

## CHAPTER 1: Introduction

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### 1. CHAPTER 1: INTRODUCTION

*“A work that aspires, however humbly, to the condition of art should carry its justification in every line.”*

**Joseph Conrad**

#### 1.1 Introduction

This chapter provides an introduction to the research study by starting with:

1. a research study motivation section that will provide the necessary background for the research study;
2. then it describes the research study process that will be followed, and includes the:
  - ❑ research study problem statement and objectives,
  - ❑ research study goals,
  - ❑ research study research questions, and
  - ❑ research study strategies;
3. then it moves on to the research study approach that will be used within the research study, which consists of a theoretical contribution process as described by Eisenhardt (1989), Kerssens van Drongelen (2001), Whetten (1989) and Walsham (1995); and
4. it provides a research study overview to indicate the layout of the research study, which will include a thesis roadmap that will be presented at the start of each chapter within the research study, before moving on to the chapter’s summary and conclusion sections.

Checkland and Scholes (1990) state that a problem can be formulated as a situation in which the current state differs from the desired state and that problem solving is then applied as the method that will lead to the desired state. The research study will do

that by defining a problem statement, sketching the current state by means of a literature study, moving on to an exploratory field study by means of interpretive research, analyzing the research data collected and providing a solution that will lead to the desired state.

## **1.2 Research study motivation**

Information Technology and Information Systems play an important role in the everyday lives of users and organizations (Moll 1983): creating, storing, retrieving and processing information used for operations, management and decision-making functions. Information Technology, in its various manifestations, processes data, gathers information, stores collected materials, accumulates knowledge and expedites communication (Chan 2002). They consist of (Giovanetti and Bellamy 1996) computer systems, telecommunications networks, hardware, software, multimedia, etc. Information is seen as a key corporate resource (Rogerson and Fidler 1994) and has evolved within organizations through advances in Information Technology and the use of Information Systems. It is, therefore, important to understand that Information Technology has a radical impact on its users, their work and their work environment (Chan 2002) and plays an important role in the everyday operations of organizations. Although Information Technology plays such an important role in today's workplace, it is important to remember that it is neither the only cause of progress nor the singular facilitator of change; it is essential to keep in mind that the "human elements" of individuals – issues of personality, culture and society – that impact on user perceptions also play major roles in organizational operations (Chan 2002), including the effective and efficient deployment of Information Technology and Information Systems. This "impact" that the introduction and use of Information Technology may have on the organization, on work and on the individuals in an organization can either be of a technological nature – that is often explicitly known, or of a social nature – that is usually not as easily identifiable. Nonetheless, it is important that both the technological and social

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factors should be managed and that the complex relationship that exists between humankind and Information Technology is recognized. The research study will focus on certain some social factors that should be managed and not on the technological factors that could play an important role.

The use of the Internet, a self-regulated network connecting millions of computer networks around the globe, and Electronic Commerce by individuals and organizations around the world is the new way of doing business (Karakaya 2001) and plays an important role in the everyday operations of organizations. For organizations to use Electronic Commerce applications successfully they need the right information, infrastructure and support systems (Turban 2002) in place. Many factors impact on the success of Electronic Business. One of these is the security of conducting on-line transactions. According to Riem (2001), not a day passes without a new Internet fraud scam coming to light – Internet crime appears to be growing faster than the Internet itself. For every new on-line service, another one has been hacked into, either deliberately, or as a result of some security flaw (Riem 2001). The security of credit card transactions remains the number one concern, both for Internet users who have yet to make an on-line purchase, and for those who have performed on-line transactions, and is a deciding factor preventing businesses from pursuing this avenue (Noie 1999). Bequai (1996) adds to this by stating that concerns over Information Technology security, including theft, fraud and abuse have forced organizations to take a cautious approach to Electronic Commerce.

The research study suggest that an effective and accurate identification system could perhaps provide a solution to this dilemma by improving administrative productivity, keeping organizational resources secure, as well as streamlining Electronic Commerce transactions (RSA Security 2002). On the other hand, without an effective and accurate identification system, the staggering proliferation of identities in Electronic Business and the challenge of

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managing them securely and conveniently will threaten to inhibit the growth of Electronic Business (RSA Security 2002). When one then considers an identification system as a possible solution, it is important to understand that human identity is a delicate notion, which requires consideration at all levels of philosophy and psychology (Clarke 1994). Accurate identification is important to allow organizations to provide a better service to their customers and to prevent individuals from misrepresenting themselves to the organization (Clarke 1994). A variety of identification means are available, but the key focus should be to establish accurate identity. For this reason, biometric identification will be discussed as the preferred means of identification, as it is based on physical and difficult-to-alienate characteristics of an individual and is claimed to provide greater confidence that the identification is accurate (Clarke 1994). According to Albrecht (2003), one of the fastest growing applications for biometric identification techniques is Electronic Commerce. In an ideal world, the participants involved in an Electronic Business transaction should be able to identify whether the partners they are dealing with are in fact who they claim to be. With biometric identification, this uncertainty can potentially be removed (Albrecht 2003).

However, the tie between the actual identity of an individual and the use of biometrics is subtle and provokes many debates, particularly relating to privacy and other societal issues (Soutar 2002). Clarke (2001) adds to this by stating that biometrics has extremely serious implications for human rights in general and privacy in particular and that biometric design has been highly insensitive to the interests of the individuals upon whom they are imposed. Therefore, user perceptions will always play a vital role in the success or failure of new implementations. Ram and Jung (1991), who studied organizational members' responses when they were forced to adopt a new implementation, show that even innovative individuals resist the new implementation in the context of forced adoption. The use of biometrics is seen as an invasion of privacy, because the individual has to enrol with an

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image of a body part and once acquired, it is possible that the biometric might be used for other purposes, unknown to the individual (Bolle *et al.* 2001).

It is therefore understandable, based on the above discussion, that user perceptions (social factors) will play an important role in the implementation of identification through biometrics in Electronic Business. Ghorab (1997) states that understanding why individuals accept or reject Information Technology innovations has proved to be one of the most challenging issues in Information Technology research.

### 1.3 Research study process

#### 1.3.1 Research study problem statement and objectives

The research study motivation section has led to the following research study problem statement: **The identification of user perceptions related to identification through biometrics within electronic business.**

The main objectives of the research study problem include the identification of:

1. Important factors that influence user adoption of Electronic Business.
2. Why identification plays such an important role in Electronic Business.
3. Important factors that influence user perceptions related to biometrics as an identification system within Electronic Business.

#### 1.3.2 Research study goals

According to Olivier (1999) there are usually **three** types of research goals that can be defined for a research study:

1. **Technical** – those that deal with the implementation of Information Systems and related issues.
2. **Social** – those that deal with the people side of computing, including the management of Information Technology facilities.

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3. **Philosophical** – those that deal with the responsibility, accountability, legal aspects, implications and similar aspects of using Information Systems.

The research goal for the research study is of a **social** nature, dealing with the people side of computing, and includes user perceptions related to biometrics, trust amongst participants within Electronic Business, and security and privacy considerations within biometric identification systems.

### 1.3.3 Research study questions

A process-based research framework, for research in Information Systems in which the fundamental social nature of Information Systems is taken into account, as described by Roode (1993) will be used in researching the research study's problem statement. Roode's process-based research framework is based on the taxonomic framework of Burrell and Morgan (1961), where one consciously traverses the problem space in order to develop a richer understanding of the nature of the problem statement under investigation (Phahlamohlaka and Lotriet 2002).

The process-based research framework (Roode 1993) forces the researcher to take into consideration the social nature of Information Systems. Information Systems is an inter-disciplinary field of scholarly inquiry, where information, Information Systems and the integration thereof with the organization are studied in order to benefit the total system, which includes technology, people (users), organization and society. Thus, according to Roode (1993), the fundamental issue underlying Information Systems as an inter-disciplinary discipline, is to balance the need to contribute (through Information Systems), to the achievement of the mission of the organization, with the moral responsibility to develop and implement socially acceptable Information Systems.

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Research projects always start with a problem statement, usually expressed as a question or questions. By making use of the process-based research framework, the researcher would need to pose different research questions to explore different aspects of the problem statement. The research questions are not linearly related, and the uniqueness of each problem statement will dictate which questions would be relevant, and the order in which they should be posed. The research questions for the research study problem statement will be identified from the following set of **four** generic research questions (Roode 1993):

Table 1-1: Generic research questions

	<b>What is?</b>	
<b>How does?</b>	Research study problem statement Teaching situation Information System development	<b>Why is?</b>
	<b>How should?</b>	

**Source:** Adapted from source - ROODE, J.D. 1993. Implications for Teaching of a Process-based Research Framework for Information Systems. *Working paper - Department of Informatics: University of Pretoria*, 1993.

1. **What is?** With this research question the **fundamental nature or essence** of the problem statement is first explored. It aims at exposing the structure of the problem statement and/or the meaning of the underlying concepts.
2. **How does?** In answering this research question the problem statement is **directly observed and described** as it manifests itself in reality.
3. **Why is?** The purpose of this research question is to explain the **real-life behaviour or characteristics** of the problem statement and in doing so, determine the relationships between aspects of and/or variables within the problem statement.
4. **How should?** This research question focuses on the **conclusions, implications or normative aspects** of the research results. It is an

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evaluation of the research results or new insights obtained during the research.

To summarize, posing the research questions in this manner leads to a holistic approach to problem solving, whilst taking the unique nature of the research project into account. The researcher is not required to accept the assumptions associated with one question, but merely enquires about different facets of the problem statement to obtain as much information about it as possible (Phahlamohlaka and Lotriet 2002). The process-based research framework approach is multi-dimensional and takes the specific uniqueness of each research problem explicitly into account and will be used in the research study to identify the research questions.

Based on the process-based research framework (Roode 1993), the following research questions have been identified for the research study problem statement:

### 1. What is?

- What is meant by the social nature of Information Technology?
- What is Electronic Business?
- What are the social factors within Electronic Business that impact on user adoption?
- What does biometrics comprise?
- What concepts do users have of what biometrics can do?

### 2. How does?

- How does a technology adoption process work?
- How do users respond to biometrics?
- Do users respond differently to different kinds of biometrics?

### 3. Why is?

- Why is identification so important in Electronic Business?

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- Why do users respond to biometrics in the way they do?
- Why would users adopt biometrics?

### 4. How should?

- How user perceptions, related to biometrics, should be taken into consideration to ensure success with the implementation of identification through biometrics in Electronic Business?

#### 1.3.4 Research study strategies

The research goals previously described in section 1.3.2 are, according to Olivier (1999), either:

1. **Exploratory/empirical** – those that depend on observation and include surveys, case studies, interpretive research and experiments.
2. **Creative** – those that are intended to devise new algorithms and languages.
3. **Tautological** – those that transform their inputs to reveal something that was not obvious in the inputs.

The research strategy for the research study is of an **exploratory** nature, meaning that it depends on observation, and includes surveys, case studies, interpretive research and experiments. This research study has used interpretive research (questionnaires) as a basis to identify various themes related to user perceptions of biometrics. These themes were then discussed during a focus group session with research participants. Interpretive research will be discussed in more detail in Chapter 7 – Research method.

### 1.4 Research study approach

#### 1.4.1 Theoretical contribution process

The theoretical contribution process has specifically been selected because it takes the social nature of Information Technology into account. Eisenhardt (1989) states that a theoretical contribution, which can be considered as a

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trajectory or, in other words, a process (Kerssens van Drongelen 2001), is the central activity of a research study.

Whetten (1989) identified **four** essential elements that a theoretical contribution must contain:

1. Which factors should be considered as part of the explanation of the social or individual phenomena of interest?
2. How are these identified factors related?
3. What are the underlying psychological, economical, or social dynamics that justify the selection of factors and the proposed relationships between them?
4. That the “**who**”, “**where**” and “**when**”, that place limitations on the propositions generated from the theoretical model, should be identified.

In this study the “**what**” and “**how**” elements constitute the subject of the literature survey that has lead to a theoretical framework (elements (1) and (2)). The links identified between the factors in the framework have been investigated through an exploratory field study (element (3)). The results of the exploratory field study have lead to propositions and exposed limitations in the study (element (4)).

The research study has been divided into **two** major parts:

### 1. Theoretical understanding

The first part provides a theoretical understanding through a literature survey of:

- The social nature of Information Technology.
- Electronic Business and the social factors within Electronic Business that impact on user adoption.
- The importance of identification within Electronic Business.
- Biometrics as the selected identification method and the social factors that impact on user perceptions related to biometrics.

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- A technology adoption process.

The theoretical understanding or framework takes previous knowledge into account and creates a theoretical basis to inform (Walsham 1995) the exploratory field study.

### 2. Exploratory field study

The second part of the research study contains the details of the exploratory field study, which addresses:

- How users respond to biometrics and why they respond to biometrics the way they do.
- How user perceptions related to biometrics should be addressed to ensure success with the implementation of identification through biometrics in Electronic Business.

According to Eisenhardt (1989) it is the exploratory test of a research study that permits the development or contribution of a relevant or valid theory, in other words, delivering a theoretical contribution through the research study to the Information Technology discipline.

### 1.5 Research study overview

The research study consists of ten chapters, including this chapter. **Chapter 1 – Introduction**, provides an overview of the research study. It covers the research study motivation section, the research study process that will be followed and approach that will be used within the research study.

The remainder of the research study will consist of:

1. A literature study comprising:
  - **Chapter 2 – The social nature of Information Technology**, addressing the research question: What is meant by the social nature of Information Technology? The chapter will define the term Information

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Technology, describe the different roles Information Technology can assume within an organization and discuss the social nature of Information Technology.

- ❑ **Chapter 3 – Electronic Business**, addressing the research questions: What is Electronic business? and What are the social factors within Electronic business that impact on user adoption? The chapter will define the term Electronic Business, list some Electronic Business benefits and limitations, discuss some social factors that will have an impact on the user adoption of Electronic business and provide some social factor solutions, proposed by other researchers.
  
- ❑ **Chapter 4 – The importance of identification**, addressing the research question: Why is identification so important in Electronic business? The chapter will define the term identification, discuss the importance of identification within Electronic business and list different means of identification.
  
- ❑ **Chapter 5 – Biometrics**, addressing the research question: What does biometrics comprise? The chapter will define the term biometrics, provide a brief biometric history, clarify important biometric terminology, explain how a biometric system works, list **two** categories of biometric methodologies, summarize some biometric identification system advantages and disadvantages, discuss some social factors that will impact on user perceptions related to biometrics and provide some social factor solutions proposed by other researchers.
  
- ❑ **Chapter 6 – Adoption of technology**, addressing the research question: How does a technology adoption process work? The chapter will discuss the impact of technology adoption, specifically user perceptions relate to biometric identification methods, discuss a technology

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adoption model and develop a specific Technology Adoption Model for the research study problem statement.

2. **Chapter 7 – Research method**, addressing interpretive research used to collect the research data by means of a research study questionnaire and research study focus group. The chapter will provide information on the actual research site selected, the user interview process, including the research period, the research results and reporting process and an explanation on how the research results were analyzed.
3. An exploratory field study comprising:
  - **Chapter 8 – User response to biometrics**, addressing the research questions:
    - What concepts do users have of what biometrics can do?
    - How do users respond to biometrics?
    - Do users respond differently to different kinds of biometrics?
    - Why do users respond to biometrics in the way they do?
    - Why would users adopt biometrics?
  - **Chapter 9 – User perceptions related to biometrics**, addressing the research question: How user perceptions, related to biometrics, should be taken into consideration to ensure success with the implementation of identification through biometrics in Electronic Business? The chapter will discuss user perceptions related to biometrics that need to be considered for biometric identification systems, revisit the Technology Adoption Model constructed in Chapter 6 – Adoption of Technology, list additional use of biometrics as identified by the employees that participated in the research study questionnaire, summarize additional comments by employees on the research study problem statement presented to them, illustrate the interest shown by the employees that answered the questionnaire in receiving the research

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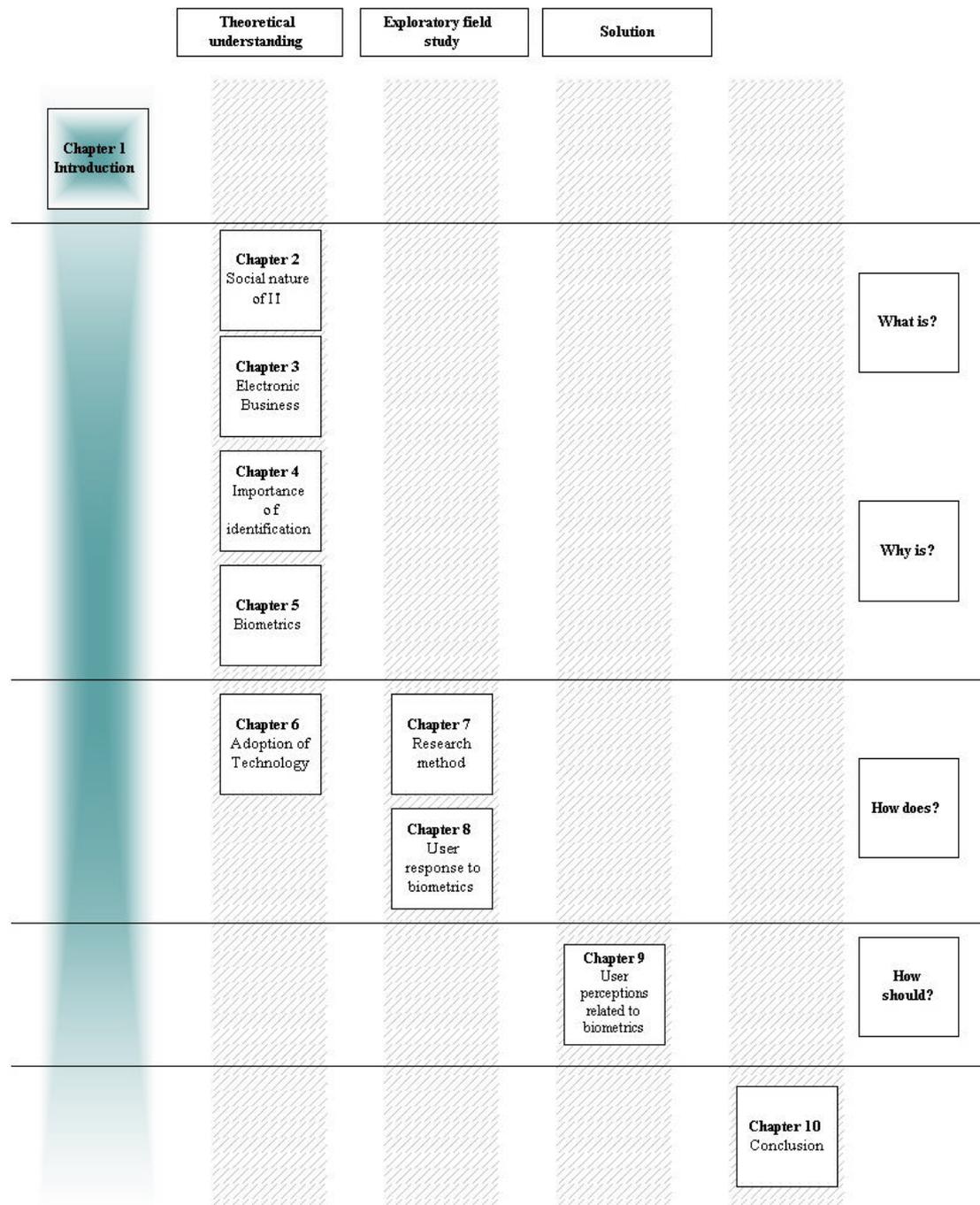
study results and summarize the results of the focus group with key employees that responded to the research study questionnaire by discussing the conclusions reached within Chapter 8 and 9 of the research study in order to provide more insight into the employee's perceptions and attitudes.

4. **Chapter 10 – Conclusion**, comprising of the research study conclusion, the research study evaluation and recommendations for future research studies
5. A list of literature references
6. An appendix section covering the research study ethics and the research study questionnaire.

The following figure will be presented before each chapter to provide a graphical guide to the area under discussion:

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**Figure 1-1:** Thesis roadmap – Chapter 1



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### 1.6 Summary

This chapter provides some background to the research study problem statement and objectives by means of a research study motivation section. The actual research study problem statement was then defined as: **The identification of user perceptions related to identification through biometrics within electronic business.** The research study goals, research study questions and research study strategies were discussed before moving on to the research study approach that will be used within the research study. Lastly, a research study overview was supplied to indicate the layout of the research study, which includes a thesis roadmap that will be presented at the start of each chapter of the research study.

### 1.7 Conclusion

It was concluded in this chapter, **Chapter 1 – Introduction**, that user perceptions (social factors) will play an important role in the implementation of identification through biometrics in Electronic business.

The first chapter that forms part of the literature study section provides a theoretical understanding of “The social nature of Information Technology”.