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SYSTEM CHANGES IN A GROWING SOUTH AFRICAN ORGANISATION

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A research report submitted to the Faculty of Commerce, Law and Management, University of Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration

Johannesburg, 2006

ABSTRACT

This research study examines how changes in management structure and the concomitant technology changes in a growing organisation impact on each other, and to investigate the intended and unintended influence these elements have on the manner in which work is done. A social constructivist approach is taken to this researching using an ethnography of a case currently undergoing technology changes. Orlikowski's (1992) structurational model of technology is used to frame the research. The research reveals that the planning and implementation of a system change are absolutely fundamental to its success. The research further shows that a system change in isolation cannot bring about the requisite changes an organisation may require. The research suggests that systems be planned as a part of a greater change process, and that the change be well communicated to all stakeholders with the requirements planning and implementation to be undertaken thoroughly.

DECLARATION

I, Carmen Monica von Fintel, declare that this research report is my own, unaided work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Carmen Monica von Fintel

August 2006

DEDICATION

“I can do everything through Christ who strengthens me.”

Philippians 4:13

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CHAPTER 1: INTRODUCTION

1.1. Purpose of the Study

The purpose of this research study is to determine how changes in management structure and the concomitant technology changes in a growing organisation impact on each other, and to examine the intended and unintended influence these elements have on the manner in which work is done.

1.2. Context of the Study

As an organisation grows, in order to remain effective, its structure may require some adjustments in order to keep pace with the changes that the growth brings about. The manner in which the organisation is managed also needs to alter. This may in turn results in a need for some form of management information system or technology development, the objective of which being to solve a management problem which has arisen due to the growth. While the technology, if well developed and implemented, does assist the organisation, it almost always results in another, different problem; an unintended consequence of the technology. Further, the technology usually brings about a change in the way in which the organisation's staff works (Greiner, 1998).

It is against this backdrop that this research will focus on changes in management and the concomitant technology changes in a growing organisation, and the impact these have on each other. The study will also examine the intended and unintended influence these elements have on the manner in which work is done.

The research will be conducted using the ethnographic research method and Giddens' (1984) structuration theory will be used to frame the research study. Ethnography has been selected as the method of research as it focuses on understanding the dynamics present with single settings (Eisenhardt, 2001).

1.3. Problem Statement and Sub-problems

1.3.1. Problem Statement

The purpose of this research study is to determine how changes in management and the concomitant technology changes in a growing organisation impact on each other, and to examine the intended and unintended influence these elements have on how work is done.

1.3.2. Sub-problems

The first sub-problem is to identify how the changes in management structure, that have occurred as the organisation has grown, have affected the way in which work is done.

The second sub-problem is to identify how the changes in work practices have affected the technology.

The third sub-problem is to establish how the technology changes have impacted on the management structure and the work practices.

1.4. Significance of the Study

The study fills a gap in the literature, particularly with the literature on information systems within the South African context. Organisational studies have undoubtedly had more influence on the field of information technology than the reverse, and this study aims to address that specific gap (Orlikowski & Barley, 2001).

Furthermore, much of the literature analyses information technology and organisational culture (Robey & Azevedo, 1994 and Walsham, 2002) but there appear to be fewer references to information technology and management in growing organisations, particularly within the South African context.

1.5. Delimitations

The study will be done from the perspective of business manager within medium-sized organisation currently experiencing capital expansion.

As the research will be undertaken as an ethnography, the scope of the study will be limited to data collected from the research site of Remata iNathi (Pty) Ltd.

1.6. Assumptions

The study assumes that there are benefits to be gained from understanding how changes in management and the concomitant technology changes in a growing organisation impact on each other, and also that an awareness of the intended and unintended influence these elements have on the manner in which work is done will be beneficial to the overall management of the organisation.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

Webster & Watson (2002) believe that a literature review of prior, relevant literature is essential to any academic project. The literature review establishes a firm foundation for advancing knowledge; it highlights areas where much research has already been done and areas where further research is needed.

Moreover, according to Leedy & Ormond (2001), a literature review is critical when doing qualitative research using an interpretive research method. This is because of the integrated role of the researcher in the data collection process. The researcher needs to have a robust understanding of the literature around the research area in order to be in a position to separate out the important information for observation and discussion (Human, 2003). The following chapter will provide an overview of the literature that was used in developing the research questions and which will be used to guide the data collection process.

The purpose of this research study is to determine how changes in management and the concomitant technology changes in a growing organisation impact on each other, and to examine the intended and unintended influence these elements have on the manner in which work is done. The research study will be done as ethnography, and Giddens' (1984) structuration theory will be used to frame the ethnography. The literature review therefore provides a brief discussion on structuration theory and shows how this applies to the problem set out for the research study. The review then looks at Orlikowski's (1992) structurational model of technology as an application of the structuration theory in information technology and organisational and management research. Finally, the review looks at previous research on technology and organisations, as well as research on information technology development and implementation is also reviewed.

Following from the literature review, research questions are formulated as they emerge from the literature.

2.2. Structuration Theory

Giddens' (1984) structuration theory will be used to frame the ethnography in this research study. While this theory has received considerable attention in the information systems arena, the focus in this report will be to develop an ethnographic study using structuration theory to determine how changes in management and concomitant technology changes in a growing organisation impact on each other, and to examine the intended and unintended influence these elements have on the manner in which work is done (Walsham, 2002). Structuration further offers significant insights into information technology in as much as information systems are seen as social systems, which operate within social and organisational contexts that influence their development and use, and in turn are also responsible for sustaining and changing these contexts (Jones, 1999).

Giddens (1984), sited in Walsham (2002), describes structuration theory as "a description of the nature of human action and social organisation" (Walsham, 2002: 361). A core feature of the theory is its attempt to treat human action and social organisation as a duality rather than a dualism. That is to say that instead of seeing human action as taking place within the context of external constraints of social structure, as would be the case in a dualism, action and structure are seen as two elements of the same whole (a duality) (Walsham, 2002). The theory recognises that human actions are enabled and constrained by structures and yet, that these structures are the result of previous actions (Orlikowski, 1992).

This distinction is made possible by the way in which Giddens (1984), sited in Walsham (2002), redefines the meaning of structure. Structure is defined as "rules and resources, recursively implicated in the reproduction of social systems. Structure exists only as memory traces, the organic basis of human knowledgability, and as instantiated in action" (Walsham, 2002: 361).

Structure, so defined, is viewed as rules of behaviour and the ability to put into action resources that exist in the human mind itself rather than as an outside limitation. The actions of people therefore draw on these rules and resources and in this way produce or reproduce structure in the mind (Walsham, 2002).

Structuration theory seems to be focused on reproducing structure in the mind and broader social structures within societies, through a process of routinisation of

activities and thus reinforcing existing structures. However the theory also emphasises human knowledgability and the manner in which people reflexively monitor their own, and others', actions and the intended and unintended consequences thereof. The idea that actors are knowledgeable and reflexive is a central premise to this theory. Giddens (1979), sited in Orlikowski (1992), notes that all humans are "highly 'learned' in respect of knowledge which they possess and apply in the production and reproduction of day-to-day social encounters" (Orlikowski, 1992: 404). He (Giddens) further distinguishes between discursive (what is said) and practical (or tacit) knowledge (what is simply done). "Reflexivity refers to the capacity of humans to routinely observe and understand what they are doing while they are doing it" (Orlikowski, 1992: 404). This applies not only to their own actions but also the constant monitoring of theirs' and others' physical and social contexts and activities.

Through the regular action of knowledgability and reflexivity, patterns of interaction are established as standardised practices. Over time, the habitual use of these practices result in them eventually becoming institutionalised and therefore they begin to form the structural properties of an organisation. These structural properties are drawn upon by the people within the organisation in their on-going interactions and in so doing further reinforce the institutionalisation (Orlikowski, 1992).

When people act in organisations they create and recreate three fundamental elements of social interaction, namely, meaning, power and norms. While these elements are highly interdependent and not separate in practice, for the purposes of analysis they are looked at individually (Orlikowski, 1992) (see figure one below).

FIGURE 1: Analytical Elements of the Duality of Structure

STRUCTURE	Signification	Domination	Legitimation
MODALITY	Interpretative Scheme	Facility	Norm
INTERACTION	Communication	Power	Morality

(Giddens, 1984: 29)

Human interaction involves the constitution and communication of meaning which is achieved via interpretative schemes or stocks of knowledge that people draw on in their on-going interaction with the world. The interpretative schemes do more than

share meanings and as a result mediate communication; they represent structures of signification, which represent the organisational rules that inform and define interactions. These schemes are also reinforced or changed through social interactions. Power enters into people's interactions through providing organisational capabilities for them to accomplish outcomes and is understood as a transformative capacity. Finally, norms are organisational conventions or rules that govern what is considered legitimate or appropriate behaviour (Orlikowski, 1992).

2.3. Structurational Model of Technology

Despite much investigation into the area, there is little agreement on the definition and measurement of technology, nor any compelling evidence as to the exact role of technology in organisations. Early research assumed technology to be an objective external force that would have deterministic impacts on organisational properties such as structure. Later research focussed on the human aspect of technology, viewing it as the outcome of strategic choice and social action. More recent work has taken a type of hybrid view which holds that technology is an external force having impacts, but where those impacts are influenced and moderated by people and the organisational context (Orlikowski, 1992).

Orlikowski (1992) holds that these divergent definitions and opposing perspectives have resulted in a limited understanding as to how technology interacts with organisations. She (Orlikowski) draws on Giddens' (1979) structuration theory and suggests that a reconstruction of the previously discussed views need to be taken into account to get a more accurate and complete view. She (Orlikowski) undertakes such a reconstruction and proposes a model for analysing the nature and role of technology in organisations which she called the "structurational model of technology" (Orlikowski, 1992: 398).

2.3.1. Premises of Structurational Model of Technology

Orlikowski (1992) makes use of to two key premises on which to base her model, namely, the duality of technology and its interpretive flexibility.

The first premise, taken from Giddens' (1984) structurational theory, which Orlikowski (1992) calls the duality of technology, is based on the recursive notion which says

that “technology is created and changed by human action, yet it is also used by humans to accomplish some action” (Orlikowski, 1992: 405).

The duality of technology shows previously stated views of technology as an objective force, on the one hand, or a socially constructed product on the other, as being false. Technology is a product of human action while also assuming structural properties. Technology is physically constructed by human agents that work within a specific social and organisational context, and at the same time it (technology) is socially constructed by the different meanings the human agents attribute to the features that are emphasised and used. At some point, once the technology has been deployed into the organisation, it seems to become institutionalized and loses its connection to the human agents that developed it, giving the appearance of being part of the objective and structural properties of the organisation (Orlikowski, 1992).

The second premise, the interpretive flexibility of technology, says that “the interaction of technology and organisations is a function of the different actions and socio-historical contexts implicated in its development and use” (Orlikowski, 1992: 405).

Orlikowski (1992) used the term “interpretive flexibility” to refer to the degree to which users of technology are involved in its physical or social construction during development and use. It (interpretive flexibility) is therefore an attribute of the relationship between humans and technology, and as a result is influenced by, and constrained by, characteristics of material artefacts, human agents and the organisational context.

2.3.2. Components of Structurational Model of Technology

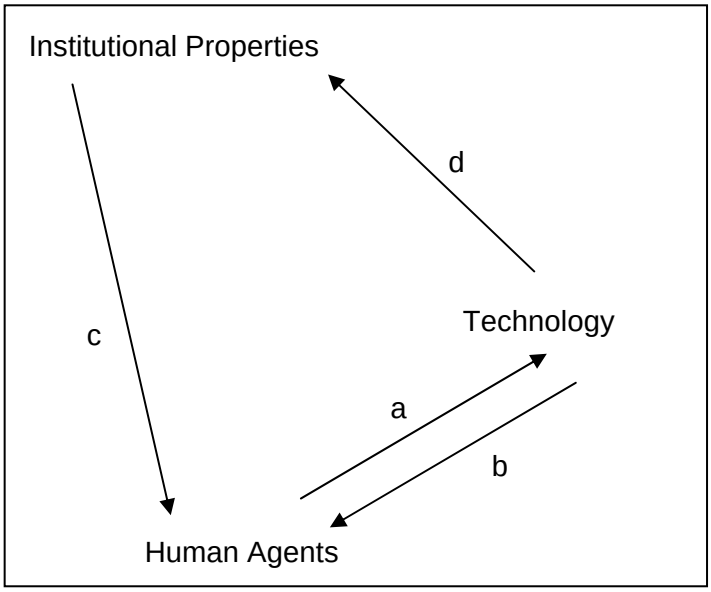
The structurational model of technology comprises of the following components:

1. human agents, being technology designers, users and decision-makers;
2. technology, being the material artefacts mediating task execution in the workplace; and
3. institutional properties of organisations, including organisational dimensions such as business strategy, ideology, culture, control mechanisms, standard operating procedures division of labour, communication patterns as well as other

environmental pressures such as government regulation, competitive forces and socio-economic conditions.

The discussion about structurational model of technology that follows makes reference to the relationships depicted in figure two (below) (Orlikowski, 1992).

FIGURE 2: Orlikowski's (1992) Structurational Model of Technology



Broadly speaking, Orlikowski's (1992) model puts forward that technology is a product of human action and as such, technology comes into being through creative, human action and is also sustained by human action through the on-going maintenance and adaptation of technology (arrow a). In turn, however, once deployed, technology works to facilitates human action (arrow b), enabling it in one way and therefore necessarily constraining it in another.

One influence concerns the nature of human action in an organisation, which is situated action, and therefore shaped by organisational context (arrow c). When making use of technology, human agents are influenced by the institutional properties of the context they are operating within. The final influence that Orlikowski (1992) deals with is the manner in which human action, when it uses technology, acts on the institutional properties of an organisation (arrow d) either by reinforcing or by transforming them.

Each of the elements mentioned in the model shown in figure two will be elaborated upon in greater detail below.

- **Technology is a Product of Human Action**

The model proposes that technology is a product of human action (arrow a). As a human product, technology comes into being through creative, human action and is also sustained by human action through the on-going maintenance and adaptation of technology. Moreover, once created and deployed into an organisation, technology remains static and ineffectual unless it is given meaning and manipulated, directly or indirectly, by humans within the organisation.

On its own, technology can be of no importance. It is only through its use by human agents that is can begin to play a significant role within the organisation (Orlikowski, 1992).

- **Technology Facilitates Human Action**

Technology facilitates human action (the performance of certain kinds of work) (arrow b). However, an important corollary of this is that by facilitating action in a particular manner, technology also necessarily constrains it.

Unlike earlier models, there are two important differences with respect to the structurational model when looking at these corollaries. Structuration theory recognises that technology cannot determine social practices; human agency is always needed to use technology and this therefore implies that there remains a possibility of humans choosing to act differently. Technologies can therefore only guide or condition human actions.

The structurational model further acknowledges that technology, in conditioning actions, is both enabling and constraining. Which of these implications is the dominant depends on the actions and motives of those designing and implementing the technology, the organisational or institutional context and the capability of the users (Orlikowski, 1992).

- **Situated Action**

Other influences that reflect the interaction between human agents and structural properties are also relevant to the study of technology in organisations. For the purposes of highlighting the key aspects of technology, two such influences are particularly important to the structurational model of technology. One influence

concerns the nature of human action in organisation, which is situated action, and therefore shaped by organisational context (arrow c).

When acting on technology (designing, appropriating, modifying or resisting it), people are influenced by the institutional properties of their environment. They draw on existing knowledge, resources and norms in order to perform their work. These influences are often unarticulated and are referred to as the "institutional conditions of interaction with technology" (Orlikowski, 1992: 411). Technology is built and used within a certain social and historical context and as such, its forms and functions will bear the fingerprint of that specific context.

- **Human Action, Technology and Institutional Consequences**

The final influence that Orlikowski (1992) deals with is the manner in which human action, when it uses technology, acts on the institutional properties of an organisation (arrow d) either by reinforcing or by transforming them. These effects, referred to as the "institutional consequences of interaction with technology", are generally not thought about by users, who often are unaware of their role in reaffirming or disrupting the institutional status quo (Orlikowski, 1992: 11).

When users adhere to the technologies rules, they are unconsciously further entrenching the institutional structures within which the technology was deployed. When they, however, do not use the technology as it was intended, they may undermine, and sometimes even change, the rules of the technology, and hence the institutional context.

2.4. Organisational Consequences for Information Technology

Having examined Giddens' (1984) structurational theory and Orlikowski's (1992) structurational model of technology, this section looks at technology changes within organisations, technology implementation projects and the organisational consequences that these result in for both the organisation and the information technology.

According to Sahay and Robey (1996), a persistent theme in information technology literature is the potential for computer-based information technology to address a wide variety of social and organisational problems. Information technologies are

human creations that embody social purposes, and have the potential to greatly improve the social conditions. The literature is however filled with examples of unfulfilled potential in this area.

It appears that for the social objectives of technology, deployed within an organisation, to be met, it is critically important that the nature of the social (or organisational) context and its interaction with the human agents be understood. Context represents the social structure that both constrains and enables the human agency directed towards the implementation and use of an information system. At the same time, human agency has the potential to change both the information technology and the context within which the technology is used.

Three related concepts taken from the studies on the social construction of technology are particularly significant for the interpretive studies of information technology; namely, the concepts of “relevant social groups”, “interpretive flexibility” and “technological frames of meaning” (Sahay & Robey, 1996: 259).

Firstly, actors that have a similar interpretation of the technology are known as a relevant social group, of which there may be many within a single organisational context. Different groups of actors are involved in a technology implementation; all participating in one form or another. These groups differ in their motives for use, political and social interests, educational background, occupational culture and power within the organisation. This results in the groups developing different interpretations about the information technology and these interpretations, in turn, affect the groups’ behaviours during the implementation, and as they interact, the groups shape the use and consequence of the system (Sahay & Robey, 1996).

Applied to Orlikowski’s structurational model of technology, the concept of relevant social groups coincides with the idea of the impact human agents have on the technology and the institutional properties of an organisation.

Secondly, “interpretive flexibility refers to the capacity of a specific technology … to sustain the divergent interpretations of multiple relevant groups” (Sahay & Robey, 1996: 260). Information technologies are generally accepted as having greater interpretative flexibility than productions systems, for example, because they present fewer material constraints and are more easily transported over different locations (Sahay & Robey, 1996).

Again applying this to Orlikowski's structurational model of technology, the concept of interpretive flexibility can be examined with the technology aspect of the model.

Thirdly, Orlikowski and Gash (1994), sited in Sahay & Robey (1996), describe technological frames of meaning as a component of the larger frames of meaning by which groups understand the organisational realities within which they operate. Technological frames include the basic assumptions, beliefs and expectations that people hold about a specific application of technology. These frames are likely to be common within a relevant social group while each groups' frame may differ from those of the other groups. Information systems with greater interpretative flexibility are more able to accommodate multiple, and different, frames of meaning.

On an individual level, the idea of technological frames of meaning can be attached to the human agents in Orlikowski's (1992) model. On a collective level, these technological frames would affect the entire organisation with respect to the institutional properties that become reflected as a result of the manner in which the technology is viewed.

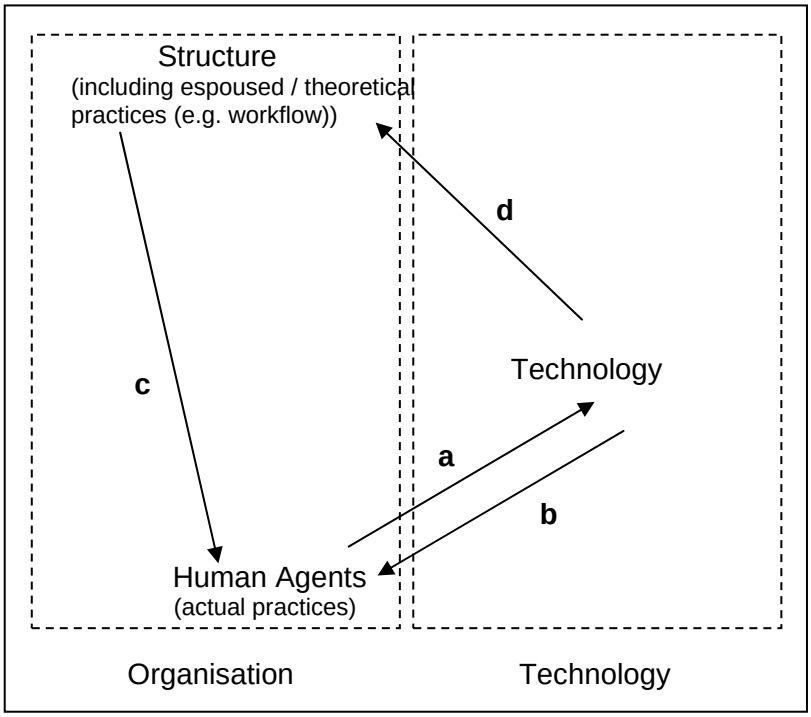
2.5. Structurational Model of Technology as applied to the Research Study

Giddens' (1984) structurational theory does not provide hypotheses "about the degree or direction of influence of context or process in any given situation, so its use as an inductive framework is appropriate. The value of the framework is to guide research efforts by sensitizing data collection and data analysis. Research findings may also be organized within the framework to give them coherence and form" (Sahay & Robey, 1996: 262).

Using Orlikowski's (1992) structurational model of technology, and drawing from the literature review undertaken, the figure 3 can be generated in applying Orlikowski's (1992) model to the research problem at hand.

Important to note that all three elements, structure, human agents and technology have an impact and change because of changes in the three elements that impact on the other elements but the elements are also subject to external influences that impact only one of the elements at a time. Further, it is also important to note that the model is a dynamic one, made up of changing elements.

FIGURE 3: Structurational Model of Technology as applied to Research Study



The model can be divided into two main areas of study, namely, the organisation as one and technology as the other. Elaborating further on the arrows in Orlikowski's (1992) model, arrow (a) that denotes technology as being a product of human action can also be the arrow that denotes the implementation of technology by human agents within and organisational context. Arrow (b) then, being the indicator that once deployed, technology works to facilitate human action, enabling it in one way and therefore necessarily constraining it in another, can also indicate the effectiveness of the implementation and the (intended and unintended) consequences on the agents.

Arrow (c) indicated the effect that the context or structure may exert on the human agents and the actions being taken, in the research problem, this being the growth the organisation is experiencing. The final influence is the effect that the interplay between the human agents acting on the technology and the technology's impact on the actors has on the organisational properties. It is clear that this will in turn affect arrow (c) and in so doing affect the entire system once again.

This application of Orlikowski's model to the research problem gives rise to research questions that will be discussed in the next chapter.

CHAPTER 3: RESEARCH QUESTIONS

From the model shown in figure three the following research questions emerge and are posed in this study:

1. How have the changes in management structure, if at all, affected the work practices of the organisation (with reference to arrow c in the model)?
2. How have the requirements of the human agents been relayed to develop the specification for the technology (with reference to arrow a in the model)?
3. How has the technology, already implemented, affected the actual work practices in the organisation (with reference to arrow b in the model)?
4. Taken from the action denoted by arrow d, has the technology affected the management structure?

CHAPTER 4: RESEARCH METHODOLOGY

4.1. Introduction

This chapter describes the research methodology that was followed in order to answer the research questions posed in the previous chapter. The chapter begins with a description of the chosen research methods and its underlying characteristics. The research design, the research site specific to this research and the interviews samples are then outlined, followed by the process undertaken for data collection, analysis and interpretation. The chapter closes with a brief discussion on the validity and reliability of the research.

4.2. Research Method and its Underlying Characteristics

The research method chosen for this study will be qualitative research, undertaken in the interpretive approach, using ethnography.

Given the nature of the research problem stated in Section 1.3, qualitative research was been identified as the most appropriate method for this study. Leedy and Ormond (2001) suggest that this type of research problem, where the researcher is require to gain an understanding of and gather insight into a particular problem, lends itself well to qualitative research. Furthermore, the findings of the study will differ from organisation to organisation and between industries.

An interpretive approach was chosen for the research because an ethnographic research method was adopted, and the interpretive approach appeared to be better suited to ethnographic research, particularly in the case of this study, than the positivist (or functional) approach.

4.2.1. Qualitative Research

A number of distinguishing characteristics exist between quantitative and qualitative research (Leedy & Ormond, 2001). The research method to be used for a study is selected by viewing the characteristics against the research to be done.

Weerd-Nederhof (2001) suggests characteristics of qualitative research as follows:

- Conducted through and intense and prolonged contact with a real situation; such as an organisation;
- The researcher's role is to gain a holistic overview of the context of the study;
- The researcher will try to collect data from inside of the organisation, and will try to capture the perception of the role players within the organisation
- There are many possible ways of interpreting the data collected
- Little use is made of standardised instruments and most of the analysis is done with verbal data

Given these characteristics, qualitative approach was proposed for this study for the following reasons: the purpose of research was to explore a real situation; the research was context-bound and unstructured interview were used to collect data.

4.2.2. Interpretative Approach

Use of the interpretive approach allows questions, insights, propositions and observations to emerge from the data collection process. This is in contrast to the positivist approach where the definition of questions and proposition is made in advance of the data collection; and data is then compared to these predetermined propositions. The role of the researcher is also critical in that the researcher is an active player in the research process, and needs to communicate well, observe and interpret as data is being collected (Rowley, 2002).

Orlikowski & Baroudi (1991) suggest that interpretative research, which emphasizes the subjective meanings that human agents place on technology in its context of implementation and use, is appropriate for the research of information technology.

Three basic assumptions guide this interpretative approach:

1. neither human actions nor technologies are assumed to exert a direct or causal impact,
2. human agents give the technology social meaning as they work with it, and

3. the aim of interpretive research is to increase the understanding of a particular phenomenon within a specific context and as such often will make use of a research or case site (Sahay & Robey, 1991).

The interpretive approach was chosen for this study as it allows for an understanding to be developed, that emerged as the research site was studied in-depth, within its specific context, taking into account the role of the researcher.

4.2.3. Ethnographic Research Method

Although each research technique has its own particular strengths and weaknesses, ethnography was found to be the preferred method for this research because of its well explicated approach, its relatively rich pedigree when applied to technology problems and its suitability for questioning commonsense assumptions (Myers & Young (1997) sited in Lightfoot (2006)). In addition to this, ethnography was also favoured because of its flexibility and its mixed-method approach to data collection (Cecez-Kecmanovic (2001) sited in Lightfoot (2006)). In order to contain the scope of the research, ethnography was applied to the problem within a single company (Lightfoot: 2006).

The generally accepted view of ethnography is that it is a singular method of observing derived from anthropology (Hair & Clark, 2003). In this characteristic form, ethnography involves the researcher participating as observer, overtly or covertly, in people's daily lives for an extended period of time, observing what happens (Bate, 1997). As a result, ethnography is viewed as one of the most in-depth research methods available. Researchers are required to spend a great deal of time at the research site, which allows them to observe what people are doing, and in so doing obtain a deeper understanding of the people, the research site (organisation) and the context of the work being studied. As such, ethnography was found to be well suited with the needs of and to being used within the field of information technology research, because much technology research tends to focus on the social and organizational contexts of information systems (Myers, 1999).

Ethnography and case study research are very similar; as such the section below makes reference to both forms of research. The main difference between the two research methods is the extent to which the researcher immerses him or herself into the research site, life or group being studied (Myers, 1999). Ethnographies, and

case studies, as a research method have been viewed as being less scientific and lacking objectivity when compared to other research methodologies. Despite this, these two methods are widely used because they offer a method of gaining information and insights not otherwise achievable (Rowley, 2002). It is the personal interaction by the researcher with the subject of study that is the unique contribution of ethnographic research (Friedman & McDaniel, 1998). "Ethnographic research methods provide a richness in a detail, a sensitivity to perceptions, and an opportunity to discover important new issues that cannot be achieved through a prior theorizing" (Friedman & McDaniel, 1998).

There are four distinctive features of ethnography:

1. Ethnography requires direct and personal observation of the people and situation being studied. It requires interacting directly with people, often for long periods at a time, gathering data firsthand.

2. Ethnographers make their observations in context of people doing there work and interacting with their colleagues within the organisation being studied

3. Ethnography pays attention to the subjective elements often eliminated by positivist research, such as words, interpretations and experiences of the people being studied. The objective of this being to gain an understanding of work and work relationships, on a conscious and subconscious level.

4. Ethnographers share their observations with the readers by sharing their interpretation of the situation and also allowing the reader to share in the experience and derive an interpretation of their own. This is done through the use of extensive quotations and detailed descriptions of the situations observed. (Friedman & McDaniel, 1998).

The above features provided compelling reasons for selecting the ethnographic method of research for studying the effect of organisational growth on management structure and the concomitant technology changes within an entrepreneurial organisation in a real-life context. "Ethnography is also uniquely suited to addressing certain research questions, such as those that require an understanding of culture, social interaction, or other aspects of complex social systems that cannot be reduced to individual actions or attitudes (Friedman & McDaniel, 1998: 117).

4.2.4. Role of Researcher

The following section deals with my role as a researcher in the context of being one of the three members that make up the strategic leadership team of the organisation. The board consists of an additional three non-managing members, whose input is more on a strategic level.

My background is primarily working in a listed, multi-national corporate organisation. Joining Remata iNathi (Pty) Ltd in July 2005 was my first experience working in an entrepreneurial and (relatively) small organisation. Furthermore, my work experience has been in the area of category and customer management within the fast-moving consumer goods industry, working with well-known consumer brands and retail organisations. The move to Remata iNathi (Pty) Ltd therefore also represents a complete change in industry which presented me with a steep learning curve. It also allowed for a pair of "fresh eyes" to look at the organisation and see matters in a different manner. Furthermore, within the corporate environment, I was very much a functional specialist in the area of category management whereas my role in Remata iNathi (Pty) Ltd is more one of a general or business management, in which I experience a wider, more holistic view of the organisation.

Undertaking this research from the space of my role in the organisation presented some interesting challenges on many levels. Firstly, there was the issue of acquiring an understanding of the industry, the organisation and the dynamics within the organisation.

Secondly, I had to gain an understanding of the information system that was no longer ideal; understand why this was the case as well as grasping the requirements of the new system. Understanding the requirements of the new system included understanding what the desired outcome within each functional area affect by the implementation of the new system after the implementation of the new system would be. This was all required to happen while in parallel I was making my own recommendations of what the system should deliver from a business management perspective, based on my observations and experiences working with the teams. This represents accurately the dichotomy of ethnography where the researcher has to present an accurate objective view from within the case site.

Finally, my role as a researcher required getting accurate views from the interviewees in the interviews, while my role as a researcher and business leader could not be split for the respondents. This made for interesting interview situations and I found that much of my data gathering was more effectively done in an informal manner, such as observations and group discussion, rather than in the formal interview process.

4.3. Research Site and Interview Sample

The next section elaborates on the research site used for the ethnography as well as providing a list of persons that were interviewed.

4.3.1. Research Site

Field work was conducted at a medium-sized printing and communications organisation, Remata iNathi (Pty) Ltd. It provides short- to medium-run print solutions to a variety of clients within the greater Johannesburg and Pretoria geographies.

A detailed case description is provided in chapter seven.

4.3.2. Interview Samples

The people that were interviewed at the research site were a sample of the people involved with the management of the organisation and the users of the information system.

The people that were interviewed are listed below and it was believed that they would provide a representative view of the situation. A total of **9** in-depth interviews were undertaken.

TABLE 1: List of Interviewees

	NAME	DESIGNATION
1.	Annemarie Burger	Finance
2.	Esmé Bense	Sales and Marketing
3.	Eldred Ekermans	Production & In-house Software Developer / Project Champion
4.	Tony Wall	Account Executive – DI74
5.	Lesley Groenewald	Planning & Production Manager
6.	Eric Hahn	Sales Manager
7.	Linda Kleingeld	Scheduling Manager
8.	Lizelle van Eerden	Estimator
9.	Anton Ekermans	External Software Developer

4.4. Data Collection

Data collection was undertaken from three sources of data, also commonly used in ethnography and case study research, namely, interviews, researcher observations and other relevant documentation collected (Weerd-Neferhof, 2001). This data was supplemented by detailed, observational data obtained from participant observation (Myers, 1999). This form of data collection allows for triangulation (to be discussed below).

4.4.1. Interviews

The interview schedule detailed in table one was used to conduct the interviews. The interviews took place at the interviewee location of preference (within the organisation's premises). It was preferable that the interview took place at the respondents' office so that any relevant documentation was on hand. Because of the unstructured nature of the interviews, the interview time varied; however, no interview took longer than one hour, given work constraints of the participants as well as the fact that the interviews were undertaken during working hours and time was therefore constrained.

Given my role in the research (as detailed in section 4.2.4.), written permission was not required from the respondents for the interview. Each respondent was however asked whether they were willing to participate in the study. The objective of the interview was made clear. The interviews were recorded, with the upfront consent of participants, and notes taken. The records were then transcribed for use later. In addition to the voice recording, any interviewee illustrations, field note observations, and conceptual summations, taken at the time of the interview have also been used.

At the close of the interview the respondent were asked if their identity may be revealed. If the respondent were uncomfortable, they were assured of absolute confidentiality.

See Appendix I for a sample of the interview questions. As the interviews were rather unstructured, not all respondents were asked all the questions; questions were posed as appropriate to the interviewee's role in the study matter.

4.4.2. Researcher Observation

The interview data was used in conjunction with observations made during the interview process and the observation of the researcher as a participant at the research site. Regular field notes are a defining characteristic of ethnography (Myers, 1999). Comprehensive notes therefore were written-up on an ongoing basis, covering observations, impressions, feelings and questions that emerged. These field notes were chronicled for referencing, retrieval and archiving (Lightfoot: 2006).

4.4.3. Other Documentation

Any other documents gathered during the interviews and at the research site were also used in the data collection process. A database, such as a case study database has been created, as suggested by Rowley (2002). The database contains the data from the above three sources for ease of referencing.

4.4.4. Triangulation

The opportunity to use many sources of data is one of the key strengths of ethnographic research. Any findings made from this type of study are likely to be

much more convincing and accurate if they are drawn from multiple data sources that corroborate each other. This process of using evidence from multiple sources to corroborate each other is known as triangulation (Eisenhardt, 2001 & Rowley, 2002).

Based on the data collection from multiple sources of data, triangulation was undertaken in this research.

4.5. Data Analysis and Interpretation

"Analysing data is the heart of building theory from case studies, but it is both the most difficult and the least codified part of the process" (Eisenhardt, 1989, 539). This holds for the analysis of data from ethnographic studies as well. Analysis consists of three activities, namely data reduction (or analysis), data display and conclusion drawing and verification (or interpretation) (Weerd-Nederhof, 2001).

4.5.1. Data Analysis

Analysing case study data is not easy and relies heavily of the researcher's ability (Rowley, 2002). This was even more so the case in the chosen form of research. Eisenhardt (1989) believes that overlapping data collection and analysis (as the interpretive, case study approach allows) speeds up the analyses and reveals potential adjustments that can be made to the data collection process. This allows the researcher to capitalise on themes that emerge from the case study. Care must however be taken in this approach to remain unbiased and not to confuse observation made in the case with interpretation.

According to Rowley (2002), there is no predetermined or agreed procedure for case study analysis, but a good analysis would adhere to certain principles. These principles will be adhered to in this study and are listed below.

The analysis will:

- Make use of all the relevant evidence
- Consider all the major rival interpretations
- Address the most significant aspects of the case

- Draw on researcher's prior expert knowledge in the case study area in an unbiased and objective manner (Rowley, 2002: 26).

4.6. Validity and Reliability

As mentioned in Section 4.2.3, ethnographies as a research method have often been viewed as being less scientific and lacking the objectivity and rigour of other research methodologies. This is one of the reasons why particular attention must be paid to research design and implementation, taking into account the requirement of validity and reliability (Rowley, 2002).

Validity refers to the extent to which an instrument measures what is intended to be measured. Reliability pertains to the accuracy and precision of the measurement procedure (Leedy & Ormond, 2001). There are some obvious concern with respect to ethnographic research around validity and reliability.

4.6.1. External Validity

External validity refers to a study's generalisability, that is, the degree to which findings from a study can be applied to situations beyond those of the study itself. Research that is context-specific may have poor external validity. According to Rowley (2002) generalisations can only be made from case study research if the case study design has been informed by theory and can be seen to be adding to existing theory. As such, limited generalisation is possible from this study as the purpose of the study was to explore the research site and add to existing theory rather than establish findings that were generalisable.

4.6.2. Internal Validity

Internal validity is "the extent to which its design and the data that it yields allow the researcher to draw accurate conclusions about the cause-and-effect and other relationships with the data (Leedy & Ormond, 2001: 103).

Internal validity of this research was established by reviewing the research finding with the respondents and ascertaining whether they are in agreement with the researcher's documentation.

4.6.3. Reliability

Reliability is the extent to which the same or similar research can be repeated in the future obtaining the same or similar results (Rowley, 2002). This study was found to be limited in its reliability since it was confined to a specific context and the respondent's interviewed in this study may or may not be available in the future; nor may they hold the same perceptions or opinions on the research matter than their successors or other respondents selected.

Reliability can be improved by means of thorough documentation of procedures and good record keeping (Rowley, 2002).

CHAPTER 5: CASE DESCRIPTION

5.1. Introduction

This ethnography was undertaken in a medium-sized printing company, Remata iNathi (Pty) Ltd, which was established in 1970. Over the years, Remata iNathi (Pty) Ltd has undertaken a series of significant organisational changes, both with respect to the type of work it is involved in and the management structure of the organisation.

5.2. Nature of Work

When Remata iNathi (Pty) Ltd was first established, it was established as a print bureau (pre-press service provider) in only. In 1987, Remata iNathi (Pty) Ltd moved away from traditional business methods and launched the first desktop publishing bureau in South Africa, introducing the first significant change to the type of work done at the organisation. From this, Remata iNathi (Pty) Ltd went on to employ technology that digitizing scans so that the scans could be placed directly into a computer file. This change was again a significant change in the type of work done at the organisation, however still in the same line of work as before.

Remata iNathi (Pty) Ltd moved away from being a purely pre-press operation in 1996 when the company bought an Agfa Chromapress, which was a full colour, digital, short-run printing press. This change from pre-press to printing introduced the second significant change in the type of work done at the company. Remata iNathi (Pty) Ltd then developed its print capabilities further and purchased two Heidelberg lithographic printing presses.

The third significant change in the type of work that was done was the introduction of more specialised short-run, personalised digital printing. Remata iNathi (Pty) Ltd purchased a Hewlett-Packard Indigo, followed by a Kodak NexPress. The type of work done on the Heidelberg lithographic printing presses and these digital presses was totally different. This required a greater attention to detail, the speed of work (particularly on the digital presses) and the quality of customer service offered.

5.3. Organisational Structure

The discussed changes also brought with them changes in organisational structure. As a bureau, Remata iNathi (Pty) Ltd was a very small, entrepreneurial start-up company with a staff of five people including the 2 owner-managers.

The first significant management change occurred in 2001 when the organisation (called Remata at the time) joined with iNathi Technologies, a black empowerment organisation, to form Remata iNathi (Pty) Ltd. This happened as a result of the political pressure on organisations at the time within the South African context to reflect the changes of the country.

A second significant change in the management structure occurred when Heidelberg lithographic printing presses were purchased, changing the organization from a very small pre-press environment to a larger printing environment. At this time the organisation also changed from having departmental facilitators to structuring the departments into teams and assigning team leaders over the teams and the two person owner-management team increased to three people, forming the strategic leadership team of the business. This was a very significant changes as the addition to the strategic leadership team was also the person who would drive the change in the organisation. At this time the two founders of the business took somewhat of a more ‘back seat’ role with respect to the changes taking place.

I, also the researcher of this research report, represent the third significant change to the management structure of the organisation. This came about in July 2005 with the introduction of a fourth member of the strategic leadership team, a business manager who was recruited from a large corporate organisation. The intention of my placement at Remata iNathi (Pty) Ltd was to introduce some larger organisational thinking into Remata iNathi (Pty) Ltd, which to date was still operating much like an entrepreneurial start-up in spite of the rapid growth it had experienced.

At the time of working on this research, another significant organisational structure change was taking place. Remata iNathi (Pty) Ltd was approached by a large black consortium that purchased forty percent of the organisation’s shares.

In addition to this, one of the management members, largely responsible for the move away from only pre-press operations and the introduction of print to Remata iNathi (Pty) Ltd, was to exit the business within the next six months. This manager

was also the internal software developer working on the technology project that forms the subject of this study.

5.3.1. Remata iNathi's Information Technology Project

Remata iNathi (Pty) Ltd developed its own software programme approximately three years ago, called 3Animal with a management tool add-on for production management called 3Insect. This was developed to accommodate the unique manner in which the organisation wished to quote and complete its clients' work.

3Animal is a quoting and cost estimating tool which as developed specifically for Remata iNathi (Pty) Ltd to take into account the uniqueness of the printing industries cost estimating (unique cost per every job) as well as the costing philosophy which Remata iNathi employs being different to the industry at large.

III Insect is an add-on to 3Animal which is essentially a management tool for the production team. It allows the departmental managers to see, at any given time, the description of the job, its status and where it is in the organisation's work flow, as well as client information and job deadline.

The system capability of the software was found to be no longer suitable. 3Animal and 3Insect are not synchronised at all nor do they link to the production planning system. This means that a great deal of manual (human) intervention is required. Not only does this create a large amount of duplicate work as much of the information is the same and required in several different fields, but it also opens up the potential for errors that are very costly.

As a result of these reasons and as Remata iNathi (Pty) Ltd grew, it outgrew the (previously ideal) system and a new system needed to be developed. A system that would integrate the workflow right from a client call and cost estimate being issued to the scheduling of production, stock management, job delivery and costing and invoicing details. This system development was commissioned and development commenced in January 2006. At the time of this research, four of the eight modules, namely estimating, production planning, resource allocation and stock control modules had been implemented.

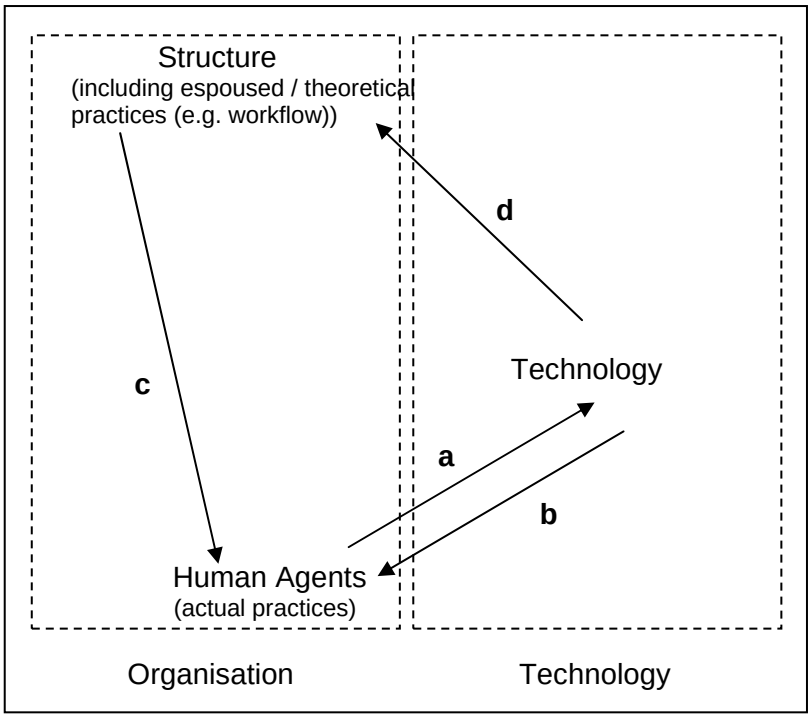
CHAPTER 6: PRESENTATION AND INTERPRETATION OF RESULTS

6.1. Introduction

The chapter that follows is a consolidation and summary of the data that has been collected over the last six months, based on the structurational model of technology used for the research (shown in figure 4). The presentation and interpretation of the results is structured around each of the four research questions posed in chapter three, namely:

1. How have the changes in management structure, if at all, affected the work practices of the organisation (with reference to arrow c in the model)?
2. How have the requirements of the human agents been relayed to develop the specification for the technology (with reference to arrow a in the model)?
3. How has the technology, already implemented, affected the actual work practices in the organisation (with reference to arrow b in the model)?
4. Taken from the action denoted by arrow d, has the technology affected the management structure?

FIGURE 4: Structurational Model of Technology as applied to Research Study



Based on the structurational model of technology used to structure the research study (see figure 4), it is clear that the areas highlighted by the respective research questions cannot really be discussed in isolation as they are all interlinked and have an impact on each other. As previously stated it is important to note that all three elements, structure, human agents and technology have an impact and change because of changes in the three elements that impact on the other elements and that the elements are also subject to external influences that impact only one of the elements at a time.

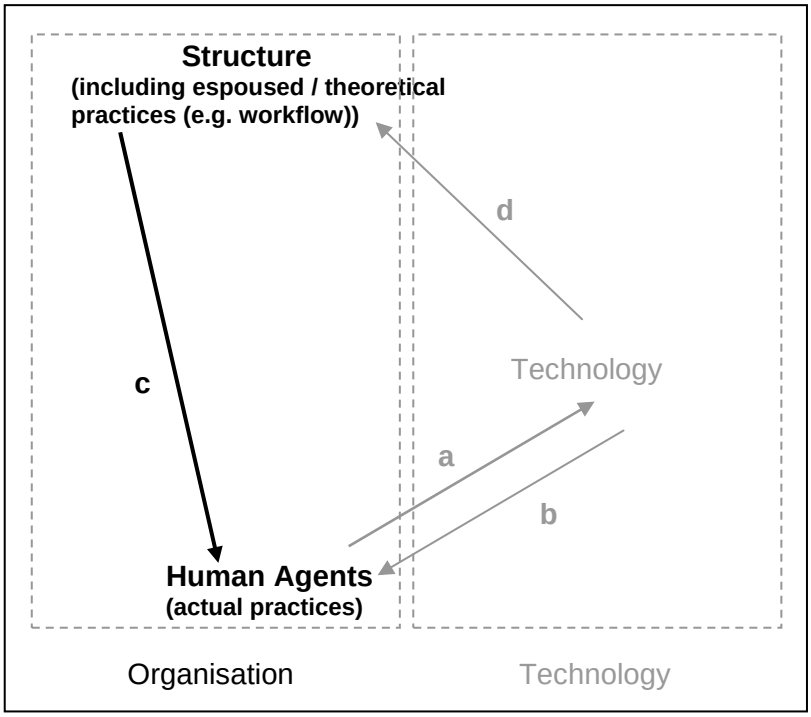
The model is a dynamic one, made up of changing elements and the purpose, therefore, of structuring the presentation and interpretation of the results around each of the research questions is therefore merely an attempt to bring focus to each research question / area of the model and thus ensuring that each area is adequately discussed.

6.2. Research Question 1: Management Structure and Work Practices

Research question one looks at how the changes in (management) structure, if at all, have affected the work practices of the organisation. As discussed in section 2.3.2 of chapter two, the influences that reflect the interaction between human agents and structural properties are also relevant to the study of technology in organisations. One such influence, particularly relevant to the structurational model of technology used for this research, concerns the nature of human action in organisation, which is situated action, and therefore shaped by organisational context (arrow c).

Figure five (below) indicates clearly the area of the model this section addresses.

FIGURE 5: Nature of Human Action in Organisation, Shaped by Structure



6.2.1. Human Agents

As mentioned above, the people in an organisation, when acting on technology (designing, appropriating, modifying or resisting it), are influenced by the institutional properties (or management structure in the adapted model) of their environment. The human agents will draw on existing knowledge, resources and norms in order to perform their work. These influences are often unarticulated and are referred to as the "institutional conditions of interaction with technology" (Orlikowski, 1992: 411). Technology is built and used within a certain social and historical context and as such, its forms and functions will bear the fingerprint of the specific context.

This influence is clearly evident in the development of the new management information system at Remata iNathi (Pty) Ltd. The software developer, Anton, and the internal developer / project champion, Eldred, were both involved in developing the original 3Animal software for another organisation, which was subsequently adopted by Remata iNathi (Pty) Ltd when the project champion joined the strategic leadership team of the organisation. As a result of this, the new management information system technology bears the 'fingerprints of the specific context' that these two individuals have as a predisposed bias. This is also evidenced from the interviews in that many of the respondents state that the new management

information system is “almost the same as the old one, only better” or state that it “is the same thing” when, in fact, the system was required to be fundamentally different to 3Animal in order to address new business needs not previously encountered.

My observation, from the various interviews and working with the management information system project over the last six months, is that this influence has limited the development of the new management information system at Remata iNathi (Pty) Ltd. Anton and Eldred have such intimate knowledge of 3Animal and Eldred, specifically, has very strong views on how the management information system should operate within a print environment that those views may very well have prohibited different ideas from surfacing in the requirements planning and development phase of the MIS.

A further influence is borne out of the preceding discussion and that is because the developer and project champion worked on the software together and because they have such a detailed and intimate knowledge of the programme requirements, for another, independent person to understand the software is almost impossible. There is very poor, and in some cases, absolutely no documentation around the planning and implementation nor are there any training manuals for the programme. This is in my opinion a fundamental weakness of the system and also represents a significant business risk.

The following quote from a user of the estimating module bears witness to the above:

> *I think in my mind, what I have seen is that the power is behind the buttons where on the old system the power was in front of the buttons where you had to basically get all the detail... (on the quoting side) ... where it's actually become easier to quote a job than what it was on the old system. On the old system you had to put far to many things in to get to the end product. It seems like the new system you can just click, click, click and then you have an answer which on the old one would have been click-click, click-click, click-click, click-click and you still get to the end but this one; it just seems to run smoother.*

Another user went on to say:

> *“On the new system you don’t have to think about a quote, you simple push the buttons and the system spits out a quote. Done.”*

While from a user's perspective this may be beneficial in that is makes the job easier and the user's personal responsibility for the output less, from a management perspective the systems is very limiting and does not require intelligence or thinking behind the actions required. It also means that an errors in the software (as a result of the thinking of the developers) will not be highlighted very quickly, if at all. This is particularly concerning when estimating is viewed as the gateway for work to enter into the system; errors at this point would have ramifications throughout the system.

6.2.2. Organisational Growth, Changes in Management Structure and Work Practices

Chapter six discusses the extensive changes that Remata iNathi (Pty) Ltd has undergone over the past few years.

The organisation has radically changed the work that it has been involved in and added an extensive amount of capital equipment to the organisation over a relatively short period of time. Specifically, Remata iNathi (Pty) Ltd has purchased six printing presses from 2002 to 2006. While the capital structure of the organisation changed in this significant manner, what is apparent in my observations is that the management structure and the work practices have remained largely unchanged. This has resulted in the employees becoming increasingly stressed; functions becoming heavier and this has had a negative impact on the organisation as a whole. The increased capital structure required increased revenue streams to flow through the organisation, while the human resources in place where not in apposition to manage greater workflows or deliver against the increased revenue stream required. This is a good illustration of how the structure of the organisation influences the human agents, in this case, in a negative way.

Coming out of the previous observation is a corollary of that idea which is that any work practice changes that have occurred as a result of changes in the management structure seem to have occurred largely by accident. There appears to be a total absence of planning for the changes. On the one hand, the employees of the organisation are not change agents and very often do not recognise the change when it is approaching or even when it occurs. On the other hand, management of the organisation in the past have not communicated change well or even timeously which had further compounded the issues that arise in such a situation. This is

particularly applicable to the implementation of the new MIS, which will be elaborated on in section 7.4 (below).

Most respondents interviewed stated that their or their colleagues' work practices have not changed over time.

> *"'Because of Animal have I changed?' ... Not really..."*
>
> *"It (*the MIS*) is the same thing; the one is just more human-based and the other is more electronically-based. "I still work the same as always."*

It is further my observation that in the period that I have been working on this research report, following the management information system project, there has been no real change in the work practices in the various departments. As a result of this frustration levels, present prior to the implementation and were being managed with thoughts that the new system would make the changes requires, have escalated over time. The frustration levels in themselves are a further negative influence that needs to be handled in parallel to all the other factors and this presents another difficulty.

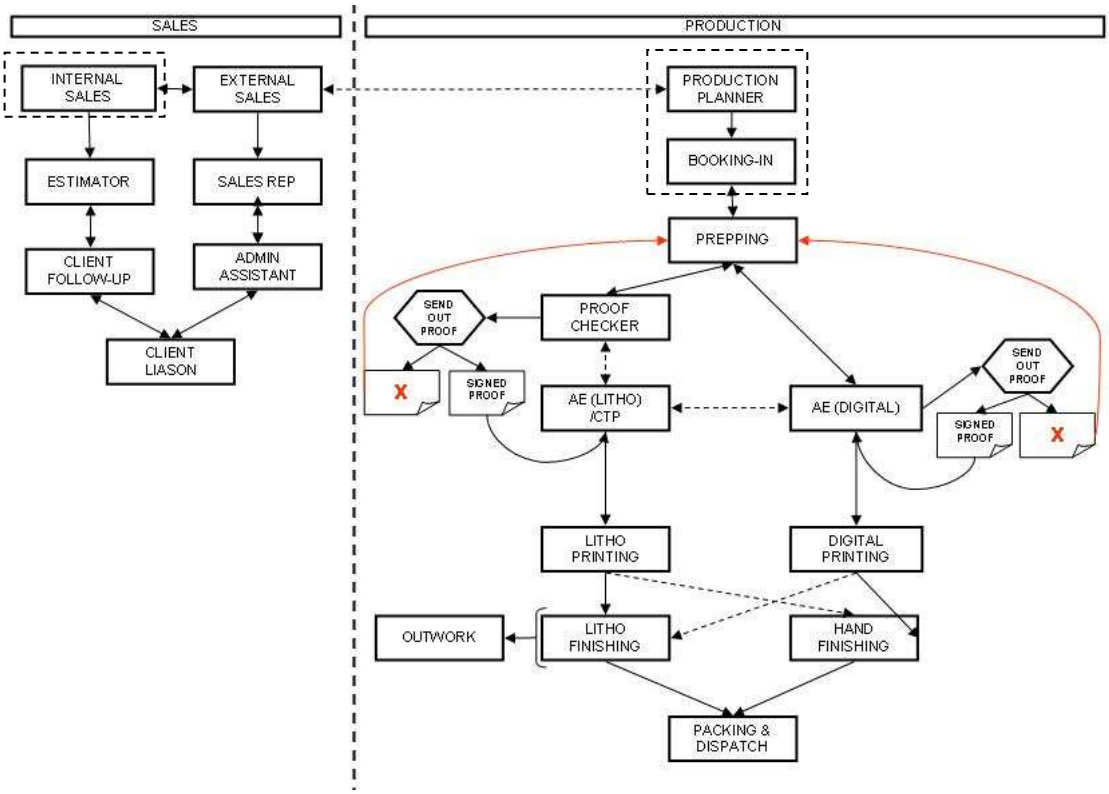
This is a key concern because in an organisation that has changed so rapidly and markedly, these changes should be at least recognised by the employees and the old work practices should at least in some way be uncomfortable as they no longer 'fit' with the new organisation. It was also interesting to note that the employees are not change-fatigued, as one may expect given the rapid change and the degree thereof. I put this down to previously discussed factors discussed.

6.2.3. Workflow Process Change

A significant change in the structure of the organisation during the time of this research came about with the complete re-design of the production workflow system. This structure change is particularly interesting because it was undertaken completely independently of the MIS. One of the requirements from the management information system was to support the workflow processes more than 3Animal did previously as well as to facilitate an improved workflow system, given that the workflow had outgrown the capability of 3Animal. Inspite of this stated requirement, the new workflow is in fact entirely divorced of the management information system and uses it as a support tool rather than and enabler.

Figure six (below) is a representation of the original workflow system

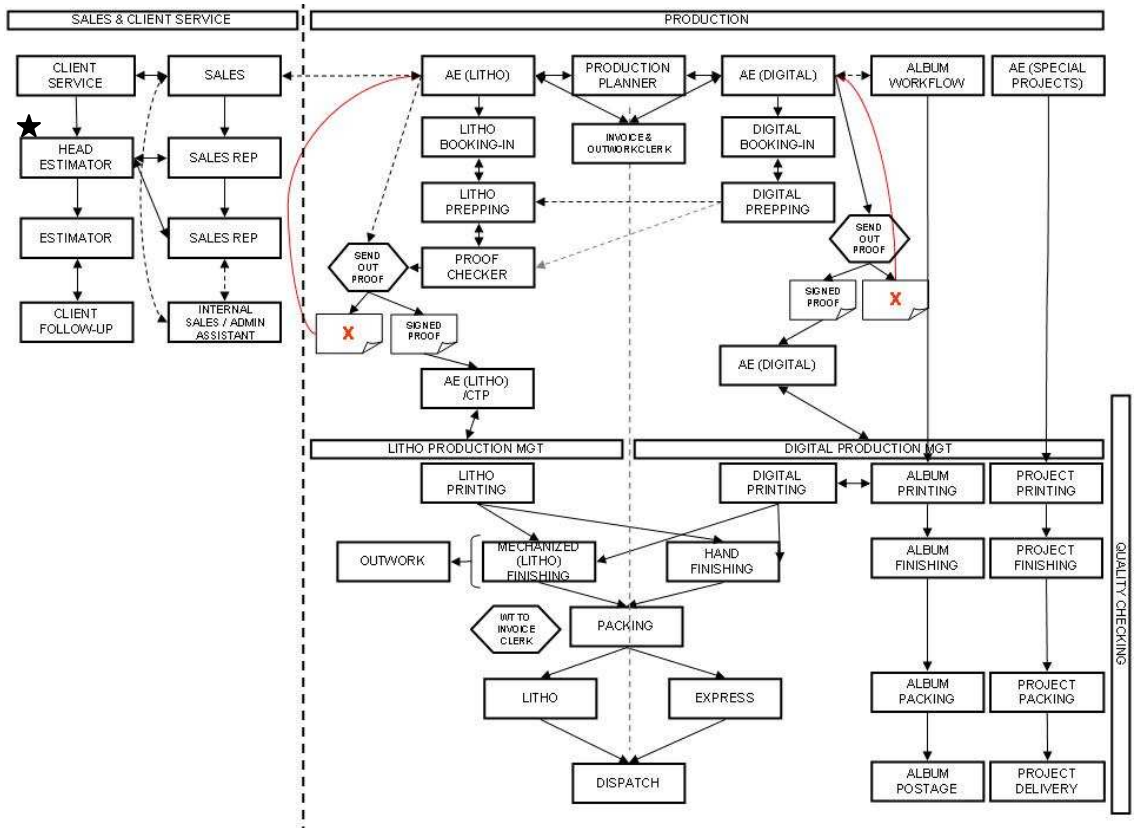
FIGURE 6: Original Workflow



The above diagram illustrates, broadly, the workflow as it was prior to the change. Essentially in this workflow the estimating function and the production planning and booking-in function were supported by 3Animal (areas highlighted with dashed blocks around the function).

Figure seven (below) is a representation of the new, re-designed workflow system implemented in July 2006.

FIGURE 7: Re-designed Workflow



It is less important to understand the two workflows than it is to note the relative complexity of the re-designed system over the previous one. The second workflow represents a fundamental departure from how work was done in the past and this is critical precisely because it was done in isolation or independently of the MIS. The impact of this on the human agents in the organisation is that they have to become accustomed to a new workflow and then again, should the management information system implementation be successfully complete, become accustomed to a management information system which may or may not support their workflow optimally. Should the management information system not support the workflow optimally, one (the workflow) or the other (MIS) factor will have to change once more.

This illustrated again, how, had the requirements planning be undertaken better, the re-designing of the workflow could have been implemented in line with a management information system that would ultimately facilitate such a workflow.

It is significant that the change, however, received a great deal of attention with respect to its planning and also in the way in which it was communicated and implemented. All relevant stakeholders were involved in the process re-design and several planning session where undertaken to ensure collective understanding and

buy-in to the procedure. Having achieved this, an implementation plan was developed to facilitate the smooth transition from one flow to the other. The result is that the workflow is in place; people are working differently and the benefits anticipated from the change are being realised. This process in itself highlighted the shortcomings of the management information system project.

6.2.4. Staff Turnover

Over the last six months Remata iNathi (Pty) Ltd has experienced quite a dramatic staff turnover, relative to its average. This can, to some degree, be attributed to the transition the organisation is going through. This is another significant influence as new employees need time to adjust to the organisational culture and often bring with them elements of a different culture, which can influence the management structure of the organisation they have joined. At the very least staff turnover is disruptive and has an adverse affect on (some) employees.

This influence will be discussed again in more depth in section 6.3 with reference to the external influences on the human agents within the organisation.

6.2.5. New Shareholders

In parallel to all the changes in the organisational and the management information system project, Remata iNathi (Pty) Ltd management was also in the process of acquiring additional shareholders. As mentioned in chapter six, a large black consortium, Imbani, created a division of the group called Imbani Creative, which Remata iNathi (Pty) Ltd was to become a part of. This represented an entirely new way of working.

Remata iNathi (Pty) Ltd had always been a small family-owned business; it already had to deal with the issues of becoming a larger organisation and all the change that is associated with that. This venture to join the Imbani Creative group meant further, fundamental changes. Decision would have to be taken differently, different people would have to be employed to take the organisation to the next level, and a different type of expectation in terms of bottom-line return would be expected. In the interviews, it became clear that all of these factors played on the employees minds and there are mixed feelings towards the change.

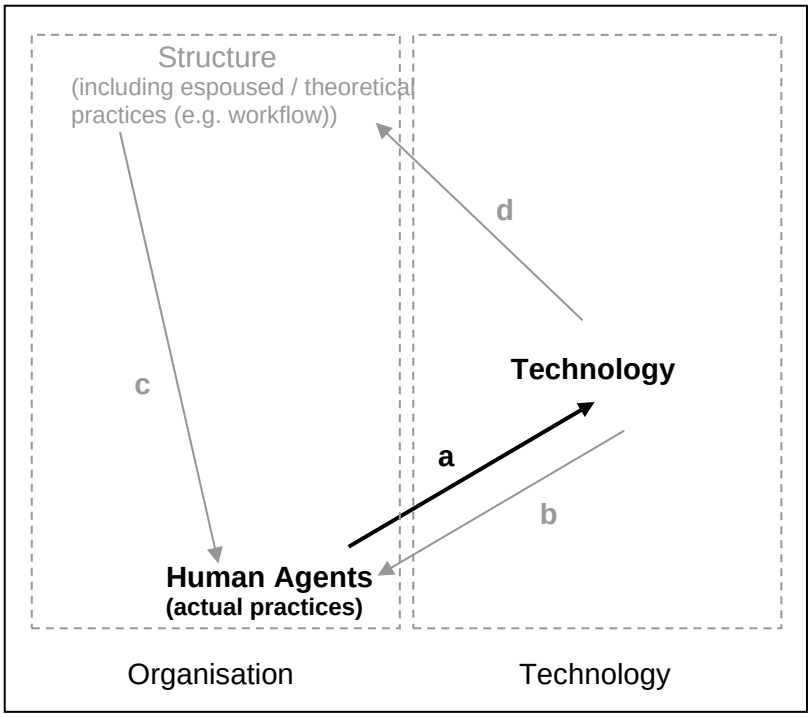
6.3. Research Question 2: Specifications for the Technology

Following on from section 6.2, the second research question looks at how the requirements of the human agents, working within the specific organisational context, have been communicated in order to develop the specification for the technology.

As discussed in section 2.3.2 , the structurational model of technology used for the research proposes that technology is a product of human action. As a human product, technology comes into being through creative, human action and is also sustained by human action through the on-going maintenance and adaptation of technology. Moreover, once created and deployed into an organisation, technology remains static and ineffectual unless it is given meaning and manipulated, directly or indirectly, by humans within the organisation. On its own, technology can be of no importance. It is only through its use by human agents that is can begin to play a significant role within the organisation (Orlikowski, 1992).

Figure eight (below) highlights the area of the model that the section refers to in light of the research undertaken.

FIGURE 8: Technology – A Product of Human Action



6.3.1. Requirements Planning

What became apparent to me while conducting the research is that the requirements of the new management information system are in fact to develop a full ERP system for the organisation. What was required from the MIS, once fully implemented, was complete integration of all processes, from creation and prepress to press, post-press and delivery. All support functions such as stock control and invoicing would also have to be supported.

Fui-Hoon Nah et al. (2001), cited in Voordijk & Stegwee (2005), define an ERP system as "a packaged business software system that enables a company to manage the efficient and effective use of resources (materials, human resources, finance, etc.) by providing an integrated solution for the organisation's information processing needs" (Voordijk & Stegwee, 2005: 418). ERP systems provide organisations with one of two types of functionality, namely, a transaction processing function that allows for the integrated management of data throughout the organisation, and a workflow management function that controls the many process flows within the organisation.

This definition clearly and concisely described what Remata iNathi (Pty) Ltd hoped to achieve from the management information system that was commissioned. It is clear that the scope of project was, or became, much larger and more significant than it was intended or understood to be. This finding also fits with the structurational model of technology being used as it highlights another structure change within the organisation which has influences on the human agents and clearly the technology requirements.

The following became clear from the interviews: firstly, the scope of the management information system was not understood by all the stakeholders who were to be involved in the implementation and use of the MIS; secondly, the requisite planning was not done (with respect to the requirements planning and implementation) nor was the time taken to understand the requirements and the impact thereof; and thirdly, there were specification changes during the development and implementation phase of the management information system project. Each of these factors will be discussed in more detail below.

- **Scope**

It is necessary to elaborate slightly on some background in order to provide a better understanding of the situation. Over the course of the previous year (2005) it became apparent that the organisation's IT infrastructure and specifically its management information system systems had lagged behind the growth of the organisation. The management information system could no longer adequately process the work required nor could it provide the management of the organisation with relevant and timeous data with which decisions could be made.

On the basis of this and given the growth of the organisation and the future vision, aspects or requirements for a management information system where discussed, mostly informally, and literally a software development project was commissioned. This informal or unstructured approach, in addition to the fact that, as mentioned previously, both the software developer, and the internal developer and project champion (by default) were involved in developing the original 3Animal, necessarily limited the requirements planning in a number of ways.

Firstly, the responsibility for the requirements planning was largely left entirely up to these two individuals how they consulted with other team members was entirely up to their discretion.

The project champion articulated his understanding of Remata's requirements of the management information system as follows:

> *"It requires a management information system. So a system that can, number one, manage the production workflow and, number two, can integrate the different components of the production flow, because we had different systems but they didn't talk to one another; so integrate the whole lot, and then thirdly, give information and that was probably the biggest key for us is to give the information back so management decision can be made."*

This is in line with the organisation's requirements as per the preceding discussion and yet this was not dissimilated to the users and stakeholders well. A potential reason for this could be because the consultation process was also not formalized and this is another issue that flawed the requirements planning. The very stakeholders that were consulted on what they believed the requirements of the

management information system to be have a poor understanding of what the organisation required from the new system. To illustrate the lack of understanding of the stakeholders, three responses to the question: do you know what Remata iNathi (Pty) Ltd requires from the MIS?" from interviews with members of the management team of Remata iNathi (Pty) Ltd, are quoted below.

> *"(Remata is) trying to take out human factor and (increase the) speed behind it to get a job to move faster through the system so we can take on more work. But it's changed because now we have added on stuff like 'why don't we do stock', why don't we do finance…'. Originally it was about the totally frustration of it all (estimating and production planning)."*

> *"I have a good understanding; I believe they wanting it as a tool to run the company efficiently and effectively... from a customer relationship marketing background / front-end through to client, stock control, monitoring of press space, and outwork so pretty much an entire integrated system from start to finish."*

> *"Purpose of it (new MIS) is to generate accurate quotes; taking into account the costs that we are going to pay against what we are going to charge clients so that our profits are good ... and it must be efficient like that so we are not doing anything we are loosing money on."*

Secondly, at no point was a formal specification brief generated by the stakeholders at Remata iNathi (Pty) Ltd and presented to the developer. Had the time been taken to do so, the extent of the scope and the potential pitfalls would have been highlighted, at least to some extent, and contingency planning could have been done at that stage.

Finally, at no point, prior to development, was a final requirements plan and how this would translate into a programme that delivered against the organisation's requirements, presented to the stakeholders for verification or at least to achieve a common understanding of the scope and deliverables of the MIS. The proposal from the software developer shown in Appendix II is the only (public) documentation available and this does not cover the project in nearly enough detail.

- **Requisite Planning**

The lack of understanding or, perhaps rather, clarity around the scope of the MIS, discussed, is a critical point with respect to the research. This is so because without a clear understanding of what one hopes to achieve at the conclusion of the project, the planning for the project cannot be done adequately.

As can be deduced from the above discussion, the planning was entirely inadequate. Operating from the base of inadequate documentation of the requirements, the project then moved along with no formalized planning apart from that done between the developer and project champion, therefore, in addition to the requirements not being clearly documented, there is also no documentation detailing the planning of the MIS. Elements such as the timing for the entire project; relevant milestones or deliverables and the impact of this on the users and the organisations were not done. It is important to note that this was not done from the developer's side and nor was it requested or implemented from the organisation's side. It goes without saying that a project without a plan has a high probability of limited success. This is even more so, when it is being undertaken in the context of an organisation in the midst of significant changes, as Remata iNathi (Pty) Ltd is.

Another important note is that during the planning phase, no one was tasked with looking at the systems that had become available in the industry since 3Animal had been implemented to ascertain whether another development had been launched that may, one the one hand, have met Remata iNathi (Pty) Ltd's requirements or, on the other hand, at the very least, given an indication of best practice in the area. One of the respondents commented on this by saying:

> *"Because he (the programmer) is so clever, he is very self-sufficient, so I think he develops a system and he doesn't look what's out in the market... the point is, I think ... you need to know what are best practices in the market before you develop your own (system).*

- **Specification Changes**

On the back of a poorly defined and understood scope and inadequate planning, the project had to further accommodate specification changes during the implementation phase to redress areas that had not achieved the desired outcome or to enhance certain features.

This was made possible by the fact that the system is a fully customized system and that the project champion was able to make some development changes in house; in addition to this, there was (and still is) an open-feedback loop to the developer. This meant that any changes required could be done by way of an update to the system. This is a beneficial aspect of the MIS, however it has meant that there has been scope changes and project creep as a result of the software developer working on improvements rather than finalizing the entire management information system as commissioned.

6.3.2. A Product of Human Action

The structurational model of technology used for the research proposes that technology is a product of human action. As a human product, technology comes into being through creative, human action and is also sustained by human action through the on-going maintenance and adaptation of technology.

This is particularly relevant to the research because what emerged during the process of the interviews was that the modules of the new management information system that are firstly, similar to the same module in 3Animal and secondly, that are necessary to continue with the baseline work of getting jobs through the organisation, are being used extensively. More than that, there is continuous feedback to the software developer on issues that need to be corrected or possible improvements that can be made to the module to better its functionality.

The modules that are entirely new to the organisation however, are not being used extensively, if at all. 3Animal was essentially an estimating and top-line production planning tool and in the new management information system the estimating and the production planning model are being used to date. The production requirements planning and stock control modules although complete and available are not being used at all.

From the interview process and my observations, I put forward the following reasons for this being the case:

Firstly, the project champion has left the organisation and the impetus behind the project has definitely slowed. This is not as a result of the priority having lessened but as a result of the fact that the remaining management members do not primarily

have the same level of knowledge as him and secondly do not have the time available to focus on the management information system in addition to their areas of responsibility.

Secondly, there is generally, from my observation, a poor understanding of system as a whole. The modules that have been deployed and are being used are well understood by those persons needing to use them. The understanding of the modules is however limited to an understanding of their immediate use and does not extent to how they integrate with other modules or how the use thereof and information generates contributed to the bigger picture of the MIS.

Furthermore, the modules that are available and not yet in use, requires a fundamental mind and culture shift from the users in order for them to be successfully implemented as they represent an entirely new way of working in some areas. This, in addition to the absence of a project champion, means that the task of implementation becomes rather difficult.

Fourthly, the project was aimed at delivering an ideal system designed to facilitate the flow of work and make use easier for the users of the system. What was not taken into account during this process was the fact that the computer literacy levels of the large majority of the users are exceptionally low. This will be further elaborated upon in section 6.4.3.

The above factors combined with the fact that there is no documentation for the system in the form of training manuals or explanatory notes makes it even more difficult to work with and for new employees to be trained on.

The final discussion point here is related to the time required for the human interaction with the MIS, in order to bring it to the point where it delivered against the desired requirements, in relation to the current priorities of the organisation. With the project champion having left, the management information system is not any one person’s priority and in the face of the transition period Remata iNathi (Pty) Ltd finds itself in the midst of, other priorities are being attended to and the management information system is being neglected. This is however mitigated by the need to finalise the way forward and the critical role the management information system can play within the workflow of the organisation. The management information system is remaining top of mind for the directors as the reasons for the project beginning in the

first place remain as relevant and critical to the organisation as they were at the onset of the discussion about a new MIS.

6.3.3. Workflow Process Change

The workflow process change, discussed in section 6.2.3 from the perspective of the structure component of the structurational model of technology used for this research, is revisited with reference to the impact on the human agents.

One of my observations is that, as a generalisation, the level of computer literacy is very long amongst the users of the MIS. This presents a fundamental challenge to the implementation of the new system as well as to the vision of what the system is designed to deliver. The current user base, if they do not receive significant training, both specific to the system and general computer skills, will not be able to successfully adopt the system in the way the organisation intended.

The preceding discussion is an indication of why, perhaps, the workflow re-design was done in isolation to the MIS. The people have adopted the workflow process and are working within the newly defined parameters, probably better than they would have if it was necessary to work with the management information system to the full or to a greater extent.

This will be discussed further in section 6.4.3 with specific reference to user maturity and management information system implementations.

6.3.4. Staff Turnover

Staff turnover was previously discussed in relation to its impact on the structure of the organisation. It (staff turnover) is again relevant here with respect to the impact it exerts on the organisation's human agents.

The most significant change with respect to staff turnover and the management information system is the resignation of the estimator who has been with Remata iNathi (Pty) Ltd for the last six years. Lizelle worked on 3Animal and was integrally involved in the testing of the management information system in January this year. Her position of estimator has been replaced with a new role of a head estimator / client liason person (indicated by the * in the re-designed workflow shown in figure

seven), who will not only be responsible for estimating but also for working with the newly restructured sales team to increase the quote to job acceptance ratio.

6.3.5. Business Strategy

When looking at how the requirements of the human agents have been relayed to develop the specification for the MIS, I looked to the business plan for clues on how Remata iNathi (Pty) Ltd usually goes about executing from the plan to the actual. What I established was that there is in fact no documented business plan and resultantly, no articulated human resource planning or development as well as no IT strategy or plan in place.

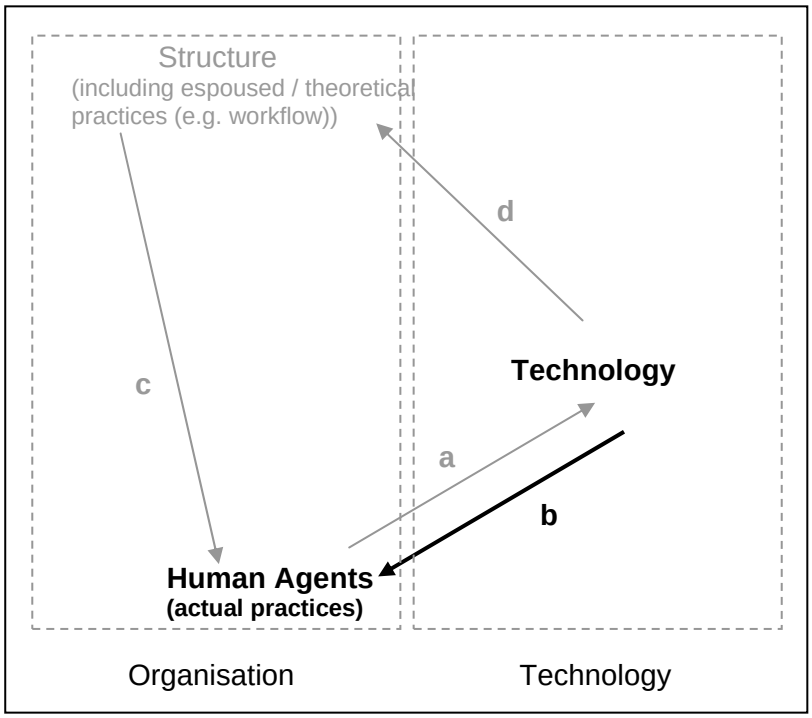
During my observations, it has become apparent that the absence of planning appears to be an organisational norm. This can be attributed to the fact that when the two-member owner management team ran the business and it was small, they were in a possible to control everything; further, due to the size and nature of the business, planning was not a critical necessity and they could rely on their instinct to make decisions. While the organisation has grown and this can no longer be a valid *modus operandi*, the planning or rather, decision-making model has not changed. As a result, the absence of planning is not only the norm, but the reason why the organisation loses a great deal of time and money and exerts a great deal of effort on reacting to the situations that arise due to lack of planning.

6.4. Research Question 3: Impact of Technology

From the preceding discussion, it is clear that only through the use of technology by human agents can it begin to play a significant role within the organisation. This therefore leads the research into the area covered by research question three, namely, that of how the technology, already implemented, has affected the actual work practices in the organisation.

The structurational model of technology holds that while technology on its own can be of no real importance, it does facilitate human action (the performance of certain kinds of work). However, an important corollary of this is that by facilitating action in a particular manner, technology also necessarily constrains it.

FIGURE 9: Affect of Technology on Work Practices



6.4.1. Implementation

The following four modules of the management information system had been developed at the point that this research was being written up: (1) the estimating module (including a client database address function) designed to generate cost estimates for clients; (2) the production planning model designed to book work into the production system; (3) the production requirements planning module designed to plan the production requirements of all jobs by booking press space and other machinery as well as allocating stock to all jobs (using the stock control model); (4) the stock control module designed to record and keep track of all stock within the organisation and to prompt re-orders required based on the rate at which stock was allocated to job by the production requirements planning module.

As previously mentioned, while all four modules had been developed, and technically speaking, had been implemented, in as much as the modules were deployed on the Remata iNathi (Pty) Ltd system, only the first two were actually being fully used, and even then not by all users.

A fundamental short-coming of the system implementation was the manner in which it was done. As mentioned in the requirements planning section, there was no documented implementation plan and as such the people that would be affected by

the changes firstly, did not know when the change was coming and therefore secondly, did not know how to plan for it and prepare themselves for the changes. This implementation was undertaken by the project champion without much communication or forewarning. This is characteristic of the manner in which the project champion prefers to work, that is, informally, requiring very little structure. This can be noted by his view of the implementation, quoted below.

> *"I think the implementation was done very informally which has a lot to do with the values of the organisation... I think a more professional approach could have helped a lot of things, but the informality also helped us to keep on change things until we were happy with them, so it was very informal... I don't think we spent enough time training people upfront and also no training material was made available so the in depth know-how was always in the minds of people and not on paper somewhere ... but it was difficult because of the time constraints ... but the flexibility in which it was done was great because it meant that if something wasn't as user-friendly as we wanted it to be, we just change it. So the system kept evolving over a period of two to three months so that was nice about it. It's got its downsides, of course."*

In contrast to his positive view, almost all the respondents involved felt that is was handled in a less than manageable manner. This is evidenced by the following quotation from an interview:

> *"You got to work one day and there it was. 'Learn it.'"*

> *"Implementation was quite haphazard; it happened overnight; and then Eldred went away and the developer was in PE; and then not even the IT guy knows how the system works and the person who is suppose to help you is not available."*

The above quotations reference to the implementation happening overnight is actually correct and not an exaggeration. 3Animal was in use on a Friday and the new MIS, Animal, was installed and live on a Monday preceding it. Users had to learn in a Monday morning what needed to be done to keep the work moving through the organisation.

6.4.2. Training

Leading on from the previous section, there was no training at all for the modules mentioned prior to the implementation being done. There are also no training or instruction manuals on the software that users could make use of to learn about the new system and use to train themselves. This is illustrated in the two quotations from interviews below:

> *"You get thrown into the deep end; you are reading a work ticket that you don't know; sitting with someone like Tony who doesn't like a computer... and you say 'just work on it'. People were frustrated for six months and then only the training was given and now only they can perform on it."*

> *"Six months into it (the implementation) and people don't know how to use the address book. If there was basic level training then it would have been sorted."*

The absence of training I identify as a critical shortcoming. Training allows for the shaping of people's views about the MIS; it allows the trainer to guide users on how the management information system should be used in order to obtain certain results. In essence, training allows for the required or desired behaviour changes to be preempted. By doing this, the chances of the technology having the expected or desired affect on the human actions are significantly improved. If the users, as they had to in this case, have to 'find their own way' and discover how the software works entirely by themselves, they will tend to find the ways that support their previous way of working and the change will take much longer to prevail, if it does at all.

As the above quotation shows, adequate training was only done six months after the implementation. This training then only covered the modules already in use and not the other modules, implemented but not in use, nor the remaining modules. This is mentioned because it again illustrates how failure to connect each step with the bigger picture has resulted in the fact that not one of the users can see the system in its entirety and how their area (module) of the systems fits into that bigger picture and therefore, why it and the whole management information system is critical to the organisation.

6.4.3. Effect on Actual Work Practices

As a result of the above mentioned factors pertaining to the implementation, its intended affect on work practices is somewhat different to the actual affect.

With the change in MIS, the management of the organisation anticipated some adaptive difficulty as the users became accustomed to the changes in the management information system and adapt to a different way of working. This was made worse by the fact that the implementation was managed so poorly. In addition to there being formalized requirements plan that teams could agree with and anticipate and no implementation plan that allowed people to plan for when and how the changes would occur, there was also no training; the project champion implemented the first two modules on a Monday and two days later left to go to Namibia on a ten-day trip. This left people feeling extremely insecure and vulnerable.

Having been received off of this platform, the system, having not been tested prior to this implementation, proved to be very unstable and Remata iNathi (Pty) Ltd experience a series of system crashed during those first two weeks of implementation. With the project champion away and the developer based in PE, this left the organisation in somewhat of a difficult place. Launching the software in this manner made the launch entirely more difficult than it needed to be because from the onset people had a negative perception of the management information system and did not trust that it would make their workflow easier and be beneficial to them.

What follows below is a discussion about the specific changes in work practices since the implementation of the MIS. Given that only the first two modules are truly operations in the sense that they are being used daily, the discussion will be limited to those two areas within the organisation.

- **Estimating**

The estimating module is designed to provide details estimates based on clients' quote requests and is based on a cost-plus costing model.

In the past, Remata iNathi (Pty) Ltd has always had only two estimators; one of whom has been with the organisation for six years. Lizelle began working at Remata

iNathi (Pty) Ltd before the introduction of the printing presses and had previously worked at the same organisation as the project champion. This is significant because her entire estimating experience is based on working on 3Animal and Animal. The second estimator, Louanne, joined Remata iNathi (Pty) Ltd in May 2006. She has extensive print estimating experience although it was on an off-the-shelf estimating packages used by many print organisations and as such moving to Remata iNathi (Pty) Ltd and working on Animal obviously changed her work practices but not in a manner relevant to the research question at hand.

It is relevant to point out that the implementation of the management information system was handled somewhat differently within the estimating function. Firstly, the estimators were called into a specific meeting and the new management information system was discussed with them prior to the implementation. Secondly, Lizelle was tasked with testing the estimating module of the software during the first few days that it was being used. She had to generate and estimate on 3Animal and then generate the same estimate using the new management information system and compare the two to ensure that the set up in the new management information system was correct. This allowed some time for them to work with the new management information system and get accustomed to the changes. And finally, the two systems, with respect to quoting, are designed on the same interface and as such the estimators where familiar with the interface already.

> *"I don't think there are really huge differences in the old and new; … there are just a lot more steps in doing the quote because the quotes have more detail"*

Based on the above, it is fair to say that within this function, the implementation of the management information system has not affected the work practices of the estimators in any real manner. This is borne out by the estimator's response to the question of whether the new management information system has changed the manner in which she works:

> *"Not really; in the beginning it (*the way she work*) was (*different*), but it was just because it was different, you worked much slower and all of that, but now that we are up to speed it is basically the same as before."*

With the re-designing of the workflow process discussed in section 6.2.3, Remata iNathi (Pty) Ltd decided to employ a slightly different approach in the estimating

function by employing a very senior individual as a head estimator in July 2006. The opportunity to implement this change was taken when Lizelle resigned, opening up a vacancy in the estimating function (discussed in section 6.3.4).

This above-mentioned change will have an impact on the estimator's work practices because they are no longer require to only generate estimates but are also tasked with adding intelligence to the estimates in such a way so as to increase the quote to job acceptance ratio, under the head estimator's guidance. As with other work practice changes identified in the research, this change also cannot be attributed to the implementation of the MIS, but rather to the structure change implemented in the function.

With respect to the estimating module, it is important to add at this point that the client database set up in the management information system for the purpose of automatically linking all client details to their quotes is set up in such a way that is may be accessed and updated as an address book. The address book then also records all the estimates completed for a client as well as which estimates translated into actual jobs done by Remata iNathi (Pty) Ltd for that client. This additional functionality has proven very beneficial in a number of ways.

Estimating. From the estimating perspective, it saves a great deal of time in that the estimator does not have to look up client information manually every time a quote is requested; it also eliminated potential errors that may occur in the re-typing process if the information were not linked.

Sales. From a sales perspective, the additional functionality also adds value because the sales team is able to be more proactive in the management of their clients. Any sales person is able to review a client's history in a very user-friendly and easily obtainable manner. Furthermore, in terms of client service, the sales team is able to deliver a better quality service in that they are able to search on an estimate number and look up details of jobs to assist with client queries. The team is also able to see a summary of the costs associated with the job from the quotation and advise clients accordingly or make decision based on actual cost information against industry information they may have available.

> *"(The) system is much more user friendly, so sales can also go into the quote and clients and get info without having to ask estimator every*

time; everyone can help a client over the phone. It is not just an estimators' programme anymore; it is much more user-friendly."

In addition to the above, because all the modules are contained on the same system and the system is perceived to be more user friendly, the sales persons are able to check on the production planning without having to ask the production planner necessarily.

The nice thing about the new thing is that I can call up quotes at my own discretion, look at a client snapshot; see at how many jobs have been accepted from a client versus quotes done; get those ratios, which is really great. At the same time to be able to go into the production planning side and just to be able to look at the production planning side which I was not able to see in the old one.

From the above quotations and my observations, it is apparent that from a sales perspective, the estimating module and the integration of the system has changed work practices in small but significant ways.

Production. From a production perspective the address book functionality is useful in its most basic form, that is, the production team can look up client contact information when they need to call a client regarding a query on a job in the production process without having to rely on a sales person to get the information for them. This obviously aids faster and more effective communication between a client and Remata iNathi (Pty) Ltd.

"The address book function comes in very handy on Animal; very, very good indeed. Instead of phoning sales, you can look it up on the programme, otherwise you've got to find it only on the work ticket so you have access to that now."

- **Production Planning**

The production planning module is designed to provide an effective mechanism for processing the accepted cost estimates into the system and to convert the information from the estimate into a production instruction sheet (work ticket). Having done that, the module is further designed to generate a daily production schedule based on the clients' deadlines associated with all the jobs, to facilitate the

management of the jobs through the organisation in order that they may be dispatched timeously.

Significant structure changes have occurred in the department over the period of the research. There has bee a one hundred percent staff turnover since October 2005 apart from the department's manager and the structure of the department has changed twice in that time, excluding the workflow re-designed discussed in the previous section, which would then be the third structure change.

With respect to processing the information from the accepted cost estimates into the system and then converting it into an instruction sheet (work ticket), the new management information system has made a very significant difference; work can be processed into the system significant faster than on 3Animal. With the 3Animal system all specifications on the quote had to be re-typed onto the instruction sheet for the job ticket. This was very tedious and slowed the system down as the process could only be as fast as the person capturing the jobs into the system. On the new MIS, the quote reference number is used to call up job from the database and the instruction sheet for the job ticket is automatically populated; what remains is for any special instructions from the client to be captured. This also means that the process can happen significantly faster and that there are much fewer errors in the process than before.

> *"A major, major change or a thing that I think has changed the world here is the opening of work ticket. Work tickets took up to, at one stage, up to 20 minutes to get all the detail out, now you can open up to twenty tickets in twenty minutes; it's very, very fast now."*

Another fundamental change coming out of the implementation of this module is the daily production schedule generated by the system that allows the production management team to effectively work with the jobs and have them completed on time. Users are also able to make changes to information, such as the deadline date, so the information is real-time accurate.

> *"We never had a day-to-day thing, a production scheduled... I used to write things down on a piece of paper … so you can play out an accurate production table every day and it also gives you the facility of moving things (*jobs*) around ... with clients' consent … to move things*

and give yourself an accurate thing on a day-to-day basis, so I find it a necessity; you have to have something like that. That's the main thing."

In an organisation where the deliverable as absolutely deadline based, this function of the new management information system is a critical management tool to have in place.

*"It makes it more efficient for me to work; because of having access to basically everything (*all the jobs*) in the shop; knowing what to look for; being able to edit a list of production things for the day so it really makes it more efficient for me."*

From a production perspective though, the system has also resulted in some changes that have created difficulties that were not so in 3Animal. The difficulties are not such that they affect are job-critical functions but the purpose of mentioning this point is to illustrate how the 'ideal system' has not delivered against the objective. Again, this could have been identified had the requirements planning phase been undertaken more thoroughly and been documented for users to sign off against. At that point the production team could have identified the areas of concern.

The quotation below illustrates one such area of difficulty.

*"If it showed for any part of outwork how much we have allowed, it would save a lot of phone calls upstairs (*to sales*): 'how much have you allowed for this?, can you tell me...' and then they report back to you: 'it's gonna cost this and we have only allowed that' ... Before (*on 3Animal*)... the outwork ticket used to printed out so at a glance you could see how much had been allowed for it, even if it was done at Remata it used t tell you,... so I could compare anything going out and it doesn't show me that now and I don't understand how to go into the quoting system because I've not been trained on that; and so I can't quickly grab the information myself so it is very frustrating for me."*

6.4.4. Maturity of Users

In gathering information in the various ways undertaken in this research to answer the research question "how has the technology, already implemented, affected the actual work practices in the organisation?" it became clear to me that a key

consideration in this was the users of the system. The impact of the technology is necessarily constrained by the users of the system and, in this case, specifically their understanding of the purpose and use of management information system in the organisation, their level of computer literacy and their previous use of computer systems in general. This becomes particularly relevant when viewed in light of the way the implementation and training was done. These aspects are elaborated upon below.

- **Understanding of the Purpose and Use of the Management Information System**

In section 6.3.1 the researched showed that there is not a common understanding about the purpose of the management information system within the organisation. There is also not a common understanding of how it can or should be used to achieve the purpose for which it was designed and implemented. The fact that this is the prevailing situation six months after the initial modules have been implemented is a great concern and shortcoming for the organisation.

It is clear that operating for this platform, Remata iNathi (Pty) Ltd can never hope to achieve the desired outcome of the management information system project. This factor is however one that can be relatively easily addressed with some planning and communication efforts from the leaders of the organisation. This is borne out by even the project champion's comment below:

> *"It is very difficult to find balance between training people how to operate the system and training people how to understand the system and I think the ideal is that people will understand it; the reality is that some people are not focused to understanding it, they just want to know where to click and when to click ... I don't think enough people understand the system. I think they just use it ... so there probably needs to be another push in training to get them to understand it; the 'why' of the system not just the 'how'."*

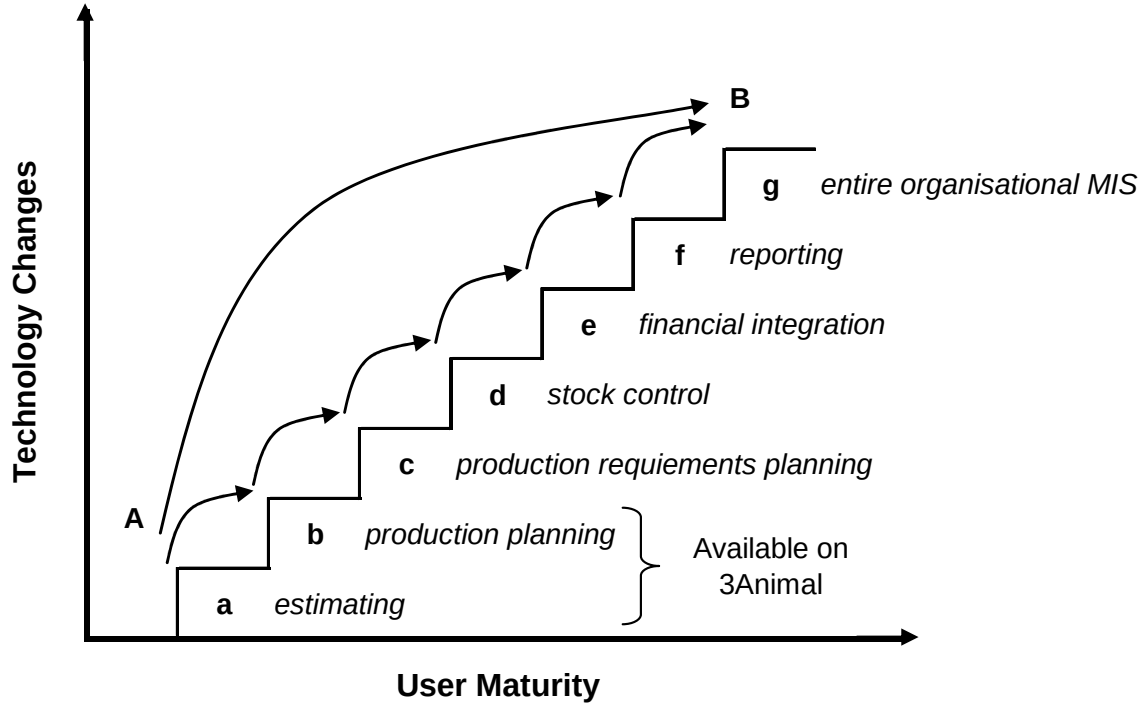
- **Users' Level of Computer Literacy and Previous Experience**

Furthermore, the users' level of computer literacy and their experience with working on computer systems as a generalisation is very limited. This factor can not so

readily or easily be addressed and as such needs to be accounted for in the planning of the system and the implementation process.

Figure 10 is an illustration of what I understand the relationship to be between the extent to which technology can be changed in relation to the maturity of the users that are going to be working with the technology.

FIGURE 10: Graph of the Relationship between the Changes in Technology and User Maturity Required



From the research it is clear that what Remata iNathi (Pty) Ltd attempted to do in its management information system implementation was to move from point A to point B on the graph in one phase. In my observation this was simply to great a leap of technology for the users to grasp. Many of the users at Remata iNathi (Pty) Ltd come from a background of using manuals systems and literally of writing information on pieces of paper and in books, and as such this is their preferred way of working. They have had little, or in most cases, no exposure to automated management technologies.

In essence, by attempting to move from A to B, Remata iNathi (Pty) Ltd was asking someone who has never recorded stock, for example, to firstly, begin doing so, secondly on an automated system that thirdly, integrates with production planning requirements. The risk associated with making an error in this situation is enormous.

If the stock count is done or captured incorrectly, it could result in the necessary stock not being available for production to take place. It is nonsensical to expect this adaptation to be made well by such an immature user.

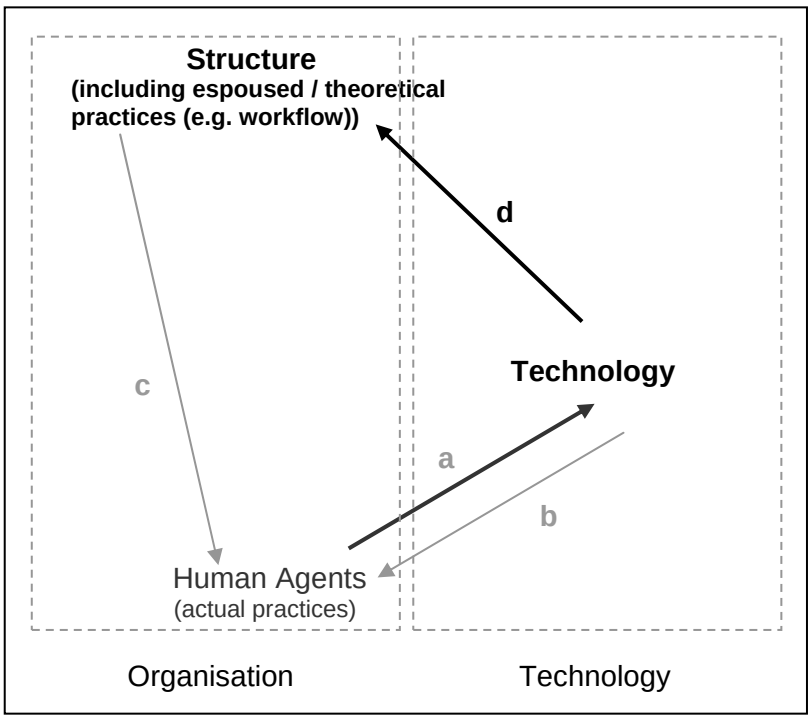
Even six months into the implementation and having had the training that was undertaken, all be it limited, some users are still not making use of the basic functionality of the system. Animal generates a daily production schedule for the production managers to work with in managing of the day's jobs that must be delivered. In spite of this, one of the production managers is still working with hand-written lists that must be written on a daily basis. Appendix four is an example of such a list used by one of the production managers, while appendix five shows the automated list that can be generated from Animal.

Had the implementation been better planned and communicated in a phased approached, as indicated by the stepped graph in figure 10, the implementation would have been much more successful and the user acceptance of each module significantly enhanced. This process would have also served to address the issue of users' understanding previously mentioned.

6.5. Research Question 4: Technology's Affect on Management Structure

The final research question addresses whether the technology has affected the management structure. This is aligned to the final influence that the structurational model of technology deals with is the manner in which human action, when it uses technology, acts on the institutional properties of an organisation (arrow d) either by reinforcing or by transforming them. These effects, referred to as the "institutional consequences of interaction with technology", are generally not thought about by users, who often are unaware of their role in reaffirming or disrupting the institutional status quo (Orlikowski, 1992: 11).

FIGURE 11: Human Action, with the Use of Technology, Acting on the Institutional Properties of an Organisation



Through the process of answering the preceding three research questions, thoughts on how the human agents, using the technology have impacted on or influenced the structure have emerged as follows.

Because the management information system has not delivered what the organisation intended it to deliver, the requisite or desired changes that the system should have delivered have not occurred. It is, however, fair to say that the structure has undergone a great deal of change over the period of this research, but not as a result of human agents interacting with the technology, as the structurational model of technology may suggest and as such having an impact on the structure. I rather observed that the humans interacting with the technology did *not* bring about the required or desired changes and as such the workflow redesign was undertaken which has had an impact on the structure.

The project champion made the following comment about his view of how the interaction between technology and structure occurred in this case:

> *"Other systems, if you implement them, they force you into a specific way of working or thinking because they are designed generically; this system is built around the way Remata wanted to work. Where in the*

*diagram you showed me (*figure 3: structurational model of technology*), the technology would influence the structure of the organisation, where in this case I would say that the structure of the organisation influenced the way that we built the technology more than the other way around... so it was more an add-on to the way Remata wanted to work and helped them achieve a specific way of working rather than buying something and then redesigning yourself to work around what you have bought."*

It is fair to say that had the system delivered against the requirement fully and in a way that all the users required to use the system had the adequate understanding, the above statement could have been true. What has happened in reality in this case is not so.

In addition to this, the various changes that the organisation experienced, such as the introduction of print earlier and more recently the new shareholders, have also impacted on the structure (independently of the humans interacting with technology loop).

6.5.1. "Made to Fit but it doesn't Fit"

It is pertinent to elaborate on the above observation that the human agents interacting with the technology did *not* bring about the required or desired changes and as such alternative actions had to be taken, such as the redesigning of the workflow.

On a macro level, the system has not delivered against the expectations to date. (This observation is made bearing in mind that the entire system has not been implemented at the time of the research. However, using the experience of the process undertaken with the modules implemented to date, it is fair to make the extrapolation that the remaining modules will be executed in a similar way and therefore that the experience of the actual deliverables against desired deliverables or organisation's expectations will also be relatively similar to what has been the case in the already-implemented modules). With much more time and resources placed against the project, and the process of testing the software and making the necessary adaptations and improvements, it may well end up delivering what it should; this would be a very lengthy process still to go though.

Perhaps even more pertinently, the system has also has not delivered on a micro level. Feedback from several of the interviews is that there are now little bugbears in the system that they all just have to live with and work around. This was the case in 3Animal and one of the areas that the new systems was specifically suppose to deliver against to avoid individual users manipulation of the system in order to make it work.

One of the reason for this, in my opinion, is that the project has had no clear planning and as a result no clear deadlines for when each module should have been implemented and as such be one hundred percent complete and bug-free. At present all users have an open line of communication to the developer by way of e-mail. Any problems encountered are e-mailed to him and he simply writes a patch or modifies that area of the programme. At next log-on an update runs and so each item is addressed.

> *There are a few nitty-gritties that still have to be sorted out, but luckily we just e-mail Ekas (*the developer*) and within a few days he just sorts it out so not really anything that will frustrate us for a long time.*

While this may at first seem to be a great advantage of the system, and in some respects it is, it is in the longer term, in my opinion a negative. It implicitly suggests that the system can under go continuous improvement of basic functionality and therefore the question must be asked: will it even be complete? If the improvements were fundamental items that made the software more able to deliver against changing business needs at each improvement, it would be a different discussion altogether; the improvements are however related to the basic functional requirements and as such should not be necessary six months into the use of the system.

> *“I don't think ... he (*the developer*) has spent enough time actually seeing how the thing works in practice...because one has to; often if you develop something, you plan the whole thing but you have to almost run a test phase and then see how you can improve; you thought something would work that way but then take that (*actual*) information and feed it back into the system to just improve it that much more with some practical implementation and I don't think we have done that. So now we've developed a system and now we work around whatever we've*

develop and we don't actually just take the time to iron certain things out and improve it a little bit more..."

The above discussion is interesting because in essence what this suggests is that the structurational model of technology would need to be amended to reflect what happened in this instance, showing that the structure could impact on the technology and therefore on the human agents rather than the human agents, through the use of technology, impacting of the structure.

FIGURE 12: Adapted Structurational Model of Technology

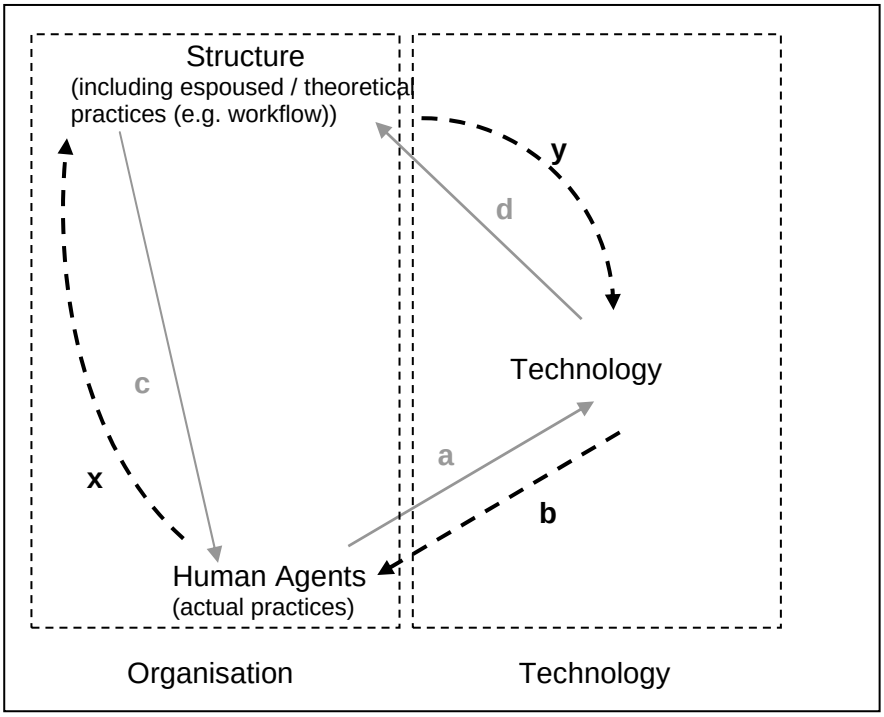


Figure 12 is an illustration of how the structurational model of technology may be adapted to account for the observation made in this research.

The structurational model of technology says that human agents, through the use of technology (arrow a), impact on the structure (arrow d). From my observations, I propose that the following may also be applicable: human agents working within a specific structure, have an impact on it (the structure) (arrow x) and as such the structure impacts or affects the technology (arrow y). This is taken from specifically the project champion's view where he says that the technology was an "add on" to the way Remata iNathi (Pty) Ltd wanted to work rather than the technology influencing the structure.

I make this observation because it is clear that the technology and human agents interacting with the technology did not affect the structure at Remata iNathi (Pty) Ltd during the time this research was undertaken. The technology was very specifically designed around the way the organisation wanted to work. It is important to mention that this was also biased strongly to the project champion and developers views on how this should be. As a result of this the structure influenced the technology very strongly.

The above discussion implies that the ‘loop’ is effective in both directions, and the direction of the influence is affected by which factor is the dominant one within the model, which in Remata iNathi (Pty) Ltd case was the structure defining the technology development.

CHAPTER 7: CONCLUSIONS

7.1. Introduction

The final chapter sets out to summarise the main findings of the research as discussed in chapter six. With all the research questions having been addressed, the chapter continues with a discussion about the limitations of the study as well as making some recommendations about the management information system implementation based on the research undertaken about the implementation experience to date. The chapter concludes with a discussion on suggestions for future research.

7.2. Summary of Main Findings

Based on chapter six's discussion on the results of the research, and once again using the structurational model of technology to focus the discussion, the following points have been distilled as the main findings from the preceding discussion:

Firstly, the research highlighted the importance of the planning phase of any technology project. It is imperative that robust and thorough planning be undertaken and in this process care must be taken to avoid the affect of what the structurational model of technology refers to as the "institutional conditions of interacting with technology".

In this case what the research showed is that because the developer and software champion felt that they knew exactly what was required and how to delivery it, the planning phase was not given the requisite attention it should have been given. In a project of this type of importance and cost to an organisation, planning must be a necessity that is a key deliverable of the project process.

The second key insight that may be concluded from this research is that how the implementation of technology is done is fundamental to the success of the technology, both from a user understanding and user acceptance perspective. The theory from the structurational model of technology states that technology is a product of human action and it can be of no use on its own; without human intervention technology remains meaningless. It is therefore imperative that the

implementation be well planned and well communicated with all stakeholders in the organisation.

Thirdly, the research shows that an organisation cannot develop and implement a system if its users are not adequately able to adapt to and make use of the system because of a lack of baseline ability with respect to working with technology and basic computer literacy. This is aligned to the structurational model of technology premise that technology on its own can be of no value; it is only through the use of the technology by the human agents that it becomes useful. It is therefore imperative to understand the knowledge and skills base of the users and then develop a system that delivers against the business requirements whilst being in line with the abilities of the users. If this is not done the software will not be used to its full potential and therefore necessarily not meet the business requirements or expectations, as shown in this research.

Finally, system changes or technology developments cannot be undertaken in isolation from the rest of the organisation and changes made with respect to the systems used must dovetail with workflow requirements and human capability.

When planning a system change an organisation must be clear and what the system is expected to delivery; how it will deliver and how that will be incorporated into the existing practices and structures of the organisation. As previously mentioned, with respect the structurational model of technology, it is important to note that all three elements, structure, human agents and technology have an impact and change because of changes in the three elements themselves that impact on the other elements and also that the model is a dynamic one. It is because of this that a system change must be undertaken within the context of the whole and not in isolation. What is clear from this research is that if a technology project is undertaken by an individual it will almost always reflect strongly the biases of that individual, and will therefore necessarily be limited.

7.3. Limitations

As mentioned in section 4.6 of chapter four, the reliability and validity of ethnographic research does pose some problems for researchers. This represents a limitation of this research. I attempted to ascertain the internal validity of the research by reviewing the interpretation of the data with the interview respondents. Their

feedback on technical or factual inaccuracies was taken into consideration, but no interpretive changes were made in order to remain true to the ethnographic approach of the research.

While the limitation is a general limitation applicable to this type of research methodology, a specific limitation of this research was experienced during the interview process in that is was difficult for the respondents to separate me from my role as a member of the Strategic Leadership Team of the organisation. As such I feel that the depth of answers may have been limited; particularly in light of the fact that the project champion was also a member of the Strategic Leadership Team and as such not much negative feedback was given in the formal interview process. The negative feedback could however be deduced from the criticisms raised in my general, day-to-day interaction with the respondents. The limitation therefore could be overcome as a result of the ethnographic research methodology allowing for the use of the day-to-day interactions and observations, along with the interview data. This provides a richness of data, not available to a researcher investigating this problem from outside of the organisation.

7.4. Recommendations

From the main findings discussed above, the following recommendations can be made.

1. All system changes must begin with thorough requirements planning, and more significantly the requirements plan must be communicated to ad signed off by all key stakeholders of the process.

2. Once a system has been designed or selected for the organisation, the implementation must also be carefully planned. Furthermore, the plan must be updated as the project progresses to account for any items not originally anticipated.

   In order for the implementation to be successful, it is recommended that it begin with a beta release of the software for testing purposes so that improvements and or modifications can be made to the software prior to it being live in the organisation. Secondly, it should have a detailed roll out plan with all the various phases and timings outlined thoroughly. This plan should be communicated well

to all parties to be affected by the implementation. Thirdly, included in the roll out plan must be a detailed training schedule covering the various training requirements for the users of the system; importantly this must be done prior to implementation so that the users have an appreciation for what they can expect and an understanding of how the new software works without the pressure of having to learn the application whilst needing to deliver against the work requirements at the same time.

3. It is further recommended that a "user audit" be undertaken at the requirements planning stage. The purpose of this would be to ascertain the level of computer literacy of the users and allow the system developers to work on a programme that would be acceptable and comprehendible to the users. It would also facilitate the development of a training plan which would be geared to accommodate the requirements of the users based on their base level of knowledge. This would increase the users acceptance of the system and their understanding, enabling the system to deliver more optimally against the business requirements.

4. The final recommendation is that the system development not be undertaken in isolation to the rest of the organisation. It is clear that a system alone cannot bring about the required changes to an organisation, but that this will only be achieved by a system through its use by the people within the organisation. The planning and implementation therefore should include as wide a sphere of people as possible to represent as many process and procedures as possible. The result of this should be a system that delivers more optimally against all user requirements.

7.5. Suggestions for Further Research

The focus of this research study was to determine how changes in management structure and the concomitant technology changes in a growing organisation impact on each other, using the structurational model of technology. A clear area of further (or continued) research within this case site itself, would be to continue the research started here based on the continued implementation of technology in the organisation. This could be done from a different vantage point or again using the structurational model of technology to structure the research. This could also be

undertaken with a specific focus on the affect of the structure on the human agents and the technology.

A second area of further research could potential be taken form the findings around the requirements planning phase of a technology project and how the critical nature of this phase impacts on the technology and organisation down the line.

A final area that I have identified out of this research is pertaining to the idea of developing a system for an organisation that is congruent with the (IT) maturity of users. While a system must deliver against business requirements, this research has shown that if the users cannot understand nor use the system adequately, it will not deliver the business requirements regardless. Further research into how the user maturity in growing organisations can be determined or how user maturity can be enhanced within a technology development process could be undertaken.

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APPENDICES

APPENDIX I: INTERVIEW QUESTIONS

Questions pertaining to management of the organisation:

1. How, over time, in your experience, has the management of the organisation changed?
2. Have these changes (if any) changed the way in which you have worked?
3. What were your frustrations with the 3Animal?

Questions pertaining to the new MIS:

Requirements Planning

4. Were you involved in the requirements planning for the management information system software? If so, what was your involvement?
5. Do you know what Remata iNathi (Pty) Ltd requires from the management information system? If so, what?
6. How can you be certain that this will be achieved once the management information system is fully implemented?

Development

7. Were you involved in the development of the management information system software? If so, what was your involvement?
8. What measures were put in place to ensure that the requirements of the management information system were met during development?

Implementation

9. Were you involved in the implementation of the management information system software? If so, what was your involvement?
10. How was the implementation done?

11. Did you anticipate that people would have difficulty in adapting to the new management information system?

12. What training, if any, was done in preparation for the implementation of the new management information system?

Training

13. What training, if any, was given to the users of the new management information system?

14. Were you involved in the training of users of the management information system software? If so, what was your involvement?

Communication

15. How were the development and / or implementation of the new management information system communicated?

16. In your opinion, was the communication around the management information system adequate? If so, how so? If not, why not?

Work Practices

17. What are the key differences / similarities between 3Animal and the new system?

18. Would you say work practices, generally, have changed since the implementation of the MIS? ? If so, how so?

19. How has the management information system impacted or changed the way in which you work?

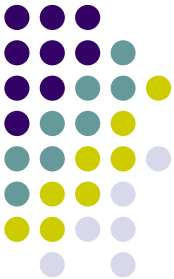
20. How has the management information system impacted or changed the way in which your co-workers work and interact with you?

21. What are your frustrations with the new management information system system?

22. What are the key advantages and disadvantages of the new management information system– versus 3Animal and the Industry?

8Animal ?

Proposed Software
for Remata iNathi



ABOUT US



- True Technologies cc
- Staff of 7 based in Jeffreys Bay
- Also supply hardware+services & is WISP
- Professional software development since 1989
- Borland Delphi – leading edge RAD
- Borland Interbase – leading RDBMS

2

WHY 8Animal



- Shortcomings of 3Animal due to nature, specifically designed with mostly DI74 in mind
- Technological limitations on size & load of database from Paradox vs. Interbase
- Complete integration of all processes, from creation, prepress, press, post-press, delivery

1

LIMITATIONS



- Only Windows based PC's
- No limit on number of PCs and no additional costs
- Can be run on LAN, through Web or direct dial-up connection (Windows exe still needed)
- All PCs on Remata premises or remote users that is permanent Remata employees

4

ROLL-OUT



- Implement core of CRM & Quoting within 4 weeks (implies most setups like cost-centres, user management & basic reporting).
- Debug & run smooth within 6 weeks. Maybe run parallel with 3Animal until all bugs cleared.
- Job flow, capacity planning & scheduling within 4 weeks of that.
- Other features added as prioritized by you.
- Estimated completion – 3 months.

5

RESPONSIBILITIES



- True Technologies cc will develop system with top-priority & complete within very best of our ability.
- Remata's responsibility to test & point out any errors in software operations and/or calculations.
- Details discussed is guideline. If any features prove to be unpractical or have negative effect on other key features, Remata must authorize such exclusions.
- No liability towards True Technologies cc for any loss incurred directly or indirectly due to software malfunction, miscalculation, downtime, nor any other reason.

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PRICING – Database Server



- Interbase 6 (Unlimited users)

= Free - OpenSource

- Interbase 7 superserver (25 user)

= ±R60 000+R9000 per extra CPU

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PRICING - Animal



- Estimated 800 hours consultation, planning, programming, debugging, optimizing
- 800 @ R180/h = R144 000 excl
- Current license fee of ±R500 pm terminated

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SUPPORT & MAINTENANCE



- Support & Maintenance of 1 year included
  - Start after completion (3 months)
  - No Travel & accommodation
  - Max. of 8 hours/month
- Thereafter @R320/h

OR

- Monthly maintenance fee of R640

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COPYRIGHT



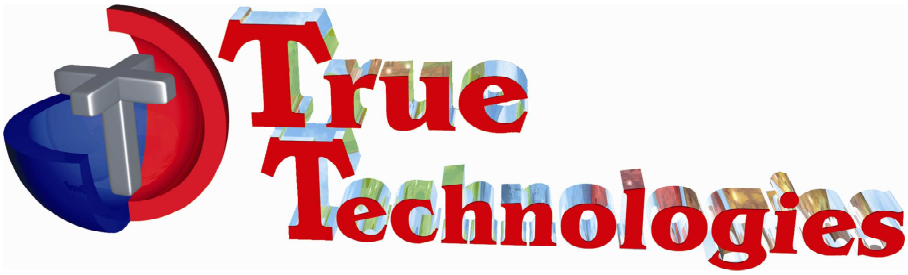
- Copyright remain with True Technologies cc
- To prevent marketing by TT, detainment fee of R1 500 pm
- If TT, Remata or other entity market 8Animal:
  - 10% finders fee
  - 30% towards TT
  - 30% towards Remata
  - 30% towards party that install & support

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THANK YOU

FOR THE OPPORTUNITY TO BE PART OF THIS EXCITING PROJECT

WE HOPE TO CONTINUE BUILDING OUR RELATIONSHIP WITH REMATA iNATHI



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APPENDIX III: CONSISTENCY MATRIX

Sub-problems	Research Questions	Data Source	Analysis
The first sub-problem is to identify how the changes in management structure that have occurred as the organisation has grown have affected the way in which work is done.	1. How have the changes in management structure, if at all, affected the work practices of the organisation (with reference to arrow c in the model)?	Research site Interviews Observations Other documentation	Content Analysis
The second sub-problem is to identify how the changes in work practices have affected the technology.	2. How have the requirements of the human agents been relayed to develop the specification for the technology (with reference to arrow a in the model)?	Research site Interviews Observations Other documentation	Content Analysis
The third sub-problem is to establish how the technology changes have impacted on the management structure and the work practices.	3. How has the technology, already implemented, affected the actual work practices in the organisation (with reference to arrow b in the model)? 4. Taken from the action denoted by arrow d, has the technology affected the management structure?	Research site Interviews Observations Other documentation	Content Analysis

APPENDIX VI: HAND-WRITTEN PRODUCTION SCHEDULE

CLIENT	W/T NO	QTY	DESCRIPTION	GANG. TRIM. FINISHING	DATE	DATE REQ	TIME REQ
ASSHA MARKETING.	3764	100000	2007 NEWSLETTERS	FORD GANG	V 4-UP?	31/7/06	2.00
SGB SUBURBAN GLASS	3817	800	2007 BROCHURES	FORD GANG	V	31/7/06	2.00
MADISON AUV.	3775	3X480	HEADERS.	TRIM	V	31/7/06	2.00
REFLECTIONS DESIGN	3844	200000	HEADERS.	TRIM	Mini Sum. V	31/7/06	2.00
MARCUS HATTINGS	3804	1000	FOLDERS.	GANG.	V	31/7/06	2.00
TURNSTYLE AUV.	3795	100	POSTERS.	TRIM	V	31/7/06	2.00.
BEGADA PAINTWORK	3766	3500	JEWEL TONE BROCHURES	FORD GANG	V	31/7/06	10.00.
ALCHEMY AUV.	3790.	3X7800	COMPETITION CARDS	TRIM	V	31/7/06	2.00.
KAMZAR PTY.	3789.	1000	SM. BROCHURES	GANG		1/8/06	2.00.
MADISON AUV.	3819.	800	HEADERS.	TRIM.		1/8/06	2.00.
KIMATA	3693	4X3000	ARCHIVE SHEETS	TRIM		1/8/06.	2.00.
A.	3695	5000 X 5200	4 HEADS CUTOUTS	TRIM		1/8/06	2.00.
BKS. PTY LTD.	3814.	1500 4UP.		TRIM FORD		1/8/06.	10.30
AGRINET. LTD.	3801.	2700	NEWSLETTERS.	TRIM FORD.	V	1/8/06	9.00.
KEMATA	3694	1500.	PAPER WEIGHT	SCORE FORD	H/FIN	1/8/06	2.00.
COLORADO. AUV.	3813.	2000.	FOLDERS.	GANG. H/FIN.		4/8/06	2.00
KEMATA	3691	1500	BROCHURES 16PP	FORD GANG		1/8/06	2.00

APPENDIX V: SAMPLE OF THE DAILY PRODUCTION SCHEDULE GENERATED BY ANIMAL

WORK TICKET LIST

Date in	WT No	QuoteNo	V.	Qty	Client	Description	Finishes	Presses	Resp	D. Date	D. Time
2006/04/28	002068	008807	1	10000	Southern Implants	Patient Info Brochures	Remata / Score in 2 places. = 112 min Remata / Folding with 2 folds. = 111 min Remata / Trim to size. = 24 min Remata / Shrink Wrap into packets and pack into boxes. = 27 min	DI74= 97 min	AE-Con	2006/05/12	11:00
2006/04/28	002071	008134	5	300	Trainiac (Pty) Ltd	Product Training	Remata / Drilling with 2 holes = 20 min Remata / Trim to size. = 46 min Remata / Collating = 342 min Remata / Drilling with 2 holes = 20 min Remata / Trim to size. = 15 min Remata / Collating = 31 min Remata / Shrink Wrap into packets and pack into boxes. = 9 min	DI74= 485 min DI74= 20 min	AE-Con	2006/05/12	13:00
2006/05/02	002099	008685	1	500	DTZ Leadenhall	Brochures	Remata / SR Score & Fold in 2 places = 445 min Remata / Trim to size. = 11 min Remata / Shrink Wrap into packets. = 6 min	Indigo= 21 min	AE-Dig	2006/05/12	10:00
2006/05/03	002116	006033	2	25	Pharmaplan	Detail Aid	Remata / SR Score & Fold in 2 places = 49 min Remata / Trim to size. = 11 min Remata / 24 mic MATT lamination Double Sided. = 42 min Remata / Shrink Wrap into packets. = 5 min	DI74= 78 min	AE-Con	2006/05/12	14:00
2006/05/03	002117	006037	1	10000	Pharmaplan	Leave Behind	Remata / Trim to size. = 16 min Remata / Shrink Wrap into packets and pack into boxes. = 11 min	DI74= 74 min	AE-Con	2006/05/12	14:00
2006/05/03	002119	006036	4	15000	Pharmaplan	Colpermin Competition Entry Forms	Remata / Trim to size. = 21 min Remata / Shrink Wrap into packets and pack into boxes. = 15 min	DI74= 43 min	AE-Con	2006/05/12	14:00