 years</td>
</tr>
<tr>
<td>Member of BoD</td>
<td>BoD3</td>
<td>M</td>
<td>40s</td>
<td>7 years</td>
</tr>
<tr>
<td>Sales manager</td>
<td>M-S</td>
<td>M</td>
<td>50s</td>
<td>8 years</td>
</tr>
<tr>
<td>Marketing manager</td>
<td>M-M</td>
<td>M</td>
<td>30s</td>
<td>8 years</td>
</tr>
<tr>
<td>Chief Editor</td>
<td>M-N</td>
<td>M</td>
<td>30s</td>
<td>9 years</td>
</tr>
<tr>
<td>Accounting Manager</td>
<td>M-A</td>
<td>F</td>
<td>40s</td>
<td>N/A</td>
</tr>
<tr>
<td>IT Department manager</td>
<td>IT-M</td>
<td>M</td>
<td>40s</td>
<td>Few months</td>
</tr>
<tr>
<td>IT Department employee</td>
<td>IT1</td>
<td>M</td>
<td>40s</td>
<td>5 years</td>
</tr>
<tr>
<td>IT Division manager</td>
<td>IT2</td>
<td>M</td>
<td>30s</td>
<td>10 years</td>
</tr>
<tr>
<td>Sales employee</td>
<td>E-S</td>
<td>M</td>
<td>40s</td>
<td>10 years</td>
</tr>
<tr>
<td>Marketing employee</td>
<td>E-M1</td>
<td>F</td>
<td>30s</td>
<td>15 years</td>
</tr>
<tr>
<td>Marketing employee</td>
<td>E-M2</td>
<td>F</td>
<td>50s</td>
<td>30 years</td>
</tr>
<tr>
<td>Journalist</td>
<td>E-J1</td>
<td>M</td>
<td>30s</td>
<td>4 years</td>
</tr>
<tr>
<td>Journalist</td>
<td>E-J2</td>
<td>F</td>
<td>30s</td>
<td>12 years</td>
</tr>
</tbody>
</table>

**Key:** BoD-Board of Directors
Table AI.3: Interviewees in Falcon

<table>
<thead>
<tr>
<th>Interviewees</th>
<th>Code</th>
<th>Gender</th>
<th>Age</th>
<th>Work in Falcon</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Within the production unit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle manager- packing</td>
<td>MP</td>
<td>M</td>
<td>40s</td>
<td>20 years</td>
</tr>
<tr>
<td>Middle Manager- Innovations</td>
<td>MI</td>
<td>F</td>
<td>30s</td>
<td>5 years</td>
</tr>
<tr>
<td>Director of the Production Department</td>
<td>D</td>
<td>M</td>
<td>40s</td>
<td>10 years</td>
</tr>
<tr>
<td>Employee- processing</td>
<td>E1</td>
<td>F</td>
<td>20s</td>
<td>3 years</td>
</tr>
<tr>
<td>Employee- foreman in processing</td>
<td>E2</td>
<td>M</td>
<td>50s</td>
<td>32 years</td>
</tr>
<tr>
<td>Employee- foreman in packaging</td>
<td>E3</td>
<td>F</td>
<td>40s</td>
<td>18 years</td>
</tr>
<tr>
<td>Employee administrator</td>
<td>E4</td>
<td>F</td>
<td>20s</td>
<td>4 months</td>
</tr>
<tr>
<td>Employee- warehouse of final products</td>
<td>E5</td>
<td>M</td>
<td>40s</td>
<td>10 years</td>
</tr>
<tr>
<td>Employee- warehouse of packing material</td>
<td>E6</td>
<td>F</td>
<td>40s</td>
<td>14 years</td>
</tr>
<tr>
<td><strong>Outside the production unit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Director of the IT company</td>
<td>IT-M</td>
<td>M</td>
<td>40s</td>
<td>19 years</td>
</tr>
<tr>
<td>Control manager</td>
<td>MC</td>
<td>M</td>
<td>50s</td>
<td>37 years</td>
</tr>
<tr>
<td>Control vice-manager</td>
<td>MC1</td>
<td>M</td>
<td>50s</td>
<td>35 years</td>
</tr>
<tr>
<td>Financial manager</td>
<td>MF</td>
<td>M</td>
<td>40s</td>
<td>9 years</td>
</tr>
<tr>
<td>Sales Manager</td>
<td>MS</td>
<td>F</td>
<td>40s</td>
<td>7 years</td>
</tr>
<tr>
<td>Sales employee</td>
<td>ES</td>
<td>M</td>
<td>40s</td>
<td>8 years</td>
</tr>
</tbody>
</table>
Appendix 3: Research questions

Research questions for employees:
Could you please introduce yourself, your position in the company?
How and what for do you use ICT?
How does utilisation of ICT influence your work? And how it influences the organisational performance?
What would you change in ICT applications or anything connected to them, to make your work more enjoyable and efficient?
How have you learned to use ICT?
Could you please tell me about your satisfaction with ICT seminars? Is there a need to repeat them?
How do your colleagues influence your use of ICT and vice versa?
Are you happy with ICT support? Could you please tell me more about your collaboration with IT employees?
How do BoD and managers influence ICT use in the company?
What is the attitude toward ICT in the company in general?

Research questions for the members of Board of Directors and managers:
Could you please introduce yourself and your position in the company?
Could you please describe shortly the company’s position in the market, its competitors, strategies and customers?
What is the role of ICT in the company?
Why did you decide to adopt ICT?
What are the benefits and possible issues with utilising ICT in the company?
How do users utilise ICT in relation to the company’s strategies?
Could you tell me more about your collaboration with IT employees?
How ICT use contributes to the company’s performance:
- Are ICT applications in the company integrated and compatible with each other?
- How it influences company’s strategies?
- How it influences collaboration with suppliers and customers?
- What are its effects in terms of productivity and profit?
- How did ICT use influenced changes in the organisation?
How could ICT use improve organisational performance even more in the company, in your opinion?

**Research questions for IT employees:**

Could you please introduce yourself, your position in the company?
Could you please tell me more about the ICT development and ICT characteristics in the company?
What is ICT used for in the company?
When was it implemented and how did that go?
How do users, their ICT knowledge and skills influence ICT utilisation in the company? Who provides ICT seminars?
How do managers and the Board of Directors influence ICT utilisation in the company? Could you please tell me more about your collaboration with them?
How does ICT use contribute to the organisational strategy and the organisational performance?
What are the ICT issues in the company?
What are your suggestions for improving ICT utilisation and effects in the company?
Table A4.1: Cross-link matrix showing positive interactions in Triumph’s ICT system

<table>
<thead>
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Table A4.2: Cross-link matrix showing negative interactions in Triumph’s ICT system

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Table A5.1: Cross-link matrix showing positive interactions in Eagle’s ICT system

| Wirkung von Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | Aktiv-Quotient | Förderndes Produkt |
|----------------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|------------------|-------------------|
| ICT integration      | 1 | 1.0| 1.0| 2.0| 1.0| 0.5| 1.0| 0.5| 1.0| 1.0 | 0.5| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 16.5| 0.83| 330.00 |
| ICT compatibility    | 2 | 2.0| 1.0| 1.0| 2.0| 1.0| 2.0| 2.0| 2.0| 1.0 | 1.0| 0.5| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 23.5| 1.24| 446.50 |
| ICT openness         | 3 | 1.0|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 1.0 | 0.67 | 1.50  |
| ICT user friendliness| 4 | 1.0| 0.5| 0.5| 1.0|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 0.5 | 0.30 | 40.25 |
| ICT utilisation      | 5 | 2.0| 1.0| 1.0| 1.0| 0.5| 0.5| 0.5| 0.5| 0.5 | 0.5| 1.0| 1.0| 1.0| 1.0| 1.0| 1.0| 1.0| 1.0| 1.0| 1.0| 1.0| 8.0 | 0.47 | 136.00 |
| Users’ age and ICT experience | 6 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 3.5 | 3.50 | 3.50  |
| Employees’ ICT knowledge | 7 | 2.0| 1.0| 1.0| 1.0| 1.0| 0.5| 1.0| 0.5| 0.5 | 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 9.0 | 1.50 | 54.00 |
| Employees’ ICT attitudes | 8 | 0.5| 0.5| 1.0| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5 | 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 3.0 | 0.40 | 22.50 |
| Managers’ ICT knowledge | 9 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 7.0 | 1.56 | 31.50 |
| Managers’ support    | 10| 2.0| 2.0| 0.5| 0.5| 0.5| 1.0| 1.0| 2.0| 0.5 | 1.0| 1.0| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 22.5| 1.32 | 382.50 |
| Organisational strategies | 11| 2.0| 2.0|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 22.5| 1.73 | 292.50 |
| Organisational culture | 12| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 1.0| 1.0| 0.5 | 0.5| 1.0| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 11.5| 0.96 | 138.00 |
| IT support           | 13| 2.0| 2.0| 0.5| 1.0| 0.5| 0.5| 1.0| 2.0| 1.0 | 1.0| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 15.0| 1.07 | 210.00 |
| Alignment between org and ICT strategies | 14| 1.0| 1.0| 2.0|    | 1.0| 2.0| 1.0| 1.0| 1.0 | 1.0| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 2.0| 17.0| 1.17 | 246.50 |
| ICT seminars         | 15| 2.0| 0.5| 0.5|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 4.5 | 1.50 | 13.50 |
| Customers            | 16|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 1.0 | 0.15 | 6.50  |
| Suppliers            | 17| 1.0|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 8.0 | 0.94 | 68.00 |
| Trends in the market | 18| 1.0| 0.5| 1.0|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 14.0| 3.50 | 56.00 |
| Partner company      | 19| 2.0| 2.0| 2.0| 2.0| 2.0| 0.5| 0.5| 0.5| 0.5 | 0.5| 1.0| 0.5| 1.0| 1.0| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 10.0| 1.33 | 75.00 |
| Informational ICT effects | 20| 0.5| 1.0| 1.0| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5 | 0.5| 1.0| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 13.0| 0.99 | 188.50 |
| Strategic ICT effects | 21| 0.5| 2.0| 1.0|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 14.5| 0.81 | 261.00 |
| Transactional ICT effects | 22| 1.0| 1.0|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 7.5 | 0.54 | 105.00 |
| Transformational ICT effects | 23| 2.0| 2.0|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 15.5| 0.91 | 263.50 |
| 24|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 1.0 | 1.00 | 1.00  |

Passivsumme PS: 20.0 | 19.0 | 15.5 | 11.5 | 17.0 | 1.0 | 6.0 | 7.5 | 4.5 | 17.0 | 13.0 | 12.0 | 14.0 | 14.5 | 3.0 | 6.5 | 8.5 | 4.0 | 7.5 | 14.5 | 18.0 | 14.0 | 17.0 | 1.0 | 252.5
Table A5.2: Cross-link matrix showing negative interactions in Eagle’s ICT system

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### Appendix 6: Cross-link matrices developed for Falcon’s ICT system

#### Table A6.1: Cross-link matrix showing positive interactions in Falcon’s ICT system

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Table A6.2: Cross-link matrix showing negative interactions in Falcon’s ICT system


Schlange, L.E. (1995). Strengthening the Bridge between Qualitative and Quantitative Modeling: Contributions to the Toolbox for Analyzing Qualitative Models, Working Paper, St. Gall Centre of Futures Research, Switzerland


