THE EMANCIPATORY POTENTIAL OF A NEW INFORMATION SYSTEM AND ITS EFFECT ON TECHNOLOGY ACCEPTANCE

by

Igor Felipe Rivera Green

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Abstract

The *Technology Acceptance Model* (TAM) currently enjoys the status of being the leading predictive tool for testing user acceptance of new technologies. Despite IS researchers and practitioners holding the model in high esteem, this study exposes some of its limitations when applied to a study of shop-floor users in South Africa. In search of an alternative theory explaining why these users so openly embraced the new information system, it emerges that the *Critical Social Theory* (CST) of Jürgen Habermas provides the most relevant insight. The use of the CST perspective reveals how these users view the new system as a potential means with which to achieve emancipation from their otherwise dreary existence as product inspectors. This thesis argues that this emancipatory potential offered by the new system played a major role in its successful acceptance.

Keywords:

Critical Social Theory; technology acceptance; Technology Acceptance Model; emancipation; emancipatory interest

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1. Introduction

1.1. The value of technology acceptance for organisations

There are several reasons why organisations may choose to invest in information technology (IT). These reasons could include demands to cut costs, to raise production volume, or, to improve product or service quality [Legris *et al*., 2003]. Nonetheless, the potential performance and financial gains promised by IT can all be undermined by user reluctance to accept and use the new technologies at their disposal [Davis, 1989].

DeLone & McLean [1992] once noted that existing definitions of success in information systems implementation were ambiguous at the best of times. In an attempt to define success more clearly, they offered a six-dimensional view comprising the following categories: *system quality*, *information quality*, *organisational impact*, *individual impact*, *user satisfaction*, and *system usage*. Of these six dimensions, it is arguable that *system usage* is a pre-requisite for any potential individual and / or organisational performance gains since the other five cannot take place unless the system is used. Therefore, despite ever more impressive technological advances in hardware and software capabilities, the fact remains that the potential that IT promises can only be realised if the intended users of the technology utilise it in a manner that will contribute both to the strategic and operational objectives of the organisation [Agarwal & Karahanna, 2000; Venkatesh & Davis, 2000].

Even though organisations have begun to realise that the acceptance of IT is a pre-requisite for its success, resistance to information systems (IS) is still a widespread problem [Al-Gahtani & King, 1999]. It is for this reason that user acceptance of new technology has become such an integral part of IS research and practice [Venkatesh & Davis, 2000]. User acceptance has long been a barrier to the success of IS, but if acceptance is achieved, so is the goal of improved work-related performance, which is the principal aim of most organisational information systems [Davis, 1993].

Researchers have identified low usage of installed systems as one of the main contributors to the so-called "productivity paradox" — a phenomenon experienced by many organisations as a result of indifferent returns from their IT investments [Venkatesh & Davis, 2000]. As could be expected, IS researchers have taken a deep interest in understanding and managing user reactions to new technologies. As a result, several theoretical models have been formulated over the past few decades in the hope of gaining a better understanding of individual attitudes and behaviours when dealing with new IT [Agarwal & Karahanna, 2000].

1.2. Problem statement

The development of the *Technology Acceptance Model* (TAM) by Davis *et al*. [1989] paved the way for the previously disjointed behavioural research discipline concerning the adoption of technological innovations [Wetzels, 2003]. TAM quickly gained widespread academic credibility on the back of a large body of empirical research involving, literally, hundreds of case studies during a period spanning almost twenty years. The promulgation of TAM over these years has made a noteworthy contribution to our understanding of user technology acceptance [Sun & Zhang, 2004].

During the early stages of my research process, I had planned to investigate the validity of TAM within an organisational context that I felt could ask new questions of the model, possibly leading to theoretical extensions. With an automobile manufacturing plant in Industryville, South Africa (name changed for reasons of anonymity) selected as a setting, my longitudinal study would present an opportunity to explore technology acceptance aspects unique to this country. Previous research has largely overlooked the effect that factors such as culture, socio-economic background, and education has on technology acceptance. The fact that issues so prevalent in the modern South African organisational environment would be explored, lead me to believe that this study could certainly be appropriate.

As was to be expected, the research subjects did not fit the mould of the sophisticated and discerning users of IT typically found in the Western-based studies predominant in this field. When faced with a group of mostly middle-aged, black South African

men who had spent most of their working lives on the shop-floor, TAM could not be applied properly, and, consequently, fell short of providing the required insight. Furthermore, as a predictive model that uses *perceived usefulness* and *perceived ease of use* as the main determinants of usage, it could not have given any explanations for the emancipatory drivers that motivated these men to embrace and adopt their new information system.

As fascinating as it was to be involved in a phenomenon that seemed to break technology acceptance convention, it caused me a major headache that the foundations of my research framework (*viz.* TAM) had proved unsuitable. Faced with the dilemma as to whether to continue this line of research or not, I instead decided to re-examine my research objectives, challenge the generality of predictive models like TAM, and find alternative theories which could provide me with the insight required to gain a fuller understanding of the research topic, in general, and my study, in particular.

1.3. Research objectives

It is important to state early on that this thesis' main objective is to demonstrate how an alternative perspective of technology acceptance was able to reveal the emancipatory potential that a group of repressed individuals perceived an IS to provide them with. The motivation behind the choice of an alternative perspective stems from the apparent failure of existing research models and theories to explicitly reveal the effect that such a perception may have on users' usage intentions. However, this alternative perspective should not be seen as an attempt at replacing existing theories, but, rather, as complementary to them.

Consequently, this study does attempt to present a balanced viewpoint by first thoroughly reviewing established technology acceptance models and theories before evaluating their underlying theoretical assumptions and what I perceive their possible weaknesses to be. By choosing the existing models as starting point, it is hoped that this study can highlight the potential for greater understanding that exists if critical social theory (CST) principles were to be applied to an area of IS research that has traditionally utilised a much more objective / positivist perspective. By contrasting the

underlying theoretical assumptions of two disparate views of conducting research in matters of the social world, I hope to convince the reader that the CST perspective provided the more balanced and detailed explanation of the specific technology acceptance study covered in this thesis.

During the course of this research, the formulation of the research question was an issue that caused me persistent problems. Since realising the inappropriateness of the first theoretical framework adopted, I went through an iterative process of scrapping, changing, and fine-tuning potential research questions. Nevertheless, the research questions, listed below in their current form, are thought the most suitable to help achieve the objectives stated above.

- Why has the effect of potential emancipatory drivers of technology acceptance been overlooked by contemporary research?
- What effects can a system's perceived emancipatory potential have on technology acceptance?

This thesis also aims to go further than what is normally expected from a technology acceptance case study by critically analysing the work environment, its people processes, and political undertones that surround the introduction of a new information system. Furthermore, by reporting on the findings of an eighteen month study, there is the rare opportunity to provide feedback on aspects such as the redressing of the balances of power and other dynamics that have been altered since the completion of the implementation project.

1.4. Structure of the thesis

However, before getting any further into the story, now seems the appropriate time to provide an overview of how this thesis is structured in order for the reader to understand the logic behind the flow of the arguments that follow. This thesis is organised into six chapters, the first of which consists of the introduction provided above that established the concept of technology acceptance, as well as the problem statement and objectives of this study.

The subsequent literature review in chapter two contrasts the traditional positivist view of technology acceptance against the CST outlook adopted by this study. The first part of the literature review presents an abbreviated history of the development and workings of technology acceptance models and theories, followed by a more critical view on their perceived short-comings. Thereafter, the justification for the paradigm shift adopted is explained, followed by an introduction to CST. As a final point, the spotlight is shifted to Jürgen Habermas' *Theory of Cognitive Interests* and *Theory of Communicative Action*, both seminal works which have proved of great relevance to IS research in general.

The third chapter describes the research process, approach and techniques utilised to collect and communicate the research data presented in the subsequent chapters. Chapter four presents the case study in full detail, from organisational background right through to work processes. It is in this chapter that the reader is introduced to the new information system at the centre of the technology acceptance story that inspired this thesis. Obviously, as a thesis that is concerned matters of the social world, a great deal of attention is also paid to the users of the new system, since it is their behaviour which demonstrated the possibilities of a new way of looking at technology acceptance in organisations.

Chapter five is purely a discussion chapter that aims to resolve many of the issues highlighted in the case study of the previous chapter. With the aid of the research framework introduced in the literature study combined with the findings of the case study, the thesis attempts to achieve its main objectives and find a way forward towards further development of this research subject. Finally, the thesis is concluded with chapter six, wherein the main themes are revisited and all findings and recommendations are put into context.

2. Literature review

One of the central arguments that is put forward in this chapter is that the existing limitations in technology acceptance research have largely been due to the positivist perspective adopted by its researchers. On the other hand, it would be only fair to add that it is because of this self-same perspective that our understanding of technology acceptance has come as far as it has. Regardless of which side of the fence one sits on, it is this positivist perspective from which TAM evolved that is first examined, followed thereafter by an introduction to the critical perspective that this study has adopted. By contrasting these two perspectives, it is hoped that a more informed comparison may be able to take place, leading us to a more rounded and politically-aware view of technology acceptance.

2.1. Technology Acceptance

2.1.1. The early years

Robey [1979] was amongst the first researchers to establish that the connection between user attitudes (or perceptions) and system use is significant. Having based this deduction on the results of a study of a sales force automation system at an industrial products manufacturer, he found several specific attitudes to be positively related to the use of a computer-based information system.

A few years earlier, Schultz & Levin [1975] carried out an exploratory factor analysis of a Likkert-type questionnaire to measure the typical concerns of ordinary MIS users. Their analysis yielded seven explanatory dimensions, of which the *performance* dimension was found to be the most highly correlated with self-predicted use of a decision model. Schultz & Levin [1975:165] define the performance dimension as the "perceived effect of the model on the manager's job performance." In order to assess user attitudes in his own study, Robey [1979] sent out the Schultz & Levin questionnaire to 66 members of the sales force, and he found that the performance dimension to be most correlated with two objective (non-self-predicted) measures of system usage.

Having combined earlier work done by Vertinksky *et al*. [1975] with the Schultz & Levin questionnaire, Robey [1979] was able to develop an expectancy model that showed that the direct determinant of system use is a cognitive assessment by the user of various factors. According to his model, "user perceptions or attitudes are formed concerning (1) the value of rewards received from performance, (2) the likelihood that rewards result from performance, and (3) the likelihood that performance results from use" [Robey, 1979:535].

2.1.2. Innovation Diffusion Theory

Rogers [1983] explained the process of innovation diffusion as one which is dictated by uncertainty reduction behaviour amongst potential adopters during the introduction of technological innovations. Even though innovations typically offer its adopters novel ways of tackling day-to-day problems, the uncertainty as to whether the new ways will be superior to existing ones presents a considerable obstacle to the adoption process. To counter this uncertainty, potential adopters are motivated to seek additional information, particularly from their workplace peers [Brancheau & Wetherbe, 1990].

Innovation Diffusion Theory (IDT) consists of six major components: *innovation characteristics, individual user characteristics, adopter distribution over time, diffusion networks, innovativeness and adopter categories*, and the *individual adoption process* [Tornatsky & Klein, 1982; Rogers, 1983; Brancheau & Wetherbe, 1990; Moore & Benbasat, 1991; Taylor & Todd, 1995(b)].

Arguably the most popular of the six components of IDT centres on the characteristics of the innovation itself. After analysing a variety of previous innovation diffusion studies, Rogers [1983] singled out the following five characteristics of innovations that consistently influence the adoption of new technologies:

- **Relative advantage** is the degree to which an innovation is perceived to be an enhancement of the current offerings.
- **Compatibility** refers to the extent to which an innovation is perceived to fit together with potential adopters' habits and practices.

- **Complexity** refers to the degree to which an innovation is perceived as being complicated to use.
- **Observability** is the degree to which the results of an innovation are observable to others.
- **Trialability** refers to the degree to which an innovation may be sufficiently tested prior to adoption.

In the domain of information systems, Moore & Benbasat [1991] built on the work of Rogers, amongst others, and expanded the array of innovation characteristics to seven. Three of the seven innovation characteristics are directly borrowed from Rogers: *relative advantage*, *compatibility*, and *trialability*. The fourth characteristic, *ease of use*, is a close relative to Rogers' *complexity*. It is worth noting that both *relative advantage* and *ease of use* are subjective characteristics since they can be viewed differently depending on an individual's perceptions.

Moore & Benbasat [1991] also derived three further characteristics. While Rogers [1983] included *image* as an internal component of *relative advantage*, Moore & Benbasat found it to be an independent predictor of adoption. Image is the self-perception that adopting an innovation could result in enhanced social status for an individual amongst his / her peers [Agarwal & Prasad, 1997]. The final pair of characteristics, *results demonstrability* and *visibility*, are derived from Rogers' *observability* characteristic. *Result demonstrability* is defined as the tangibility of the results of adopting an innovation, and *visibility* as the degree to which prospective users see an innovation as being visible in the adoption context [Moore & Benbasat, 1991; Agarwal & Prasad, 1997].

Moore & Benbasat [1991:196] reminds us, however, that these definitions are, in fact, "based on perceptions of the innovation itself, and not on the perceptions of actually using the system". As Fishbein & Ajzen [1980] concur, attitudes towards an object and attitudes regarding a particular behaviour relating to that object can frequently differ.

2.1.3. Theory of Reasoned Action

Social psychology researchers, on the other hand, are not interested in classifying the technological characteristics that determine technology adoption, but rather the behavioural determinants of the individual *per se*. A quick overview of existing research suggests that the majority of contemporary technology adoption studies are rooted in behavioural intention, which contends that a user's choice to adopt a new technology is a conscious undertaking that can be sufficiently explained and predicted by their behavioural intention. A researcher thinking along these lines is challenged to classify which factors determine an individual's intention toward adopting a new technology. The *Theory of Reasoned Action*, the *Theory of Planned Behaviour*, and the *Technology Acceptance Model* are a few of the most popular intention-based theories and models that have emerged from this school of thought [Chau & Hu, 2002].

Formulated by Fishbein & Ajzen [1975], the *Theory of Reasoned Action* (TRA) is a tool used to gain deeper insight into how attitudes and beliefs are correlated with individual intentions to perform. As an intention-based model that originated in the field of social psychology, TRA has a proven track-record in predicting and explaining "virtually any human behaviour" [Ajzen & Fishbein, 1980:4]. At the core of their work, is the assumption that people are, more often than not, rational beings who make systematic use of available information, considering the repercussions of their actions before deciding whether or not to engage in a given behaviour [Ajzen & Fishbein, 1980].

TRA proposes that the *behavioural intention* of an individual to perform (or not perform) a certain target behaviour, is solely and directly responsible for influencing that individual's *target behaviour*. In turn, an individual's *behavioural intention* is said to be jointly determined by two factors: *attitude towards behaviour* and *subjective norm*. *Attitude towards behaviour* can be described as an individual's subjective forecast of how positive or negative he / she will feel when performing the target behaviour, whereas s*ubjective norm* can be viewed as an individual's perception of the social pressure on him / her to perform the target behaviour [Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980].

Furthermore, according to the expectancy value model of attitude [Fishbein & Ajzen, 1975], an individual's attitude towards performing the target behaviour is itself determined by his / her beliefs regarding the consequences of performing the target behaviour, as well as the evaluation of these consequences. Likewise, an individual's subjective norm is the by-product of his / her normative beliefs and motivation to comply. *Figure 1* depicts a graphical representation of TRA, which illustrates that external variables (*i.e.* personality, demographics, etc.) do not have a direct influence on target behaviour, but, rather, are mediated by the TRA model.

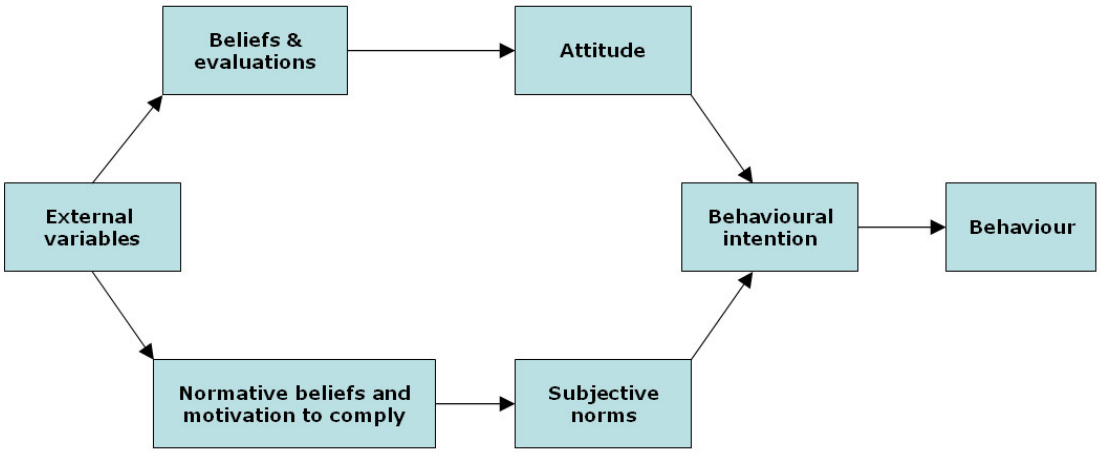

Figure 1: Theory of Reasoned Action [Fishbein & Ajzen, 1975]

2.1.4. Theory of Planned Behaviour

The *Theory of Planned Behaviour* (TPB) extends TRA to account for conditions where individuals do not have complete volitional control over their behaviour [Taylor & Todd, 1995(a)]. The inclusion of a third determinant of behavioural intention, *perceived behavioural control*, is TPB's major point of departure from TRA. This difference results in TPB recognising that not all behaviour may be under an individual's volitional control, with behaviour ranging on a scale from complete control through to total lack of control [Ajzen & Madden, 1986; Ajzen 1991]. Although TPB was formulated to predict behaviour across many settings, it has been shown to be suitably relevant in explaining IS use [Mathieson, 1991].

According to this model, *behaviour* is determined by the *intention to perform* the behaviour. In turn, the *intention to perform* is determined by three factors*: attitude toward behaviour*, *subjective norm*, and *perceived behavioural control* [Mathieson, 1991]. In an IS context, where the behaviour to be performed can be quantified as system usage, *attitude toward behaviour* can then be described as an individual's favourable / unfavourable evaluation of using a specific system, while *subjective norm* can be seen as the perceived social pressure to use (or not to use) said system. The last of these three antecedents, *perceived behavioural control*, relates to the degree to which an individual believes that he / she has control over personal or external factors that may facilitate or constrain system use [Venkatesh & Brown, 2001].

TPB goes further to include another level — the underlying cognitions and / or beliefs that lay the foundations for the three above-mentioned factors (*attitude*, *subjective norms* and *perceived behavioural control*), as shown in *Figure 2* below. *Attitude* is explained as a function of the combined effect of *behavioural beliefs* and *outcomes evaluations* [Mathieson, 1991]. The behavioural beliefs relate to the favourable utilitarian, hedonic and social outcomes that can result from performing the behaviour [Venkatesh & Brown, 2001].

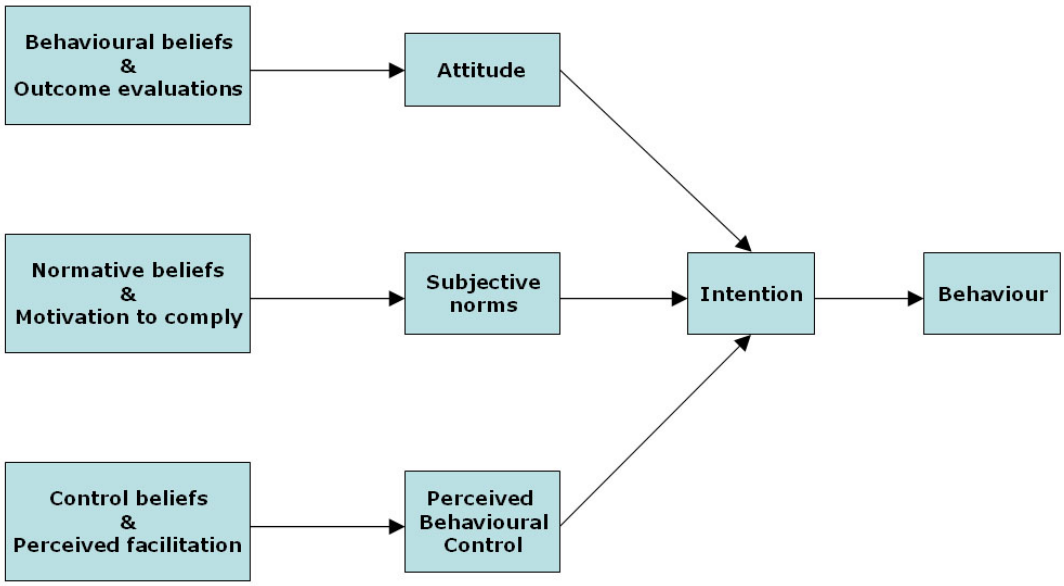

Figure 2: Theory of Planned Behaviour [Ajzen, 1991]

Subjective norms reflect the perceived opinions of a person or group (also known as *referent others*) whose beliefs hold importance to the individual [Mathieson, 1991]. The first element of subjective norms' set of underlying cognitions comprises *normative beliefs*, which relate to an individual's perception of the opinion of a referent other regarding the performance of the behaviour by the individual. The second element comprises the motivation to comply, which is the degree to which an individual desires to fulfil the wishes of the referent other.

As stated earlier, the *perceived behavioural control* (PBC) determinant is TPB's major point of departure from TRA. It refers to an individual's perceptions of the existence (or non-existence) of the resources, skills, or opportunities required to, for example, make use of an information system, or some feature of that system [Ajzen & Madden, 1986]. PBC suggests that the motivation of an individual is not only affected by the perceived complexity of performing a certain behaviour, but also by his / her perception of how successfully he / she can perform the behaviour. With PBC being a product of an individual's control beliefs and perceived facilitation [Mathieson, 1991], it then follows that an individual will have enhanced perceived control over a behaviour if he / she has strong control beliefs about the presence of elements that will assist the performance of such behaviour. The reverse is also true — that is, an individual who has strong control beliefs that will hinder the performance of a behaviour will, as a result, have a diminished sense of control. Control beliefs comprise both internal (*i.e.*, having the skills and abilities to use a system) and external factors (*i.e.*, situational or environmental).

The TPB model does have some limitations with regards to measurement which has prevented it from being sufficiently tested in empirical studies. One of these limitations is ambiguity that surrounds the definition of PBC — the seeming lack of a standard definition makes the comparison of measurements from different studies irrelevant. Furthermore, since TPB is grounded on the belief that people think rationally, making logical decisions based on the information available to them, unconscious motives are not taken into consideration. Finally, like most intention-based models covered in this thesis, demographic and personality variables are not taken into account [Godin & Kok, 1996].

2.1.5. Technology Acceptance Model

Introduced to the academic world by Davis *et al*. [1989], the *Technology Acceptance Model* (TAM) is merely an adaptation of Fishbein & Ajzen's TRA. Nevertheless, TAM has proved to be an exceptionally useful tool at predicting future system usage, specifically during the *user acceptance testing* phase of IS implementation project. During this testing, users are monitored to establish whether a system meets all their requirements, and will support the business process for which it was designed.

In a comparison of TAM and TPB conducted by Mathieson [1991], he found TAM to have a slight empirical advantage over TPB. However, he found that despite being easier to apply, TAM only supplies very general information on users' opinion about a system, whereas TPB supplies more detailed information that could be used to improve the IS development process. As mentioned earlier, there have been relatively few empirical tests regarding the effectiveness of TPB, with more tests of TRA (on which TPB is based) having taken place [Mathieson, 1991]. Numerous empirical studies have proved that TAM typically accounts for approximately 40% of the variance in usage intentions and behaviour. Consequently, TAM matches up quite favourably to alternative models such as TRA and TPB [Venkatesh & Davis, 2000].

TAM assigns considerable weight to two key determinants — *perceived usefulness* and *perceived ease of use* [Davis, 1989; Davis *et al.*, 1989]. These two concepts are fundamental in understanding the core workings of TAM. Davis [1989:320] defines *perceived usefulness* as "the degree to which a person believes that using a particular system would enhance his or her job performance." Simply put, people are more likely to use an information system that they believe will help them perform their job better.

In addition, Davis [1989:320] defines *perceived ease of use* as "the degree to which a person believes that using a particular system would be free of effort." Therefore, even if a system is believed to be useful by an individual, if the system is too difficult to use, the potentially enhanced performance benefits to be derived from the system are outweighed by the effort required of having to use it. At face value, it may seem that TAM's *ease of use* construct is comparable to the PBC determinant of TPB, but it

must remembered that PBC embraces both internal and external barriers to system use [Mathieson, 1991].

"The goal of TAM is to provide an explanation of the determinants of computer acceptance that is general, capable of explaining user behaviour across a broad range of end-user computing technologies and user populations" [Davis *et al*., 1989:985].

TAM is comparable to TRA in that it hypothesises that *actual system usage* (*viz*. behaviour) is directly influenced by *behavioural intention to use*. However, the models differ in the sense that TAM reasons that *behavioural intention* is jointly determined by *perceived usefulness* and *attitude* (refer to *Figure 3* below), instead of being jointly determined by *subjective norm* and *attitude*, as is the case in TRA (refer to *Figure 2* previously shown). The direct effect of *perceived usefulness*, a type of belief, on *attitude towards use*, is not in agreement with TRA [Wetzels, 2003].

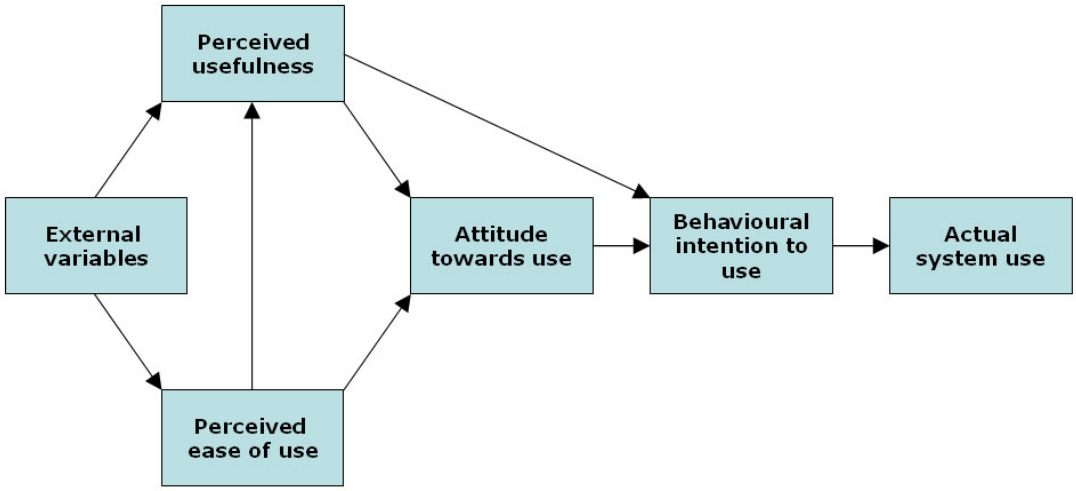

Figure 3: Technology Acceptance Model [Davis *et al.*, 1989]

Davis *et al*. [1989] found that the *subjective norm* construct from TRA was non-significant, and hence excluded it from TAM. Further investigation by Thompson *et al*. [1991] and Davis [1993] revealed that it was sometimes necessary to exclude *behavioural intention*, linking *attitude* directly to *actual behaviour*. Thompson *et al*. [1991] argue that the exclusion takes place when the sole interest is with system usage that has already taken place, and not predicting future behaviour.

2.1.5.1. Adoption of TAM

As stated earlier, countless researchers have adopted TAM over the years in order to predict and understand user acceptance of new technologies. TAM prides itself in its seeming parsimony and applicability across various organisational and software application contexts. The sheer volume of empirical support for TAM suggests that it is the most widely accepted theoretical model amongst IS researchers today [Agarwal & Prasad, 1999].

Studies that have taken place within organisational contexts have come up with various findings that have implications for introduction of new technologies. Agarwal & Prasad [1999] identified certain management actions to facilitate technology acceptance. One of their findings, for example, points to a certain profile of individual as being more receptive to information technology innovations. Thus, a targeted recruitment and selection strategy for individuals using new technologies could promote more successful technology acceptance. Montazemi *et al*. [1996] found that in spite of the *ease of use* perceptions of information centre product specialists and end users being quite similar, their assessments of the *perceived usefulness* of software packages are different. They recommended that end users in sophisticated environments should be empowered to develop their own user groups to suggest which useful software packages information centres should purchase.

It could be argued that one of the contexts in which TAM has most frequently been assessed is in the adoption of office applications. Using a computing resource centre as their setting, Taylor & Todd [1995(a)] collected data from nearly 800 student users to compare the strengths and weaknesses of TAM, TPB, and a decomposed version of TPB. Their study demonstrates TAM faring better in usage prediction, with the decomposed TPB offering a more comprehensive understanding of behavioural intention and system usage. In a related study, using the same computing resource centre, Taylor & Todd [1995(b)] established that inexperienced users place a different emphasis on the *behavioural intention* and *actual system usage* constructs. Mathieson [1991] also compared TAM and TPB by testing both models in the same context, using subjects sampled from the same population. The subjects, college students in an introductory management course, were given a task that could either be completed

using a spreadsheet or calculator. He finds both models to be empirically strong, but like Taylor & Todd [1995(a)], he believes that TAM is better suited to measure general levels of satisfaction across a diverse population, whereas TPB provides more insight into why an individual or group may be dissatisfied.

Numerous studies have been carried out to test the validity of TAM in user adoption of telecommunications and Internet technology. Gefen *et al*. [2003] integrated the previously independently-investigated research streams of TAM (*perceived usefulness* and *perceived ease of use*) and consumer trust by introducing us to the world of online commerce. The authors demonstrated how in such an environment, lacking the usual human interaction required to build trust in a relationship, the building of consumer trust is as is important as *perceived usefulness* and *perceived ease of use* of the Web site.

Adams *et al*. [1992] evaluated the psychometric properties of the *ease of use* and *usefulness* constructs by examining the usage behaviours of users of voice and electronic mail systems. They also tested the same constructs using office applications popular at the time. Despite both studies demonstrating the robustness of the two scales of measurement, the authors declared their concern that the relationship between the two may be more complex than appears at first. Segars & Grover [1993] endorsed this concern and remind us that absolute measures for these constructs may not be possible across varying technological and organisational contexts.

In their study of organisational adoption of voice-mail systems, Straub *et al*. [1995] attempted to tackle the conceptual and methodological issues pertaining to the measurement of system usage with TAM. They compared subjective and objective measures of obtaining system usage data from subjects and found little correlation between the subjective self-reported results received from their subjects and the objective usage results captured by computer logging. When faced with this evidence, Straub *et al*. argue that much of previous TAM research may have relied too heavily on subjective usage measures, thus creating a false impression of the strength of the relationships between TAM constructs. In a similar vein, Szajna [1996] discourages the substitution of self-reported usage for actual usage. She argues that most IS researchers use self-reported usage as a surrogate for actual usage in their

investigations, when, in fact, “an effective surrogate… must be a valid measure correlating strongly with other methods of measuring usage — convergent validity” [Szajna, 1996:89].

As a final point, a small group of researchers from the Far East have contributed greatly to our understanding of telemedicine technology acceptance during the past five years or so. In particular, these researchers have challenged the IS research community to re-examine existing technology acceptance theories and models in the context of system usage by highly specialised professionals [Chau & Hu, 2001]. In the first of these studies, Hu *et al*. [1999] find that fostering a positive attitude towards the technology’s *usefulness* is far more crucial than *ease of use* when dealing with such specialists. The authors argue that physicians who use telemedicine systems are most concerned whether it can help improve their effectiveness and efficiency in terms of patient care and service delivery above all else. In other words, the complexity, or *ease of use*, of a new system does not seem to have an effect on *actual usage* in the case of these physicians.

In another study, Chau & Hu [2001] are of the opinion that the methods developed for TAM, which have been frequently tested in prior studies involving end users and business managers, may not be equally valid in a professional setting. Consistent with Hu *et al*. [1999], Chau & Hu find that the *perceived ease of use* construct is not as important as *perceived usefulness*. They reason that the pragmatic nature of physicians results in them concentrating on the usefulness of a technology. The physicians’ rationale may be rooted in their tendency to view technology as tools, which are “acceptable only when proven to provide desired utility to a medical practice” [Chau & Hu, 2001:712]. The final study by Chau & Hu [2002] not only affirms the above-mentioned findings, but, additionally, uncovers the observed insignificance that peer influence has on physicians. A possible implication arising from this observation may be that management have to focus on selling the utility of new technology, rather than relying on peer group persuasion by those with limited experiences with the technology.

2.1.5.2. Extensions of TAM

In addition to research that has adopted, and in most cases, validated TAM, numerous studies have found it necessary to include new variables that extend TAM in order to enable a clearer understanding of how individuals adopt new technologies.

Some extensions of TAM deal with the addition of new constructs themselves. Segars & Grover [1993], for example, uncovered the need for the introduction of a third underlying construct that they termed *effectiveness*, in addition to *perceived usefulness* and *perceived ease of use*. As a result of using a *contemporary* approach (instead of the *classical* approach conventionally used) to establish construct validity, this third construct, comprising the *job performance* and *effectiveness* indicators, resulted in a significantly better fit than the original two-factor model for those authors. Chau [1996], on the other hand, argued that the concept of *perceived usefulness* can comprise of two specific forms: *near-term usefulness* and *long-term usefulness*. *Near-term usefulness* can include aspects such as improved job performance or satisfaction, whereas *long-term usefulness* is more concerned with the improvement of one's career prospects or social status. Of these two forms of usefulness, however, he found that *near-term usefulness* exerts a greater influence on the *behavioural intention to use* a new technology than *long-term usefulness*.

Other extensions of TAM deal with the development of the external variables, or antecedents, which are largely responsible in determining *perceived usefulness* and *perceived ease of use*. Venkatesh & Davis [2000] offered an update to the original TAM on the basis of the theoretical and empirical developments that had taken place over the previous two decades. They presented investigation results that developed and tested a theoretical extension of TAM, called TAM2, and went on to describe how *perceived usefulness* and *usage intentions*, taking into account social influences and cognitive processes, affect technology acceptance. Their research found that social influence processes, such as *subjective norm*, *voluntariness*, and *image*; as well as cognitive instrumental processes, such as *job relevance*, *output quality*, *result demonstrability*, and *perceived ease of use*, are all contributing factors in acceptance of new technologies.

TAM2 re-introduces *subjective norm* as a key determinant of *behavioural intention to use*, bringing it back in line with TRA. Furthermore, Venkatesh & Davis also put forward that *subjective norm* positively influences *perceived usefulness* and *image*. The moderating effects of both *experience* and *voluntariness* on *subjective norm* are also included [Wetzels, 2003]. Their findings also reveal *perceived usefulness* to be positively influenced by three new antecedents: *results demonstrability*, *output quality*, and *job relevance*. *Perceived ease of use* is still found to have a positive influence on *perceived usefulness*, in accordance with the first version of the model. The updated model is depicted in *Figure 4* below.

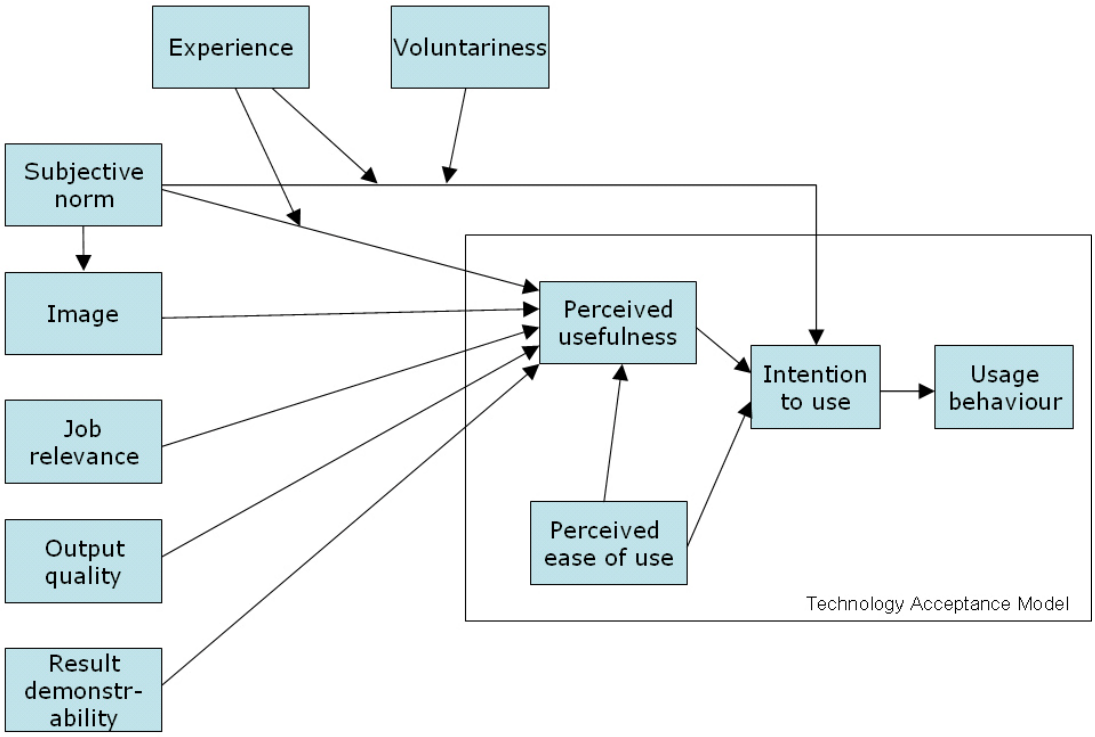

Figure 4: TAM2 [Venkatesh & Davis, 2000]

Venkatesh & Davis [2000] reported on the significant moderating effects that both *voluntariness* (mandatory usage) and *experience* (during early stages) have on the link between *subjective norm* and *behavioural intention*. Under certain conditions (when system usage is compulsory, and experience is limited), *subjective norm* is shown to positively influence *behavioural intention* directly, bypassing the direct effects of *perceived ease of use* and *perceived usefulness*. A certain amount of limited experience is also shown to have significant moderating effects on the link between

subjective norm and *perceived usefulness*, proving that *subjective norm* positively influences *perceived usefulness* via internalisation.

Result demonstrability and *image* (significantly influenced by *subjective norm*) are shown to have a significant positive influence on *perceived usefulness*. Lastly, *job relevance* and *output quality* are reported to exhibit a significant positive influence on *perceived usefulness*.

Perhaps due to the parsimony of TAM, a set of constructs not specifically included concerns variables related to the individual differences of people, *i.e.* personality, demographics, culture, etc. With both beliefs and attitudes being such significant constructs in TAM, it follows that individual differences would have an influence on two such personal themes. Agarwal & Prasad [1999] proposed five categories of individual differences that influence beliefs about usefulness, as well as beliefs about ease of use. Of these five, the only three that were validated as having a significant effect on *ease of use* perceptions are *individual role relating to technology*, *education*, and *prior similar experience*. *Participation in training* was the only individual difference to have a direct effect on *perceived usefulness*.

Drawing from theories rooted in psychology — *the personality trait dimension of absorption*, *the state of flow*, and *cognitive engagement* — Agarwal & Karahanna [2000] introduced a conceptual construct named *cognitive absorption* to technology acceptance. Their study surveyed business students' perceptions of the World Wide Web and found *cognitive absorption* to be a virtual antecedent of *perceived usefulness* and *perceived ease of use*. In addition, Agarwal & Karahanna proposed that *cognitive absorption* (comprising *temporal dissociation*, *focused immersion*, *heightened enjoyment*, *control*, and *curiosity*) is determined by the individual traits of *playfulness* and *personal innovativeness*.

Although the undoubted influence of user training on technology acceptance has seldom been examined in great detail, Venkatesh [1999] attempted to combine TAM and an assortment of training techniques to reveal the moderately positive short-term influence that an entertaining training environment can have on usage intentions. That study was closely followed by one in which Venkatesh & Speier [1999] utilised the

motivational model of Davis *et al*. [1992] to investigate the influence that pre-training mood has on user acceptance of new technology. Combining the above-mentioned parallel research streams, Venkatesh *et al*. [2002] developed and tested an integrated model by incorporating intrinsic motivation in TAM. Even though they could not prove that intrinsic motivation has a direct influence on usage intention, it does serve as an important catalyst for both *perceived ease of use* and *perceived usefulness*.

Experience is another dimension of technology acceptance around which much discourse has taken place. Traditionally, system usage models have been more effective in predicting the behaviour of experienced users since such users' past experiences are more likely to make low probability events more significant, thereby guaranteeing that they are accounted for in their development of intentions [Ajzen & Fishbein, 1980]. As mentioned earlier in this thesis, Taylor & Todd [1995(a)] investigated the possibility of an augmented TAM that allowed for a *prior experience* construct to account for the behaviour of inexperienced users. They found some discrepancies in the relative influence of the determinants of usage depending on the experience of the user. Their findings suggest that inexperienced users' intentions were better predicted by the antecedent variables in the model than were the intentions of experienced users. Additionally, they found that this augmented version of TAM could be used to "predict subsequent usage behaviour *prior* to users having any hands-on experience with a system" [Taylor & Todd, 1995(a):565].

Gefen & Straub [1997] note that the original TAM makes no reference to gender difference, and that this differentiation is generally missing from IT behavioural research. By extending TAM to include gender differences, Gefen & Straub were able to demonstrate that there are gender-related differences in the perceptions of the attributes of e-mail. Amongst some of the most interesting findings to be uncovered during the study, women were found to perceive the social presence of e-mail to be higher than men. Women also found e-mail to be more useful than their male counterparts, but, contrary to the researchers' expectations, men generally tend to find new technologies easier to learn and use.

2.1.5.3. Limitations of TAM

Being a predictive model, a major limitation of TAM is the fact that it can be non-specific, with individual cases not assigned as much value as the far-reaching generic facts that allow the prediction of generic outcomes. Its nature as primarily a predictive tool also proves restrictive when seeking motives for specific observed behaviours. Furthermore, the underlying assumption of TAM is that beliefs concerning *ease of use* and *usefulness* are always the principal determinants of any use decision [Mathieson, 1991].

A problem arises in situations where other variables besides *ease of use* and *usefulness* predict intention. In that regard, however, more flexible models such as the *Theory of Planned Behaviour* (TPB) do exist, but that flexibility comes at the expense of being far more complicated to apply to real-life situations. On the other hand, TAM's great advantage is that its constructs are always measured in the same fashion, regardless of circumstance, but, then again, this comes at the expense of being too generic. Davis [1989:334], one of the pioneers of TAM, has admitted that his model requires "further research (to) shed more light on the generality of (its) findings." The concept of generalisability will be discussed further in chapter five.

Another major factor affecting the consistent validity of TAM relates to the cultural background of users. Since the focus of this particular thesis is on technology acceptance issues within the South African organisational environment, the role of culture obviously plays a part in this study, particularly given the country's unique history and social structures. Straub *et al.* [1997] note that there is mounting pressure to understand if TAM is as applicable in other cultural contexts as it is in Western cultures, particularly with the current trend of globalisation of business and information systems. However, TAM does not explicitly include any cultural or social variables which may be necessary to explain variance not already explained by other variables [Mathieson, 1991]. As mentioned earlier in this thesis, Chau & Hu [2001; 2002] failed to validate TAM in a specific professional context where their results found that Hong Kong-based physicians' adoption behaviour is more dependent on *perceived usefulness* than on *perceived ease of use*. As will be illustrated in subsequent chapters, other exceptional cases do exist which require insights that are

beyond the scope of TAM. Results such as these prove that there could be social effects that are not directly linked to job-related outcomes such as usefulness [Mathieson, 1991].

Veiga *et al.* [2001] put forward a wide-ranging set of relationships between specific implementation issues and culturally-induced beliefs. They reported that the core variables of TAM can be influenced by various implementation approaches. The academic arguments for such a connection rest on the principle that culture affects people's behaviour in a variety of ways that can either accelerate or slow down the implementation of technological change. Straub *et al*. [1997] also found evidence that TAM may not hold across all cultures. They conducted an investigation into the adoption of email at three different airlines, one based in the United States, the other in Switzerland, and the last one in Japan. Although the results obtained from the US and Switzerland were fairly consistent with one another, the Japanese study did not validate TAM The authors speculate that this may have been because cultural tendencies in Japan may limit e-mail use due to greater uncertainty avoidance and power distances between organisational hierarchical levels. Despite these few publications, the rest of the research community has shown little interest in modelling the role that culture plays in TAM, thereby perpetuating its distinctly Westernised outlook of technology acceptance.

Apart from the *perceived ease of use* construct, which relates to internal behavioural control variables like skill and will power, TAM is ostensibly lacking of external behavioural control variables such as time, opportunity, and the co-operation of others [Mathieson, 1991]. An internal control factor relates to the characteristics of an individual, whereas an external control factor relates to situations beyond an individual's control. It must be remembered though, even if TAM sacrifices external control issues that are important in certain contexts, this simplification contributes towards creating a model that is applicable across the majority of contexts.

Another well-documented limitation of TAM is its methods for measuring system usage [Straub *et al*., 1995; Szajna, 1996]. Self-reporting from users, by means of questionnaire completion, for example, may not be the most objective way of acquiring research data. As mentioned earlier, Straub *et al*. [1995] made the argument

that much TAM-related research has relied quite heavily on subjective usage measures, thereby possibly creating a false impression of the strength of the relationships between TAM constructs. Similarly, the reader is reminded that Szajna [1996] discouraged the substitution of self-reported usage for actual usage, pointing out that surrogates should only be used if they correlate strongly with other methods of measuring usage. Under observation, research subjects may adopt different behaviours depending on their perception of their role in the study as well as that of the researcher [Ngwenyama, 1991]. On this point, Davis [1989:334] recognises this limitation too, admitting that "not enough is currently known about how accurately self-reports reflect actual behaviour."

2.1.6. Unified Theory of Acceptance and Use of Technology

An important footnote has to be added to the technology acceptance theoretical development story. As witnessed by the previous few pages, there is no shortage of models and theories to explain user acceptance of new technology, despite TAM emerging as the predominant model of choice during the last couple of decades. However, that may all be about to change as Venkatesh *et al*. [2003] claim to have unified conceptual and empirical similarities from existing theories to form the *Unified Theory of Acceptance and Use of Technology* (UTAUT), as shown in *Figure 5* below.

Before formulating UTAUT, Venkatesh *et al.* [2003] empirically compared the following eight existing models: TRA, TAM, the motivational model, TPB, the model of PC utilisation, IDT, and social cognitive theory. They then formulated UTAUT based on the best bits from existing theories, and empirically tested it. The results reflect very positively on the new theory — with it being able to explain approximately 70% of the variance in user intentions to use the new technology. The figure of 70% compares very favourably with the results of the other models, which ranged between 17% and 53%. It must be noted, though, that due to the development of UTAUT being so recent, it has yet to be adopted and validated by a significant number of studies at this stage. Furthermore, it should be remembered that UTAUT, like TAM, is a predictive model of human behaviour, and, as such, is likely to share some of the same limitations of TAM mentioned previously.

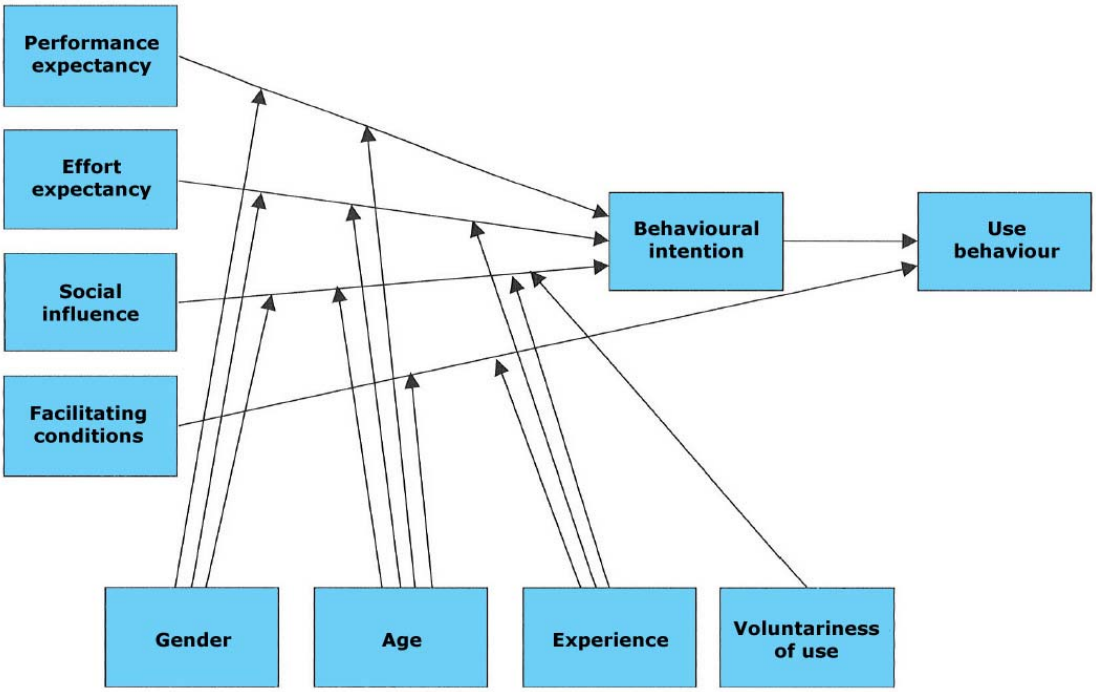

Figure 5: Unified Theory of Acceptance and Use of Technology (UTAUT) [Venkatesh *et al.*, 2003]

2.2. Why a paradigm shift is necessary

Regardless of the type of research being conducted, a researcher should firstly critically reflect on his / her most fundamental beliefs regarding the nature of the world in which he / she lives, and how he / she perceives it. This reflection is important since the way a researcher views the world will have a tremendous impact on the way he / she views his / her subjects and their environment, the manner of data collection, and subsequently, the manner in which results are interpreted [Alexander, 2002]. A "paradigm" is a fundamental set of assumptions such as these mentioned above, and when a paradigm is adopted by a professional community, for example, it allows its members to share similar perceptions and engage in commonly shared practices [Hirschheim & Klein, 1989].

Burrell & Morgan [1979] suggested that a paradigm can be categorised depending on which combination of ontological and epistemological assumptions it comprises. An ontological assumption is one that relates to a researcher's view of the social and

technical world, whereas an epistemological assumption concerns perspectives of knowledge and knowledge-acquisition [Hirschheim & Klein, 1989].

According to Burrell & Morgan [1979] an epistemological assumption can be either subjective or objective (a dualism that parallels *positivism* and *interpretivism* and that will be explored in more detail later in this thesis). An objective view of reality is one wherein the researcher assumes that all aspects of reality can be fully described and measured with the aid of observer-independent instruments. In other words, "an objectivist treats the social world as if it were the natural world" [Burrell & Morgan, 1979:7]. If one had to examine the epistemological assumptions of the predictive models featured in the previous section of this thesis, one would quickly realise that they generally share a similar, objective view of the world. The subjective position, on the other hand, propositions that every person has a unique view of the world which can, at best, only partially be communicated or extracted [Alexander, 2002].

Burrell & Morgan's second assumption used to classify paradigms concerns ontology. In addition to the subjective / objective dimension, the second dimension concerns the sociological assumptions about the nature of society. In the orderly / conflict dimension, two opposing views towards societal nature prevail: society is either considered to be stable and amenable to consensus (orderly); or, society is seen as turbulent in nature and continually changing, the principal reason for which is a constant struggle for power (conflicted).

Burrell & Morgan [1979] mapped the ontological and epistemological dimensions onto one another to construct the two-dimensional table represented in *Table 1* below. Each quadrant represents a markedly different group of social theories, with critical theory, including the social theories of the *Frankfurt school* and Jürgen Habermas, being classified within the *Radical Humanism* paradigm (perceiving society as being subjective and conflicted) [Alexander, 2002].

THE SOCIOLOGY OF RADICAL CHANGE (CONFLICT)			
SUBJECTIVE	**Radical Humanism** Critical theory (i.e. Frankfurt school, Habermas)	**Radical Structuralism** Conflict theory (i.e. Marxist theory)	OBJECTIVE
	Interpretive Phenomenology hermeneutics (i.e. German idealism)	**Functionalism** Objectivism (i.e. Sociological positivism)	
THE SOCIOLOGY OF REGULATION (ORDER)			

Table 1: The four paradigms for the analysis of social theory [Burrell & Morgan, 1979]

Building on this research, Hirschheim & Klein [1989] then specifically fitted these general theoretical assumptions of various approaches to Information Systems research into four comparable paradigms: *Functionalism*, *Social Relativism*, *Radical Structuralism*, and *Neo-Humanism*. This adaptation of Burrell & Morgan's work seems reasonably appropriate if one acknowledges the widely-held belief that the field of Information Systems is largely a social science [Goldkuhl & Lyytinen, 2000].

The first of these paradigms, functionalism, is principally concerned with explaining how social systems' individual elements interact to form an integrated whole. The social relativist paradigm works within the frame of reference of the social actor rather that the observer, with the intention of finding explanations within the scope of individual consciousness and subjectivity. The radical structuralist paradigm focuses on the structure and analysis of economic power relationships, calling attention to the need to overcome social and organisational limitations. The neo-humanist paradigm seeks radical change and emancipation, focusing on the roles of different social and organisational forces in effecting such change [Hirschheim & Klein, 1989].

In terms of these four paradigms, then, it can be argued that researchers of predictive models such as TAM, UTAUT and TRA are functionalist (or positivist) in their approach. With their process of reasoning mostly being based on hard experimental

evidence [Hirschheim & Klein, 1994], functionalists see themselves as remote observers, gathering quantitative data from which laws can be deduced. Such thinking is mostly concerned with "providing explanations of the *status quo*, social order, social integration, consensus, needs satisfaction, and rational choice" [Hirschheim & Klein, 1989:1202].

Traditionally, positivism has only embraced the kind of knowledge that results from the description of sensory phenomena, and is therefore closely related to empiricism [Benoît, 2002]. A shortcoming with making empirical generalisations is that the researcher is not really interested in particular cases, but more in general "truths" that allow one to describe and predict outcomes. An objective researcher such as this would adhere to the ideal of a universal method of science applying equally to both the natural and social universe. On the other hand, a subjective researcher would deny the appropriateness of using natural science methods for studying the social world [Burrell & Morgan, 1979].

It is not the aim of this thesis to undermine positivism, or more generally, scientific methods, because the fact that they work is undeniable. Society has progressed immensely over the past three centuries, thanks in most part to the way that scientific methods have helped us in understanding and shaping the physical world. Therefore it is only fair to expect that such an approach should so heavily influence other areas of human enquiry, such as Information Systems research. That the biggest challenges to positivism have always come from those who have directly concerned themselves with the study of human behaviour and human structures is only indicative that scientific methods may not always be *universally* applicable [Cornford & Smithson, 1996].

2.3. Critical Social Theory

In contrast to the more positivist approaches adopted by most IS researchers, I believe that in my case study, a richer understanding of technology acceptance is provided by a CST perspective. Although countless studies have been conducted on technology acceptance, particularly in the past twenty years, they can all be classed as examples of positivist research. In fact, few will argue with that the dominant rationality in IS

research is rational and positivist. This thesis is one of the very few to investigate technology acceptance from a CST perspective. The decision to choose this perspective is motivated by an interest in discovering why TAM did not provide me with suitable explanations for many of the usage behaviours I observed during my study (described in more detail in subsequent chapters). This thesis also proposes that the social implications of technology acceptance could be better assessed if researchers chose to move their focus away from empirical behavioural modelling for a while and, instead, took the trouble to understand what it means to walk in the shoes of their subjects.

In order to achieve that goal, this study will use the CST framework of contemporary German philosopher, Jürgen Habermas [1972, 1973], the principal reason for which is the significant impact it has had on the Information Systems discipline. By using Habermas' framework, this study will be building upon a foundation that has already won recognition from a large number of Information Systems academics [Forester, 1992; Mingers, 1992; Lyytinen, 1992; Hirschheim & Klein, 1989, 1994; Hirschheim, Klein & Lyytinen, 1996; Ngwenyama & Lee, 1997; Klein & Myers, 1999].

The foundations of CST can be traced back to the critical theory practiced at the Frankfurt School (*Institut für Sozialforschung*), who used this philosophical approach to tackle the social, political, and intellectual issues of the day. The Frankfurt School, a Marxist-oriented research institute primarily concerned with studying Kantian conditions for reason and knowledge, was cognisant of the fact that distortions of thought were emerging due to the social inequalities of the time [Benoît, 2002].

Two of the school's most prominent thinkers, Adorno and Horkheimer, were of the opinion that the empirical methods of epistemology were faulty because of "the requirement for an empiricist theory of knowledge that itself was subject to empiricist criteria of adequacy", thereby creating a circular self-validating model [Benoît, 2002:457]. The critical approach of the Frankfurt School saw the social and cultural problems that arose as a result of such scientific instrumentality as rational deficiencies that lead to a distortion in the balance of power within societies. They believed that in order to expose social inequity, contradictions in society have to be

sought out and questioned, especially where man-made obstacles to full societal participation exist.

The term "critical social theory" (CST) was conceived during the 1930's to distinguish between the work of critical social theorists and traditional social theorists [Lee, 2002]. Falling within the Neo-humanist paradigm of the Hirschheim & Klein [1989] matrix (see *Table 1* in previous section), the primary objective of CST is the improvement of the human condition by finding more desirable alternatives to existing social conditions [Habermas, 1972]. This objective is based on the CST assumption that humans are the masters of their own destiny, which, when applied to an organisational context, means that an individual has the capability to change his / her own organisational situation [Ngwenyama, 1991].

In CST, a researcher conducting a study within a social context phenomenon is challenged not only to acquire a correct interpretation of that social context, but he / she must also reflect critically on the nature of it. The aim is to expose unjust conditions from which the people in that social context should be emancipated from [Lee, 2002].

The CST perspective presents a more holistic view of IS research than positivist (functionalist) perspectives because of the following four characteristics [Ngwenyama & Lee, 1997]:

1. It is receptive to the life-worlds of the organisational actors and thus focuses its energies towards interpreting and mapping the meanings of these actors' actions from their perspective.
2. It supports a multi-disciplinary approach to IS research, which includes participation, observation, and the analysis of contextual data.
3. It always views its human subjects from the organisational context within which they perform their duties.
4. It recognises that the organisational context is important to both meaning construction and social activity.

According to CST, the process through which individuals, or groups of individuals, remove these obstacles standing in the way of achieving their freedom is called emancipation. This freedom that all individuals strive for comprises three different aspects: liberation from unnecessary need depravation and toil; liberation from ideological manipulation and other psycho-social compulsions; and liberation from fear [Klein & Huynh, 2004]. The concept of emancipation is dealt with in more detail in the following section, where the emancipatory interest is discussed along with Habermas' other two cognitive interests: the technical and practical interests.

2.3.1. Theory of Cognitive Interests

An excellent way to introduce the main concerns of CST to a beginner is by starting with Habermas' *Theory of Cognitive Interests* (referred to as TCI from this point on), from his 1972 book, *Knowledge and Human Interest*. TCI remains useful to this day because it is able to communicate the basic ideas of CST without getting too involved in the conceptual issues. The central argument of TCI is that all human knowledge is linked to three fundamental interests, an outlook which leads to a broader view of the nature of human knowledge than the one adopted by positivism [Klein & Huynh, 2004].

Cognitive interests (also translated as "knowledge interests" in some texts) can be described as the general orientations (or strategies) that drive all forms of human inquiry in all walks of life, including work. These cognitive interests are considered generic in terms of applying to the human species as a whole [Klein & Huynh, 2004]. TCI endeavours to trace the source of all human knowledge to two basic human actions, which it believes are fundamental to human existence [Habermas, 1972]. These two actions are concerned, firstly, with achieving given ends in labour, and secondly, with co-ordinating social interaction via mutual understanding [Klein & Huynh, 2004].

Achieving given ends in labour, simply put, is the process by which society gains its means of subsistence from nature. In TCI, this labour domain forms part of what Habermas calls the **technical interest** [Habermas, 1972]. A defining feature of the technical interest is the way that its relationships are rooted in instrumental rationality,

focusing on defining means for achieving given ends [Ngwenyama, 1991]. Habermas [1973] describes the technical interest as a process of knowledge-seeking whose main concern is the prediction and control of things, circumstances and events which are, in principle, capable of being manipulated.

In society, however, the aim is not always to treat people as instruments to achieve given ends, as is commonly the case in the labour domain, but instead, people can also be treated as partners of communication. The social interaction that takes place in the domain of socio-cultural life is deemed by Habermas to be as important as the instrumental means-end orientation of the work environment [Klein & Huynh, 2004]. The difference between these two elementary types of human actions lies in their orientation: where instrumental action is success-oriented, social interaction is agreement-oriented [Habermas, 1972]. Neither one is more important than the other, because both types of actions are required for the survival of society as a whole, as well as its individuals. Instrumental action, alone, does not provide the necessary bonding strength to hold together the stable human associations needed for socio-cultural development [Heath, 2001], since this development must be accompanied by the consensual processes of learning and shared sense-making [Klein & Huynh, 2004]. The cognitive interest in social interaction is concerned with our quest for self-understanding [Ngwenyama, 1991]; an understanding which requires an agreement-oriented attitude. TCI refers to this orientation as the **practical interest**. In contrast to the technical interest, which applies to physical objects and people in the labour domain, the practical interest applies only to humans as social communication partners [Klein & Huynh, 2004]. The focus of the practical interest is in acquiring the knowledge with which to better understand social forms of life, traditions, social behaviour and relations. The practical interest offers improved social consciousness and humanity as its products [Ngwenyama, 1991].

The third cognitive interest introduced in TCI is the **emancipatory interest**. This interest is oriented towards exposing, and, subsequently, overcoming unwarranted internal and external compulsions [Ngwenyama & Lee, 1997]. These compulsions may often appear as seemingly natural limitations, when they are, in fact, forms of social domination. The emancipatory interest uses dialectic rationality for critical reflection and analysis of instrumental rationality, and its products, with regard to

their 'rightness' [Ngwenyama, 1991]. The applicable domain for emancipatory interest lies in the social reflexivity and critique of the two other interests: the technical interest and the practical interest [Wilson, 1997]. Habermas states that each of these three interests represents a frame of reference through which researchers can apprehend reality, and make sense of the world, from every conceivable angle [McCarthy, 1982].

The fact that Habermas ranked the emancipatory interest at the same level of analysis as the two other interests in TCI has since been the source of many arguments, with its critics pointing out that it is not directly connected to previously recognised forms of human action, such as social exchange and labour [Klein & Huynh, 2004]. This criticism may be due to the fact that the emancipatory interest, being concerned with the basic moral pursuit of emancipation, cannot be classed as "formal" knowledge, as is the case with the technical and practical interests [Wilson, 1997].

2.3.2. Theory of Communicative Action

Habermas, feeling under pressure to find an improved theoretical foundation for the issues associated with the emancipatory interest, turned to discourse theory for solutions [Klein & Huynh, 2004]. He developed a new form of CST, called the *Theory of Communicative Action* (TCA), to explain how social actors can reach agreement without relying on an interest in mutual understanding [Habermas, 1984; Habermas, 1987].

It must be remembered that TCA emerged as a result of continuous theoretical evolution, and, as such, cannot be viewed independently from Habermas' previous work in TCI, for example. As described in the previous section, TCI deals with the three cognitive interests that drive all human inquiry: the technical, practical, and emancipatory interests. TCA extends the concept of the emancipatory interest of TCI in that it considers the process of critical reflection during the communication of information as having the potential to emancipate one from mental pollutants [Lee, 2002].

By basing TCA on discourse theory, Habermas introduced a novel, but contentious concept — the force of the better argument will ultimately always reveal the truth [Klein & Huynh, 2004]. With open communication being the cornerstone of a democratic society, it follows that a set of rationalities have to be implemented to support the undistorted, or democratic, communication required to provide a level playing-field for all social actors [Heng & de Moor, 2003]. This *ideal speech situation* creates an environment where mutual understanding and communication distortion minimisation are the main objectives [Benoît, 2002]. Since an idyllic situation such as this may not necessarily be viable in reality, the aim of a researcher should be to identify and highlight the obstructions to distorted communication in a given situation [Brooke, 2002(a)].

"A major goal for Habermas is the eliciting of a discursive rationality, that is, an understanding of the rationale that underlies the way in which individuals express themselves" [Brooke, 2002(a):51].

According to TCA, anyone can construct a rationality provided that it is able to be subjected to critique. Since the manner in which knowledge claims of validity are effected is via discourse (discussion), a truth claim can be redeemed, or emancipated, on presentation of evidence [Brooke, 2002(a)]. Furthermore, TCA states that all social action presupposes a fundamental set of norms that not only allows all social actors to partake fully and articulate themselves openly, but also commits them to accept the outcome of such discourse [Byrne, 2003]. It is when actors fail to adhere to these norms that communication breakdowns are likely to occur.

Four types of social action are covered in TCA: instrumental, communicative, discursive, and strategic. When performing any one of these four social actions, TCA encourages individuals to be critical of the validity of information being communicated, since people are inherently capable of critical reflection. It is by means of critical reflection that humans can detect if distorted communication is being transmitted to them, and therefore, they possess the potential to emancipate themselves from such distorted communication [Lee, 2002].

A brief description of each type of social action is provided below [Lee, 2002]:

1. Instrumental action:

   This action type is characterised by mechanical information communication, such as the shouting out of orders by a sergeant to a private in the army. This type of communication typically leaves the recipient with very little doubt regarding the validity of the statement, and therefore critical reflection in such situations is rare.

2. Communicative action:

   This action type is characterised by the communication of information that aims to promote mutual understanding. This type of communication aims to establish a common understanding between two or more parties about what each party understands a certain definition or concept to mean. During communicative action, a deeper level of critical reflection is required than instrumental action.

3. Discursive action:

   This action type is characterised by communication that aims to resolve disagreements. This discourse can continue until differences are resolved, and therefore, requires an even deeper level of critical reflection than communicative action.

4. Strategic action:

   This action type is characterised by communication that aims to manipulate an individual or group in order to advance the agenda of another. Amongst all social actions, strategic action is the most likely to stir critical reflection since this type of action is most easily detected, resulting in its validity being challenged.

In TCA, of particular importance is the second social action defined above — communicative action. During communicative action, parties pursue their own agendas in a co-operative manner in order to establish a shared definition of a situation. It may happen that consensus, rather than agreement, could become the goal of such discourse if the parties cannot agree on a shared definition, or if the basis of a shared definition has to be negotiated first. The goals of parties involved in communicative action cannot be achieved unless they come to mutual understanding over a definition of a situation [Brooke, 2002(a)].

If such semantic differences continue for a period deemed too long by the parties, the differences can eventually only be resolved in a place called the 'lifeworld'. The 'lifeworld' is a key concept in TCA, and can be seen as an ethereal location where the originator and recipient of the communication process meet up to stake validity claims that their opinion is most appropriate. Thereafter, the parties negotiate, work out their differences, and eventually reach consensus [Brooke, 2002(a)].

It is essential that one reflects critically, irrespective of which social action one is engaging in, to rid oneself of the mental pollutants of distorted communication, and in this way become emancipated. However, critical reflection cannot be considered as complete before one is able to firstly question, and secondly, receive feedback from the other party in the communication process. If critical reflection is obstructed in this manner, access to the additional information required to judge validity and progress to emancipation is thwarted [Lee, 2002].

2.3.3. Why CST is relevant in IS research

At this point of the thesis, it may seem to some readers that the previous sections that presented overviews of CST and related theories may seem like irrelevant social conjecture. After all, the link between CST and the development / use of information systems is not immediately evident. However, when one considers that two major goals of implementing IS in an organisation "are (1) to improve productivity and (2) to support various forms of social compliance through administrative or managerial measurements and reports" [Klein & Huynh, 2004:32], the association between the two fields begins to strengthen. Improved productivity relates directly to the technical interest of achieving given ends in labour, while support of social compliance relates directly to the emancipatory interest of overcoming social domination.

Since the middle of the last century, the role of IS has evolved from one of process automation and optimisation to one of decision-making support mechanism and integrated management. IS now finds itself in the role of an organisational communications enabler [Cecez-Kecamanovic *et al.*, 2002], and as such, it is time to now re-evaluate how we as researchers should assess this role.

An outsider to the IS field would surely immediately notice the influence that engineering and management thinking has had on IS practitioners. While the convergence of information and communications technologies (ICT) has deliberately been brought about to improve the efficiency of transaction processing, management discourse has almost entirely been one of 'scientific management' [Varey *et al*., 2002].

Compared to other research approaches, CST seems the only viable option when seeking to challenge existing assumptions. It is apparent that the approach / paradigm taken by most researchers in the IS discipline has left the IS community with many ideas that are rooted in the past due to their lack of critical reflection. The only way to look beyond existing assumptions and find new alternatives is by conducting the sort of critical reflection advocated by CST. In this thesis, for example, CST allowed me to critically examine the underlying political power struggles that influenced the adoption behaviour of the organisational actors.

Referring back to Habermas' cognitive interests from the previous section, the reader is reminded that there are three types of interests that may drive a researcher in their quest for knowledge. There can be little argument that the majority of IS research to date has been driven by the technical interest to predict and control the natural and social world. This approach is perfectly reasonable when one is reminded that IS is often used as an instrument of control. At times, it has been the practical interest that has driven IS researchers' inquiry. This approach, too, has its merits since the focus in this type of inquiry deals with the understanding of social interactions. However, it is only through the use of the emancipatory interest that research has the ability to challenge the *status quo*.

3. The research process

3.1. Qualitative research

Since the critical perspective adopted in this study is usually closely associated with a qualitative approach to data collection and analysis, this thesis was compelled to distance itself from the traditional metrication employed by the vast majority of technology acceptance research. Of course, the long-running debate that has been raging between critical and positivist researchers will not be solved by this single study, but it is hoped that the perspective adopted here will add something new and meaningful to a study field that has not made the sort of advances expected from it by now.

Huberman & Miles [2002] provide a straightforward definition for qualitative research: it is usually based more on words than on numbers. What they mean by this statement is that words, particularly when arranged as a story or narrative, have a meaningful flavour that often proves far more convincing to a reader than a page of summarised numbers would.

Thus, by adopting said qualitative approach, this thesis aims to supply that "meaningful flavour" so that the reader is able to get a taste of what actually happened "in the field" during this eighteen month study [Henning *et al*., 2004]. So much time was spent interacting with research subjects, collecting both unstructured and real-time observations, and eventually, making sense of them, that I believe the use of a quantitative approach would have let slip the opportunity of narrating a compelling story. The reader will also notice that there is a substantial epistemological element, mostly due to me *attempting* to seek out every research subject's experience and assigning each its own value, resulting in the study having a more subjective feel to it than is the norm.

Of course, such an attempt is far from simple, but a critical researcher is challenged to try his / her utmost to achieve this most elusive of goals. This is consistent with the reference made to Alexander [2002] in the previous chapter — that every person has a unique view of the world which can, at best, only partially be communicated or

extracted. It is always dangerous to assume that one can fully understand the point of view of another, and even more so when the other individual comes from a culture that is so different from one's own.

In terms of the methodology adopted during this study, it is difficult to categorise what I did as part of a specific methodology, but, in that regard, the CST approach to research embraces pluralism in research methods. As Brooke [2002(b):271] states, "the call to pluralism in critical research is perhaps today nowhere more apparent than within CST." However, there are researchers around today, such as McGrath [2005], who advocate a move towards more defined methods of conducting CST research. Equally, there are critics of McGrath's views [Agverou, 2005; Walsham, 2005] who support conventional CST thinking regarding methodology.

If pushed towards defining the most pervasive research methods utilised in the writing of this thesis, I would have to admit that critical ethnography and critical hermeneutics played a significant role in my attempt to add richness to this narrative. Bearing in mind that Thomas [1993] defines critical ethnographers as researchers who "describe, analyse, and open to scrutiny otherwise hidden agendas, power centres, and assumptions that inhibit, repress, and constrain", I could not really argue against someone categorising my research method as such. Critical hermeneutics, on the other hand, assumes that in qualitative research there is only interpretation, and in its most basic form, the act of interpretation attempts to make sense of what has been observed in a way that communicates understanding of the subject matter. It is important to note that critical hermeneutics is suspicious of any model of interpretation that claims to reveal the final truth, but, instead, it is more comfortable with the interpretive approaches that assume that the meaning of human experience can never be fully disclosed [Goodson & Mangan, 1996]. However, as sophisticated as my approach on methodologies may appear on paper, it was never my original intention to follow them, nor did I realise that I had to make use of them until much later in the research process; it was more a case of the methodologies finding me, to be frank. The fact that retro-fitting these methodologies to this study is so convenient should not be mistaken for orthodoxy in research method on my part.

There were failed attempts at empirical methods first, quickly followed by periods of intense reflection that were required to weigh up the merits of alternative methods and approaches. Yet it was the combined efforts of these aborted endeavours, false starts, and periods of reflection that helped shape the narrative that follows in subsequent chapters, so it is fair to say that this inadvertent pluralism was key to this thesis' evolution.

3.2. The author's role

It would be reasonable to admit that I never fulfilled the traditional role of researcher as "observer of events", but, equally, it was this lack of convention that allowed me both to become personally involved with my subjects, and to identify with their daily struggles. This was due to the fact that I continued to operate in my real-world working environment for the duration of the eighteen month study; a situation which allowed me to continually learn more about my research topic and subjects during office-hours. Being a senior role-player in the project team responsible for the roll-out of the new information system in question, one of my primary objectives at the inception of the study was to act as the primary agent of change by educating the product inspectors as to how the new system would transform the way they worked.

The change management approach involved lengthy discussions on the shortcomings of the existing manual processes and the subjects' expectations for the new system, which was followed by the technical systems training to pass on to the subjects the skills required to operate the new system. Being a newcomer to the automobile manufacturing industry at the time, the subjects also educated me, in turn, on the ins-and-outs of the manufacturing and quality control processes. Through this interaction and knowledge exchange, I was in a better position to be able to see things through the eyes of the inspectors, and vice versa. As one of their principles in evaluating interpretive field studies, Klein & Myers [1999] encourage such interaction between researcher and subjects. They use the analogy that data is not like rocks on the seashore, waiting to be gathered, but instead requires the social interaction between researcher and subjects to produce the facts. It was thanks to this type of social interaction that I was able to gain the necessary insight required to understand the

technical, organisational and social pressures that product inspectors feel in their daily activities [Henning et al., 2004].

The 'decentering' principle of Habermas was another important concept that guided this research. Benoît [2002] quotes Habermas when stating that an individual who can distinguish between the three dimensions of the lifeworld achieves a 'decentered' understanding of it. As mentioned in the previous chapter, the lifeworld is a transcendental place where speaker and listener meet up to resolve their semantic differences. It comprises the social world of inter-subjective relationships, the objective world that represents facts that are independent of human thoughts, and the subjective world of private experiences. "Decentering allows one to distinguish matters of truth, justice, and taste according to the objective, social, and subjective views, respectively" [Benoît, 2002:459]. Although not simple to apply in practice, adopting a decentered approach is essential to a researcher gathering and making sense of a lot of subjective data.

At this point it is important to remind the reader again that I had more than just one objective to achieve during the period covered in this thesis. First and foremost, as a technical consultant at the organisation, my duties not only involved the user training aspect of the project, but also the system administration / configuration and business process analysis. This involvement in the different spheres of the project resulted in me quickly establishing everybody's place in the bigger picture, and not only obtaining information from a single group of people. The *Quality Systems* department, to whom I was contracted to for the period of the study, is responsible for the steering of all new information systems relating to production quality assurance, and even though there were occasions when the academic research had to take a backseat, the opportunity of conducting my research at my place of work outweighed any possible drawbacks.

3.3. The initial training sessions

Despite being on a steep learning curve, as a newcomer to the industry, I felt an obligation to perform all my above-mentioned duties in such a way so as to impress my clients at every turn. Given these special constraints, I assigned special personal

significance to the first training sessions, which were to be my first contact with the trainee group of product inspectors. The training sessions gave me an important platform from which to conduct my research and satisfy my clients' needs. Due to this need to perform, the planning and preparation that went into the initial training sessions had to be meticulous, simply due to the sheer size of the task at hand. Though a failed technology acceptance exercise would have made for interesting reading, a success story was always the preferred option for me from a career perspective.

During the early stages of the project, a failure (in technology acceptance terms) seemed a distinct probability: the product inspectors had to be trained in a system that had yet to be translated from the original German into English; the vast majority of them had never even used a personal computer before; and, the consensus among the project team was that the new information system had a very clumsy and unattractive user interface, making it a potential nightmare for these novice to work with. Furthermore, as is frequently the case with such system roll-outs in the organisation, no local stakeholders had any say during the initial development of this new system.

During the initial training sessions, I trained five groups (consisting of four inspectors each) for two full-days. This extended contact with small groups of trainees allowed informal relationships to form in most cases. Despite the cultural and socio-economic differences between the subjects and I, the warm and open nature of the inspectors made the whole process easy and natural, and once these relationships were established I was quickly introduced into their world, their outlook on life, and the constant power struggles which take place between them, their team leaders, and *Body-In-White* management. Since I would be spending the eighteen months subsequent to the initial training sessions working closely with the inspectors, I was well aware that I would have to gain their trust very early on in the process.

A few aspects contributed to the earning of the inspectors' trust. First of all, the opening couple of hours of each training session were dedicated to listening to what the inspectors had to say (refer to *Appendix A* for a detailed outline of the course structure). After receiving assurances that anything said would not be conveyed to their superiors, each trainee took the class through typical scenarios he experienced in his day-to-day work with regards to his inspection and reworking of vehicles, as well

as the communication of these results. After each trainee had presented their particular story, a class discussion took place concerning the pros and cons of current work processes, as well as any possible constraints which kept them from doing their job to the best of their ability.

Following these discussions, I explained to the class what the implications of introducing the new system would be, what would change, and what would remain unchanged. Thereafter another class discussion took place over the pros and cons of new work processes, which served as a forum to air everyone's fears, especially those regarding the use of new technologies.

An unexpected source of much subjective information came during the tea and lunch breaks taken during the training sessions. This was a time when everyone could sit down and comfortably discuss issues related to life and work, as well as the inspectors' hopes and aspirations for the new system. Of particular interest were the stories pertaining to the politics and power struggles that occur on the shop-floor, something that many office-based workers of the organisation have little idea about. In terms of day-to-day experiences, there were several eye-opening revelations by the inspectors which made me realise that even though we worked for the same organisation, our lives were actually worlds apart.

As part of the aborted empirical endeavours mentioned earlier in this chapter, I had originally planned to hand out questionnaires to the inspectors at the conclusion of the course, but it was soon apparent that questionnaires in the form recommended by Davis [1989] would not add any value to my study. He recommends using *Likkert* scales to measure various aspects of usefulness and ease of use of a software application, but I realised that drawing up questionnaires in that vein did not result in much reliable feedback since pilot questionnaires tested on a group of product inspectors from the *Assembly Plant* only revealed what computing novices that group of product inspectors were. Many struggled to come to terms with some of the technology acceptance concepts being tested. More worryingly, the group involved in the pilot study actually had a little bit more exposure to computers and systems than the *Body-In-White* product inspectors of the main study. Something else that I encountered during this exercise was an atmosphere of mistrust, both of the

questionnaire and my intentions. Therefore the study seemed like it would have take on a different form to previous technology acceptance studies since the conventional means of extracting the subjective opinions of my research subjects was proving so problematic.

3.4. Subsequent contact

Even after the conclusion of the first round of training sessions, I maintained extended contact with the majority of the product inspectors as well as my project team members. A couple of months later, for example, a group of six inspectors identified by me were required to undergo further training. This aside, inspector input was frequently required on matters relating to the implementation of the new information system. I always took any opportunities to probe them further with regards to their thoughts on their evolving perception of the emancipatory potential of the system, for example. This was a period when my understanding of my research topic was finally beginning to take shape, and I was fortunate enough that the people I was basing my research on were still at my disposal.

As the project progressed, my involvement slowly shifted from the product inspectors to their management team. Even though the process of handing over the responsibilities and administration of the system took place over a period of approximately 12 months, the input being received during this period allowed me to finally piece together the last pieces of the complex technology acceptance puzzle at this automobile manufacturing plant. Based on the events that unfolded over the eighteen month duration of this study, I not only saw the potential that existed of recounting a technology acceptance story driven by the emancipatory interest of the primary users of the new information system, but also that of the evolution of the political situation brought about by a maturing information system.

4. The study: Plant Industryville

According to Ngwenyama [1991], the universe of inquiry in CST research includes the physical and organisational structures, social relations, symbolic interactions, as well as each actor's interpretation of these. This chapter is written with that particular aim in mind, with the reader being introduced to the entire objective / subjective spectrum of the product inspectors' social reality. At the end of this chapter the reader should have a much clearer idea of the social context from which the organisational actors of this study come from.

4.1. Organisational background

Plant Industryville (name changed for reasons of anonymity) is the manufacturing arm of *CARCO (South Africa) (Pty) Ltd* (name changed for reasons of anonymity), which itself falls under the larger multi-national *CARCO Group* umbrella. The *CARCO Group* currently comprises three major automotive brands, and runs manufacturing facilities at 24 sites in 15 countries and employs more than 100,000 employees. Although not the biggest player in the global automotive market, the *CARCO Group* is widely considered the leading player in the premium automobile segment.

Having started from humble beginnings, *Plant Industryville* has since evolved from running as a c*ompletely knocked down* (CKD) vehicle production plant in the mid-1970's, assembling vehicles with limited customisation possibilities for the South African market, to a first-class plant capable of producing sophisticated 21st century vehicles with a myriad of different options.

The plant benefited from a multi-million dollar investment by its parent company during the mid-1990s. This investment was, for the most part, the main factor in sparking this dramatic evolution. Upgrading of the production facilities was then possible, transforming the plant into one of the most modern facilities in the world. These changes have brought *Plant Industryville* in line with other *CARCO* plants around the world and earned it the title of: *CARCO World Class Plant*.

Nowadays, *Plant Industryville* is a fully-fledged member of *CARCO's* worldwide supply network. At the start of this study, the previous generation model range was still being produced there, for both local and overseas markets. Twenty percent of the vehicles manufactured at *Plant Industryville* are destined for distribution to the local market, with the remaining eighty percent heading for overseas markets, such as the USA and Japan. During the first quarter of 2005, the plant ushered in a new era when it began full-scale production of the current model range.

The Industryville plant comprises three manufacturing facilities:

- Body-In-White
- Paint Shop
- Assembly

Each car that is produced at *Plant Industryville* starts its first phase of production in the *Body-In-White* manufacturing facility. From then it sent to *Paint Shop*, where the body surface is pre-treated before the paint application takes place. Lastly, the painted body arrives at *Assembly*, where the mechanical, electrical and electronic components are fitted, as well as the drive-train and trimming.

This particular study focuses on events surrounding the establishment of the new *Body-In-White* facility. Previously known as *Body Shop*, *Body-In-White* is the new name for the facility where outer metal shell of the new model range is assembled. Due to the increased production demands that the new model range placed on the plant's existing infrastructure, it was decided that the establishment of this new production facility would be required for its production.

Along with an improved production facility and many other technical and process changes, it was also decided that the quality inspection process would have to fall into line with the *CARCO Group* standards. This meant the introduction of a new quality assurance information system called GTP (Graphical Test Plans), which the product quality inspectors would be required to use to capture their inspection results. Having previously only made use of a manual system of paper-based results capturing, it could be argued that this particular change provided one of the biggest challenges to *Body-In-White*.

4.2. The Body-In-White manufacturing process

As mentioned above, the process of assembling the body shell is the first step in the manufacturing process and takes place in the *Body-In-White* production facility. So as to emphasise the scale of the changes taking place during the transitional phase from one model range to the other, it should be noted that the automation of the body assembly processes went from 30% to 75% — equating to more than double the automation of the preceding model.

The first stage of the new *Body-In-White* assembly process occurs in the *Floor Group* production cell. Moulded high-strength and lightweight metal parts are joined to form the three sub-assemblies (*viz. Front End*, *Rear End*, and *Centre Floor*) which constitute the lower half of the vehicle. These three sub-assemblies are connected in the *Floor Group Complete* line where, after weld-studs are shot by robots, each unit is measured at a *Perceptron* station. The *Perceptron* is a group of four robots, each mounted with highly specialised cameras that measure all dimensions of a floor group to check if all alignments and measurements fall within the allowable tolerance. The fact that there are, excluding robotic inspections such as the *Perceptron*, ten human inspectors and two reworkers in the *Floor Group* cell alone, should give the reader an idea of the scale of operations in this cell.

The completed floor group is then transferred to the *Main Line* production cell where the structural outer parts, such as the side frames and roof, are joined to the floor group. It is only after leaving this cell that a unit starts resembling an actual motor vehicle. Although smaller than the *Floor Group* cell, there are still five points along the *Main Line* production cell where inspection takes place, and two rework stations where faulty units can be repaired.

From *Main Line* a unit proceeds to the *Weld & Braze* line where the hang-on parts such as the bonnet, boot-lid, and fenders, are attached and aligned. Precision is vital with hang-on parts, and each unit is inspected closely to ensure that parts are correctly fitted and that gaps are strictly within tolerance. For the final step in the manufacturing process, the unit is passed on to the *Metal Finish* line which consists

entirely out of inspection and rework processes. All outer surface defects, from scratches to dents, are identified, assessed, and reworked, where necessary. Following this, the completed unit is then transferred to the next manufacturing facility, *Paint Shop*, where the paint preparation and application processes take place.

4.3. Life before the information system

Having now provided a brief overview of the manufacturing process, this section of the thesis aims to introduce the reader to the work process of the product inspectors, in particular, as it was before GTP was introduced. The reader will get not only get an idea of how political factors often got in the way of the product inspectors being able to carry out their duties as the custodians of quality on the shop-floor, but also of how the facility's processes, as a whole, lacked the transparency and accountability expected from a world class plant.

Due to product quality being such an important differentiator between itself and the competition, CARCO has always placed tremendous value on the importance of its quality assurance processes. In the old *Body Shop* production facility alone, 16 product inspectors were on duty at any one time ensuring that the manufacturing process continues to produce defect-free units.

The inspection cycle as it was before the GTP implementation, began with the product inspector selecting a unit to be sidetracked from the production line. As is the case in most manufacturing industries, it must be remembered that only a relatively small sample of units from the population are inspected for quality assurance purposes, and the results of these inspections are used to make deductions about the quality of the larger population. In the time that it takes the product inspector to examine one unit, it is likely that numerous units have passed by his inspection station without being sidetracked for inspection. It is also important to note that it may take several inspections cycles before all welds (and other connections) that require checking are verified. The early shift inspection schedule used by a product inspector checking the quality of *Rear End* parts (as was the case during production of the previous model range) is shown in *Appendix B*. This schedule provided him with a rough outline of

what he should inspect during each of his inspection cycles, with the result being that after six inspection cycles, every feature of the rear end had been checked.

Once a unit was sidetracked, the product inspector would begin his inspection according to the printed-out schedule mentioned above. A typical inspection would include visual checks, fixture checks, and closing of gaps and flanges with a hammer. There existed some well-founded complaints from quality engineers that many product inspectors did not strictly follow their work instructions, but then again, it was so hard for these engineers to be able to track the enormous paper trail that accusations like these were almost impossible to corroborate.

In theory, after the inspection, all that is left for a product inspector to do before sending a unit back to the line was to take the unit's *Product Verification Card* (PVC — refer to *Appendix C* to view a sample copy) and record any defects found. At the same time, he would also record the defect(s) in the "Problem description" column of his inspection schedule sheet (as can be seen in *Appendix D*) so that he would have a record of his inspection results for that day. In practice, however, things did not always flow as smoothly as that since other factors could come into play before sending a "defective" unit back to the line.

There seemed to be some inherent flaws in the organisational structure at shop-floor level. One such anomaly was that a product inspector, a representative of quality operations, reported directly to a team-leader (and at time of writing, still does), a representative of production operations, on all work-related issues, including any decision-making that would necessitate the potential side-tracking of a defective unit for rework. Therefore, before the introduction of GTP, the product inspector had to prove that to his team-leader that the defects he found on a unit were serious enough to warrant side-tracking for rework. Team-leaders would be unwilling to let the product inspectors make these decisions by themselves since reworks usually have a negative influence on production volume. Reworking a vehicle not only delays its expected completion time, but also affects current production operations since it requires a production worker (usually a welder) to leave his work station to perform rework on a unit. Rework on a unit can take anything from two minutes up to an hour.

During informal conversations with the product inspectors, I picked up on this point, in particular, the compromise between volume and quality, as being a major cause of conflict on the shop-floor. While a team-leader is ultimately judged on the production volume that his area was able to achieve, a product inspector is judged on product quality. The unfairness of the previous system is evident — a decision taken by a quality-expert could be overturned by someone with considerably less expertise on such matters on the premise of self-interest.

Returning to the work process, though, and assuming that the side-tracking of a defective unit was ratified by the team-leader, the unit would be returned to the line from the inspection station with its attached PVC denoting all defects found. Like an inspection station, a rework station is also situated off the production line, and shares some of its workspace with an inspection station (note: a rework station is always situated right next to an inspection station, but since there are many more inspection stations than rework stations, the reverse is not always true). A rework station is not always manned by a reworker, meaning that it was the responsibility of the inspector manning the inspection station to check the PVC of every unit passing a rework station in order to check for any open defects requiring rework. If the product inspector found a unit requiring rework, he would go up to the process control console on the production line and press the “Request Part” button that would call the unit to the rework area. While waiting for the hanger system to respond to his request, the product inspector would get on his RF radio and call his team leader to request him to call a reworker over to receive the defective unit.

However, as in the inspection process, things did not always run smoothly in the rework process either, with several factors being able to negate its effectiveness. To start with, one would expect a product inspector’s sole responsibility to be the inspection of production units. As explained earlier, during the span of a typical inspection cycle, numerous other units pass his inspection station. So if a product inspector was in the unfortunate position of having to man an inspection and rework station, it was be expected of him to also check the PVC’s of every units passing by. With a unit going past every 220 seconds (average production cycle length during full production), his inspection process was interrupted to the extent that his performance was compromised. As could be expected in a situation like this, it often happened that

an inspector may not have remembered, or even bothered, to check every passing unit's PVC to view its rework status.

Furthermore, the use of PVC's was never considered a fail-safe way to record a unit's defects. *Body Shop* had been plagued by past incidents of lost PVC's, with the result that affected units would have be completely re-inspected before being forwarded to *Paint Shop*. Another problem with the PVC's related to the defect descriptions written-in by the product inspector, which, if not clear in any way, resulted in a lot of effort expended on investigating what the defect was and where it was located.

Nevertheless, assuming that all information was present and clearly stated in the PVC and everything went according to plan during the actual rework, the unit would typically been restored to an acceptable level of quality before being returned to the production line. Before being released, though, an inspector would then be called to verify that all the defects stated in the PVC had been repaired, and if satisfied, the unit would then be returned.

At the conclusion of a unit's journey through the *Body Shop*, its PVC would be collected, a copy scanned into the SAP system, and the original filed and put into storage. As one can imagine, this data storage solution, although effective, did not support the possibility of analysing quality data.

4.4. The inspectors

While it may seem at this point that this thesis has started shifting its focus towards the organisation and its processes, this has been done purely for the purposes of conveying a more complete story. After all, we cannot forget that this thesis is about the people who live and work in this environment, and not about the environment itself. In this section, the intention is to provide the reader with a clearer picture of the main organisational actors in this study — the product inspectors.

When *Plant Industryville* started producing vehicles back in the 1970's, one should not overlook the fact that South Africa was a very different country to the shining beacon of democracy that everyone knows today. These early days coincided with the

period that the infamous *Apartheid* regime was possibly at its strongest, with its enemies imprisoned, and the violent popular uprisings of the 1980's still some time away. Like any other place of work in the country, *Plant Industryville* was representative of what was happening in South African society as a whole — on the shop-floor one would find the black man toiling in his overalls, while the white man sat in his air-conditioned office. The institutionalised racism of that era dictated that this was the black man's place, and the chance of him moving up the *corporate ladder*, as it were, was non-existent.

The ethnic segregation enforced by the *Group Areas Act (1950)* forced the country's black majority to live in designated areas away from the commercial centres and white suburbs, where poverty and crime were rampant, and basic amenities such water, electricity, healthcare, and education were in short supply. Industryville, being an industrial area outside a major city, was primarily fed its black workforce from surrounding townships.

More than ten years after the democratisation of South Africa in 1994, and despite much change in the political landscape, many will argue that a great number of key social issues remain unresolved. In *Plant Industryville*, for example, the workforce on the shop-floor remains predominantly black, while management is still, for the most part, white. While exceptions exist, the odds are pretty good that if someone was on the shop-floor pre-1994, he would still be there in 2005. The overriding factor in the preservation of the *status quo* is attributable to both the generally low education levels of the workers on the shop-floor as well as the lack of opportunities and development granted to these workers. At the risk of generalising, it is mostly the younger generation of educated black South Africans who are reaping the fruits of the liberation struggle fought by their parents and grandparents. This leaves behind a forgotten generation of people who theoretically now have freedom, but lack the means and / or opportunities to achieve emancipation.

The majority of the twenty product inspectors that I worked with could be classed as members of the latter; being just too old to derive full benefit from the opportunities that the new dispensation has provided for the black majority. The statistics pulled from the training register bear out this fact — the average age of the group is 43 years,

which would be even higher if four inspectors below the age of 30 had not brought the average down by approximately five years. The two oldest inspectors are 53 years of age, with the youngest two being 28.

The majority of the inspectors have been working at Plant Industryville since before the milestone year of 1994. They average a period of service of just over 14 years, with eight of the inspectors having served the organisation for longer than 20 years. One dependable individual has even served for 32 years. In practical terms, what this means is that in 20 years, these eight inspectors have only managed to move up one rung on the shop-floor ladder. The only position lower than inspector on the shop-floor is that of an operator, whose duties in *Body-In-White* would either involve welding or reworking of units, or both. These figures speak volumes of the career rut and monotony that a product inspector can find himself in. Worse still, is that these men feel that their long service goes unrecognised and unrewarded despite their loyalty to the company and brand. Long service awards, given every five years after the first 10 years, consist of an inspector receiving a certificate and a small cash amount, almost half of which goes to the taxman anyway. Then, there are the perks — the product inspectors often voiced their disapproval at not getting the same perks (read "CARCO company car") as their superiors.

In terms of computer literacy levels among the group, their lack of exposure to IT meant that their skills could hardly have been any worse. Having asked my trainees what courses they had previously attended, I discovered that, with the exception of one trainee (the sole white male) who had attended more than ten computer-related courses, the vast majority of the group had attended, on average, one course. In most of the cases, this course happened to be a one-day basic *Microsoft Windows*™ PC literacy course that their department sent them on, a few months prior to the GTP training. From what I evidenced, and what the inspectors told me, that course seemed to have been a waste of time, with the trainer allegedly speeding through the study guide to be able to knock-off work early.

Nevertheless, notwithstanding all these negative factors, the product inspectors were, without exception, open-minded and very eager to learn some skills on the computer, and thus become proficient with the new system. I believe that my "marketing" of the

system to the inspectors did, indeed, play a major role too. It was only after I started reading up about CST that I was able to understand why these men were so positive and open-minded about the challenge that this change would pose. I realised that I had unwittingly sold the system as an opportunity for emancipation to the group of inspectors. Before continuing with the inspectors' story, however, now seems an appropriate time to introduce the reader to the system responsible for this change.

4.5. The new information system

4.5.1. Project background

GTP, the new production quality assurance system went "live" in *Plant Industryville*'s *Body-In-White* production facility on 12 July 2004. The system was originally developed at one of the German plants, where it has been in operation since 1997. A feasibility study was conducted to decide whether QSYS (the standard quality assurance system used group-wide for all *Assembly Plant* production facilities) would be further developed, or if GTP would be used instead, the decision was taken in the first quarter of 2003 to use GTP for *Body-In-White* production facilities in selected plants.

Firstly, though, modifications had to be made to the existing GTP system, which included improvements to the graphical user interface, as well as an interface to the QSYS system to ensure an integrated flow of quality-related information through all production facilities. These enhancements preceded the first GTP roll-outs in three German plants in late-2003 / early-2004, and the *Plant Industryville* roll-out in mid-2004.

4.5.2. Functional overview of the system

The GTP information system links to an *Oracle*™ database which contains all the productive connection data used in the *Body-In-White* manufacturing process. *Connection* is the generic term used to describe the joins created by the welding operations when fusing metal parts together. Several different connection types exist, including spot-welds, CO_2 welds, stud welds, rivets, brazing, and sealer application. With all this master data residing in productive database, the system allows for the

creation of test plans — graphical instructions that tell the product inspector which connections to check during a particular inspection cycle.

When a unit arrives at an inspection station, the inspector first checks on GTP what the test plans instruct him to check are for that particular unit. The test plans are presented to him in the form of a series of images, each one indicating which connections he must check. After completing his check, the inspector returns to his GTP PC and captures his inspection results in the system. If he certifies the unit as defect-free, it is returned to the production line, free to continue on to the next production step. However, if the inspector books a defect(s) against the unit, the system then prompts him to choose how he would like to control rework for this unit. He has two choices regarding rework control:

- If he suspects that the defect(s) he found solely affects the unit he has just checked, he will instruct the system that only *that* unit must be taken off the production line when it arrives at the next available rework station.
- If he suspects that the defect(s) he found does not only affect the inspected unit, but possibly a batch of units (*i.e.* because of a process problem), he will instruct the system that all units produced during a certain time period (decided using his personal discretion) must be taken off the production line when they pass the next available rework station.

When a defective unit arrives at a rework station (with the aid of automated process control systems), all open defects on the unit are displayed to the reworker via the GTP system. The onus is then on the reworker to rework these defects according to the information he is given. Once he has finished his rework, an inspector verifies that the corrective actions taken correspond to the information displayed in GTP. The inspector then acknowledges on the system that the defects have been closed. The unit is then returned to the production line, free to continue on to the next production step.

The GTP system is a very effective system due to its links to other higher-level systems. These higher-level systems are responsible for production operations such as process control, and vehicle identification and tracking. The information fed into the

GTP system by the inspector therefore plays a part in deciding the process control of inspected units.

There are some drawbacks, however, with the GTP system. Due to the fact that *Plant Industryville* was not involved during its development, it turned out to have a user interface and operation logic more suited to the skills of a sophisticated German user, rather than those of a user with limited technical expertise, such as an Industryville shop-floor worker. The end result, despite continuous improvements over time, is a system that is very hard for the typical Industryville product inspectors to feel at ease with (refer to *Figure 6* below). Even a few months into its productive life-cycle, many inspectors were still very unsure about its use. A case in point is the extensive use of tree structures that the system employs — understanding concepts such as hierarchies and branches is something an experienced computer user may take for granted, but when someone is a complete novice, such concepts do take a while longer to master.

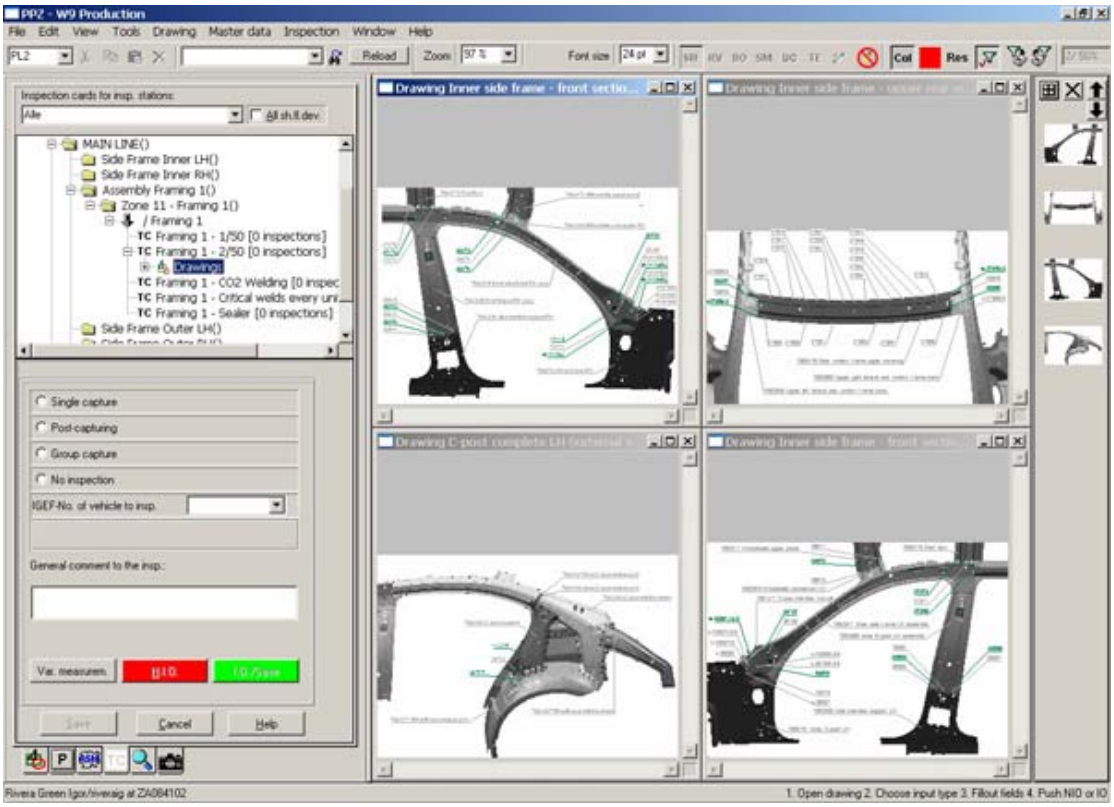

Figure 6: A screenshot of the GTP system

Given the group's inexperience with computers and information systems, the task of empowering them with the technical skills to operate the system correctly was, initially, the greatest challenge. A more important challenge but, in retrospect, an easier one, was the task of selling the system as being empowering to the inspectors. *That* is where, this thesis argues, technology acceptance can potentially be made or broken. The problem of the technical skills shortage that most of the inspectors suffered was an obstacle that was eventually overcome due to prolonged periods of exposure to computers, which, in turn, lead to boosted confidence when operating its software applications.

4.6. The emancipatory potential of the new system

As has been stated beforehand, against all expectations, the group of product inspectors showed tremendous interest when formally introduced to the new system. Prior to the training sessions, I had been advised from many quarters, including the inspectors' superiors, that the training could well turn out to be a hellish experience for me. All previous roll-outs of information systems that required shop-floor data capturing, had generally met with low levels of acceptance, user apathy, and disinterest. Given that poor recent history, the expectations from the project roll-out team were not to expect anything too different this time around.

It is important to stress to an outsider that being a product inspector on the shop-floor is far from a glamorous job — job satisfaction, recognition, respect, authority, remuneration, and upward mobility potential are all low. Furthermore, since the shop-floor is roughly divided into two teams (*Production* and *Quality*) there is a constant conflict that exists on the shop-floor because of the compromise that has to take place between volume and quality. This struggle for power often results in an inspector's evaluations being questioned. Prior to the introduction of GTP into the production facility, a distinct lack of transparency of the production and quality assurance processes seemed to put too much power in the hands of the *Production* team of the shop-floor.

As one inspector put it, "You have to remember that we as inspectors always have to report to our team leaders, who happen to report to *Production*. When we find a

process-related defect and report it to our team leader, he is always very unwilling to stop production to take care of a quality issue. At the end of the day, he gets judged by the volume produced in his area, and whether that meets the target volume for that area. As part of the *Quality* team, we get judged by the quality of the cars that we hand over to *Paint Shop*. But *Production's* power over matters of quality ties up our hands in most instances."

This statement reinforces the impression that the inspectors are inhibited in attempting to do their job to the best of their abilities. Despite being the experts at finding defects on the car body, when they alert their superiors to the problems, their expertise is undermined by someone who is not as expert as them in quality-related matters.

This all paints a gloomy picture of what it is like to constantly be fighting the oppressing forces that keep the inspectors in check, rendering them impotent even in matters wherein they should have the most to contribute. However, the introduction of the new GTP system promised to upset that balance, and that is exactly the angle that I chose to concentrate on when taking the group on training.

Having had a basic knowledge of TAM at the time, I realised that the system certainly would not measure up in the user-friendliness stakes, so I had to drive home the points relating to usefulness. As it turns out, I unwittingly struck a chord with the inspectors when I mentioned the opportunity that GTP was going to give them redress the balance of the power on the shop-floor, with the system justly handing back more responsibility to the inspectors. In the early stages of the project, few people in *Body-In-White*, including management, had actually realised the power that the users of the system would actually have over production flow and quality assurance. Added to that, the inspectors would be the only group of users on the shop-floor to have the access rights and knowledge of how to use GTP.

Although I must admitted that I was, to a great extent, probably motivated by self-interest, I made the inspectors realise that gaining the knowledge and skills to use the GTP system properly, would give them the power to bypass the team leader approval process when deciding to send a defective unit to a rework station. Furthermore, after a unit is reworked, it is the inspector, and not the team leader, who would be called by

the reworker so that he could acknowledge the rework done by the reworker on the system. This then gives the inspector, not only final say on which units get taken off the line to be reworked, but also final say on deciding if the quality of a reworked unit is of a high enough standard to be put back onto the production line.

This is the first, and most fundamental, level of emancipatory potential that the system offers the inspectors — the opportunity to finally have an authoritative say on product quality.

The goal of having more authority on quality-related decisions is something that the inspectors have been fighting for a long time. According to one of the inspectors, ever since the production volume in the plant had risen to higher levels during the past decade, the focus had steadily shifted from a quality-oriented one to a volume-oriented one, particularly during production in the old *Body Shop*. Despite being specialists in their field, the inspectors had begun to have less say on matters that they were accustomed to providing more input on.

Following some discussions with a small group of inspectors, I was implicitly made aware of two more possible levels of emancipation. **After achieving that first level of emancipation, there is the knock-on effect of an elevated social standing of the inspectors, both individually and as a group, in the eyes of the other workers on the shop-floor; this is the second level of emancipatory potential that the new system offers the inspectors.** Their social status on the shop-floor is elevated a few notches, not only due to their increased authority on matters dealing with quality, but also because of the extra respect they earn through the use of IT systems in their work function.

The elevation of the inspectors' social stature as a group, in particular, is especially important when considering the collectivist culture emphasised in African societies. The community is usually the major source of an African individual's identity, and the individual seeks approval, status and support through community affiliation. Veiga *et al*. [2001] also stress the importance of emphasising technology's effects on the interest of the group when dealing with collectivist cultures.

Although the inspector that mentioned the next level laughed at his own idealism, it does seem feasible that a third level may exist. **Therefore, the third level of emancipatory potential that the new system could offer the inspectors is the possibility of career progression.** Some inspectors believe that due to their elevated status on the shop-floor, their chances of being promoted to positions of higher responsibility and pay are improved (even if only slightly). Obviously, no evidence existed at the time of that inspector's statement that promotion opportunities would be forthcoming, so only time would tell if that third level, in fact, existed. However, looking at the situation realistically at that point in time, chances did seem quite remote.

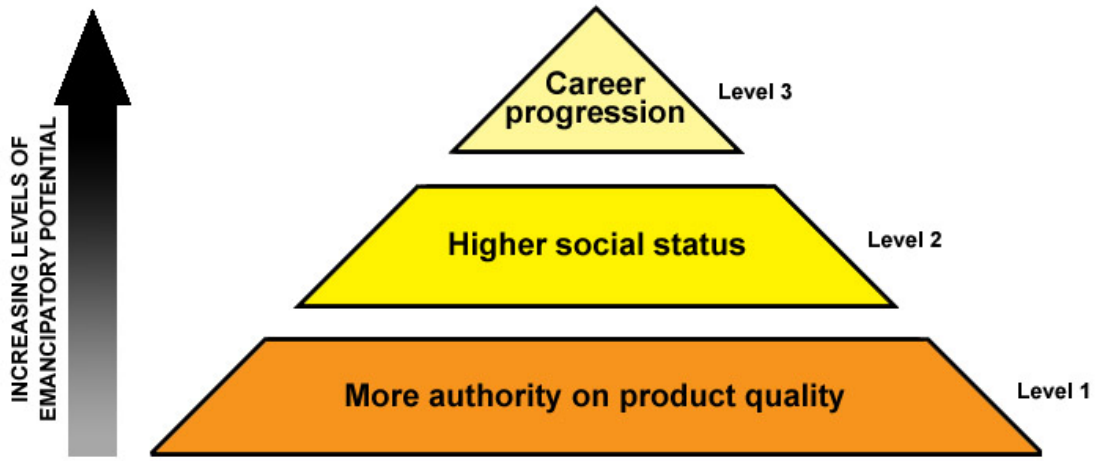

Figure 7: The three levels of emancipatory potential offered by GTP

It would make perfect sense, however, that the existence of this third level would be the over-riding driver for this group of inspectors. All are married men with families to take care of, and children to feed, clothe, and educate. Their ultimate ambition, therefore, would be to improve their work situation (and thus their income level) to such an extent that they would be able to cater for their families' every need.

4.7. A rough journey

So far, this thesis has demonstrated a particularly strong bias towards the primary users of the system, their political struggles on the shop-floor, and their subjective perspective on things. However, to end off this chapter, we will shift the focus

towards the inspectors' management team, and the larger organisation as a whole, and how these elements dealt with the changes that the new system brought about. The reader will not only learn how they were initially caught on the back foot when GTP went live in production, but also how the management team eventually bought in to the idea of the system too.

As has been mentioned previously, an organisation's intention should be that its IS users utilise the systems in a manner that will contribute to both its strategic and operational objectives [Venkatesh & Davis, 2000]. Furthermore, one is reminded of the six categories of IS implementation success defined by DeLone & McLean [1992], and that *system usage* is just a pre-requisite for the other five. Since an organisation would ideally want to achieve the other five too, what follows below is a detailed description of how the management team, in particular, went about attempting to achieve that ideal.

From an organisational perspective, a successful implementation was never going to be about getting the inspectors to merely use the system. Indeed, voluntary usage is an aspect that does not even feature in this study — early on in the implementation project, I witnessed a manager making what amounted to a veiled threat of dismissal to his group of inspectors if they refused to co-operate in that regard. As it turns out, there really was no need for that sort of coercion, especially considering the positive light in which the product inspectors would eventually view their new system. However, to delve more deeply into the details of this implementation project, it would make sense to examine the progression of this project by discussing some major milestones.

The story recounted in this thesis begins in January 2004 when I joined *Plant Industryville* as a technical consultant with the task of planning and configuring the system processes, administering the remaining project deliverables, and training the users. Within two months of my arrival, the testing of the first working version of the client application and its database connections had been successfully completed. Therefore, starting April 2004, the first few groups of trainee inspectors began attending the author's training sessions. As has been mentioned in a previous chapter, the first training sessions, which would continue until mid-June 2004, were conducted

using a German-language version of the client application since the English version was only due late-June that year. Even so, most of the events that this thesis has documented so far took place during this short period since this was the time that I had the most personal contact with the inspectors. This particular section of the thesis deals more with the events subsequent to the training sessions.

In order to coincide with the building of the first test cars of the new model range in July of that year, the first GTP inspection and rework stations were prepared for live-testing purposes. At that early stage of the system's lifecycle, the stations still had very limited process control capabilities since the manufacturing facility itself had not yet been completed. Two of the best performing inspectors during the training sessions were selected to be on the inspection roster for the new model range. The remainder of the inspectors would continue working on the production of the outgoing model range since there was still seven months before that model's run-out was completed.

The two inspectors adapted very well to working with the system initially, especially since production volumes were reasonably low for that extended testing period. There were, on average, only three vehicles being produced a day at the time and, consequently, the inspectors could work at a leisurely pace. Furthermore, a project member was almost always on hand to support the inspectors with any problems that did arise, with the result that the inspectors' confidence levels rose considerably with regard to system use. During that early period, it must be admitted, things looked quite rosy, but there was one niggling issue that was threatening to undo much of the progress.

That niggling issue concerned low levels of management interest in the new system and the work being put in by the two inspectors. If truth be told, I noticed that management displayed indifference towards GTP even before the first training sessions began. Unlike their product inspectors, they did not immediately realise the positive contribution that this new system could make to their production and quality process. Firstly, they felt that their autonomy had been undermined because the system had been forcibly imposed on them by their German counterparts. Apart from that, an *old school* mentality prevailed through the local managers, in general — they

saw production-based information systems as novelties that could not teach them anything they did not already know about their process. Furthermore, the managers were even more sceptical about their inspectors' abilities to use the system properly since they did not believe that rolling out a German system (made for German workers) in *Plant Industryville* would add any value to their quality process in the hands of their inspectors. They assumed that the technological sophistication levels of German shop-floor users would be way beyond anything that their workers could ever achieve.

Once live testing began in the new facilities, it soon became apparent GTP was quite low down in their list of priorities. Since the manufacturing facility for the new model was itself brand new, many complications arose with the automated processes like robotic welding and conveyor systems. As volume-levels during the testing period slowly increased, these problems magnified and almost all attention was focused away from the inspection processes. In hindsight it is now understandable that management's attention moved away from the non-critical activities, as they saw it, but the unfortunate result of this apathy was that the inspectors soon realised that their work was going unnoticed and unappreciated. One of the inspectors, Josiah (full identity concealed for reasons of anonymity), confided in me that he was only expecting as much since he had been working with many of these individuals for the past twenty years and he sensed that the honeymoon period of the system would be short. Even though it became noticeable that the inspectors were using the system less once they realised that their results were of little meaning, they put enough effort in to keep things afloat.

A couple of months after the first two inspectors began using GTP in the live production environment, four more were added to the roster, with two groups of three inspectors alternating between early and late shifts. The four new individuals had a harder time adapting to their new process since four or five months had passed since they last used GTP during their training. However, there were a couple that took the opportunity to work very hard and according to their new process. Unfortunately for them, only the newly appointed systems engineer for *Body-In-White* took any notice of their progress. To further compound problems, the systems engineer, inexperienced in the management of information systems, seemed to lack the effectiveness to drive

the use and benefits of the system onto the management agenda. During this time, the many outstanding system issues that were unable to be resolved without management backing further retarded to progress of the system.

By the end of January 2005, the process of migrating the remaining number of inspectors to the new production facility was completed to coincide with the successful run-out of the outgoing model. As things began to settle down with everyone now working in the new facilities, the focus shifted back to the quality processes. After a six month period of upheaval and changes, the management team began to realise that it was time to sort out the relative mess that inspection process had become.

At that stage there were still many outstanding problems to sort out with the system. The GTP system interfaces to the automated process control systems were, for the most part, absent, with the result that vehicles identified as defective by the inspectors were not being automatically sidetracked at rework stations. Most of the automatic inspection devices, like the previously mentioned *Perceptron*, were not yet communicating their results to GTP. Three of the manual inspection stations were inactive due to problems with space, location, networks, or power supplies. In addition, the inspection plans, with which GTP provides an inspector with graphical instructions to conduct his inspections, were inadequate according to the quality engineers.

On the human processes side, the inspectors had yet to go through a skills certification process, as stipulated in the company guidelines. There was also very little control over the way the inspectors were managing their inspections due to poor process documentation and enforcement from the side of team leaders and quality engineers. On the positive side, the inspectors were, to a large degree, at least capturing their inspection results in the system. This one positive aspect turned out to be one of the key factors in turning around the sad state the system found itself in.

4.8. Devolution of ownership

Once a sufficient amount of inspection data was being captured by the inspectors, the request came through from the systems engineer for a BI (business intelligence) specialist to generate some reports from the GTP data. The specialist was able to provide the systems engineer with a series of reports concerning defects, system usage, and process problems. Once presented to them, the quality engineers, maintenance specialists, and production team leaders, all took differing levels of interest in the information being extracted from the system.

The first group to buy into this information was the maintenance specialists, who used GTP information about re-occurring defects to identify robots that were producing defective welds (refer to *Appendix E* to view a sample of such a report). For them, it was the first time they had ever received current and actionable information regarding welding operations that fell outside standard allowances. Previously, the only feedback they could act on was provided by the results of the plant audit vehicles. However, that information would usually only get to them once a vehicle had left the *Assembly Plant* since audits are performed on completed vehicles. If the audit alerted them of a possible weld problem, there could well be over 500 vehicles that had being affected by the same defect in the interim.

The most difficult group of individuals to get buy-in from was the quality engineers. The role of the quality engineers is vital in *Body-In-White* since they are responsible for steering the quality in their facility. They too, in the past, had problems obtaining sufficient information regarding the build quality of vehicles in their shop. Therefore it was most unexpected when they treated the accuracy of the information on the reports with so much scepticism at first. To me it almost seemed like they were looking for excuses to dismiss the GTP information, because by believing it they would be admitting that there were faults with their processes that had gone unnoticed for so long. On the other hand, their concerns, whether warranted or not, had to be addressed by the project team since this group of individuals were the main quality drivers in *Body-In-White*.

Their first main concern related to the inspection plans that the inspectors were following. Those quality engineers who understood a bit more about the system expressed their disagreement with the way many of the plans were designed, emphasising that wrong aspects were being inspected, and other important ones being overlooked. Admittedly, the project team had already been aware of these problems, and the systems engineer undertook to update the inspection planning as per the quality engineers' requests. He knew that he would have to re-specify the inspection plans so as to then put the ball back in the quality engineers' court. Another matter which needed resolution concerned the re-location of some of the inspection stations. In this regard, two of the quality engineers felt that their areas had too many inspection stations and they suggested that these be moved further down the line to beef up the inspection process there.

Both of the quality engineers' requests, the redesigning of the inspection plans and the relocation of inspection stations, required careful planning and much effort. However, by early August 2005 everyone seemed happier with the setup in general, especially considering that a few other important issues had also been addressed in the meantime.

A couple of months earlier, the systems engineer had begun with his own initiative of handing over certain system responsibilities over to various role-players within the *Body-In-White* facility. He believed that taking the approach of devolving ownership to certain groups of individuals would help secure buy-in from those who had yet to do so. As a first step, he undertook to put all the inspectors through a fairly rigorous process of certification. Not only were they required to pass a practical competency test using GTP, but also with the newly introduced ultrasonic testing equipment used to check weld integrity. The few inspectors who did not pass the tests first time around had another opportunity, and eventually all were passed fit to use their systems.

At the completion of the certification process, the systems engineer made all inspectors sign an agreement stipulating that they accepted responsibility for ensuring that not only all data captured at their inspection station was correct (within the bounds of reasonableness), but also for ensuring that no unauthorised individuals

enter data into the system. A further stipulation was that the inspectors would have to undertake to keep their PC's and PC cabinets in good working order. From the feedback I received, the inspectors seemed all too pleased to commit themselves to these guidelines as they believed these were in everyone's best interest. To further emphasise the inspectors' "ownership" of their stations, A4-sized posters bearing a photo of the responsible inspector were stuck on every GTP PC cabinet. Below the inspector's picture was a caption: "I am responsible for the quality and output of this station" (refer to *Appendix F* to view a copy of this poster). Details also included on the poster were the relevant inspector's personal and organisational details.

The aim of the second step of devolution was get buy-in from the shop-floor team leaders, who, as mentioned previously, are the inspectors' direct supervisors on the shop-floor. The importance of getting their buy-in was underestimated initially, but soon it became apparent that these team leaders were unwittingly making decisions to the detriment of both the inspectors and GTP. On one occasion, for example, a team leader re-assigned an inspector from an online inspection station to a welding station because a welder was absent from work. Even though the team leader was accustomed to move inspectors around as he wished in the past, he did not realise that on this occasion his decision would cause a line stoppage. Since the inspector was busy with an online inspection (*viz*. the vehicle was being checked while still on the production line) before being relocated to do welding work, no-one was left behind to do the inspector's work. The team leader quickly learnt that day that not only does GTP require human acknowledgement when an inspection is completed (before the automated process control systems may move the vehicle to the next station), but also that he would have to think more carefully about re-assigning inspectors to other areas.

To this end, the systems engineer took the lead, yet again, by giving the team leaders a crash-course on the inner working of the GTP system. He also used this opportunity to educate them on their roles and responsibilities with regard to the system. I sat in on these meetings, and it was noticeable that the team leaders were unhappy with certain aspects of the system that made the production process more transparent, and them more accountable for their actions. However, unhappy as they may have been at this realisation, they accepted that from that point on they would simply have to live by

the new rules. Furthermore, it was made quite clear to the team leaders that due to the fact that the GTP inspection plans were setup for sampled inspections at specific time intervals, depending on the station and inspection, inspectors could not simply be relocated to other operations at the drop of a hat. The systems engineer had even gone through the trouble of creating inspection schedules for every station (refer to *Appendix G*) so that an inspector and his team leader would know when to pull a sample from the production line for inspection. It was conveyed to the team leaders that they had to always remember what the inspectors' primary responsibilities comprised of; therefore, should the inspectors not be allowed to fulfil these primary responsibilities, the team leaders would have to answer to their management. To this end a report was developed (refer to *Appendix H*) to monitor the frequency and reasons for non-inspections (*i.e.* occasions when inspections are not able to take place), and the team-leaders were shown how the report could display the various reasons that an inspector could enter for non-inspection, one of which was "On request (of team-leader)".

As a final step in the process of devolution of system ownership, the systems engineer decided that the quality engineers would have to be more involved in the day-to-day running of the system. This he achieved by training them to set up the inspection plans themselves. He reasoned that the quality engineers were the most suitable candidates to decide which areas of the vehicles required inspection, and which areas not. As could be expected, the quality engineers were not entirely happy with their added responsibilities, but, fortunately, the systems engineer had the backing of their manager in this regard.

The three-step process of devolution of system ownership did wonders for the stability of the human processes in the system. By the end of it, the system was maturing into an information system that had taken on a life of its own. The inspectors were capturing with a consistency that had not been there before; the team leaders were openly supporting the inspection process and their inspectors for the first time; and the quality engineers and maintenance specialists were tapping into production-relevant information the likes of which they had never dreamed would be available to them.

4.9. Still a tool of emancipation?

At the time of writing, as the implementation project draws to its conclusion, a pertinent question to ask is whether the so-called emancipatory potential of the GTP system materialised into anything concrete. It is this author's subjective opinion that it certainly did. As the reader will recall, the first level of the emancipatory pyramid (refer to *Figure 7*) proposed that the GTP system would give the product inspectors more authority on matters relating to product quality.

Before the arrival of the system, the inspectors' findings were frequently over-ruled by their team leaders who, acting in self-interest, would prefer to push for extra production volume instead of taking the time to sort out quality-related issues. However, this dynamic changed radically once the GTP system was in place and fully-functional. The transparency and traceability of the production process that the system enables, especially in the form of reports, means that all quality-related decisions taken by inspectors, team leaders, and reworkers, are all properly documented and accessible to anyone who cares to investigate. The days of sweeping information under a carpet, as it were, are confined to history.

Furthermore, it turned out that it was not only the product inspectors who benefited from additional authority on product quality, but the quality engineers too are beginning to reap the fruits of the system's success. The detail of the information coming from shop-floor is so much more than anything the quality engineers had access to in the past. They can now confidently go into their production and quality meetings with answers to production-related problems which would previously had taken many man-hours of tedious investigation to resolve. Due to them being able to pin-point where the trouble-spots are, and deal with them accordingly, they finally have a better grip on matters relating to product quality.

The second level of the emancipatory pyramid proposed that due to the inspectors' more prominent role on product quality, they would benefit in the form of improved social standing and respect amongst their peers. To this end, there is much evidence to support the view that most inspectors have reached this level of emancipation. Firstly, their inspection results are, for the first time, being presented in forums attended by

the highest levels of management. Everyone in these forums is aware of where the information comes from, and who is capturing it. Secondly, the quality engineers are beginning to relate to their inspectors more as process partners rather than the "uneducated, ill-disciplined, and uncontrollable" individuals they were perceived to be in the past. The systems engineer told me that he had noticed much more personal contact between quality engineers and their inspectors, and in some cases, the quality engineers have even scheduled weekly meetings with their inspectors to discuss the happenings of the previous week. Finally, amongst their own shop-floor co-workers, the inspectors have found the respect and admiration usually reserved for ex-operators that have graduated to office jobs. I have witnessed a couple of occasions when inspectors have been demonstrating to their peers how to operate a PC, as well as some GTP concepts. Watching from a distance, not only could I see the pride of the inspectors showing through, but the look of awe in their colleagues' faces was something to remember. It is a testament to the inspectors' determination that less than two years ago, they would have been the ones looking on in awe.

As for the third level of the emancipatory pyramid, it may be too early to pass any judgement on that. Although the majority of the inspectors have yet to see any evidence of career progression brought about by the new system, there are two individuals' stories that are worth mentioning. David (full identity concealed for reasons of anonymity) began working as an artisan / reworker in *Body-In-White* eight years ago. He had been trained as an artisan after finishing school, and at the age of forty-eight was still doing the same job. I trained David informally in September 2004 on how to operate the rework functions in the GTP system. As a reworker he had to know how to view the defect information that had been captured during inspection. Despite the rework screen being relatively easy to use, David was a slow learner and took a long time to understand the system. Even though he realised the steep learning curve he was on, having had no prior experience with computer systems, he told me he knew it was worth persevering. When, by pure coincidence, a few extra inspector positions opened up in early 2005, David made himself available for these. David got the job because, as the systems engineer told me, of his prior experience with GTP. To see him manning his inspection station nowadays, David is a changed man — someone who not only seems to be really enjoying a new lease of life, but widely regarded as one of the best inspectors at time of writing.

Another inspector whose life was positively influenced by GTP is Johannes (full identity concealed for reasons of anonymity), an ex-inspector who is now a data analyst with his own office. Johannes, in his early thirties, was a relative youngster amongst the inspector group comprising mostly of individuals over forty years of age. Johannes' talent was evident during the training sessions where he grasped the skills and concepts so quickly that he was eventually alleviating the load on his trainer by helping out his fellow trainees. While not attempting to sound self-important, I am of the belief that my recommendation at the end of the training played a large part in raising awareness of Johannes' previously undiscovered talent. Two months after his GTP training, Johannes was appointed as the *Body-In-White* representative in a committee that reviews rework bookings in *Assembly Plant*. His current day-to-day duties involve running and analysing reports about reworks caused by *Body-In-White* defects in *Assembly*. There is little doubt in my mind that more personal success stories, such as those of Johannes and David, will emerge over time.

5. Discussion

5.1. Justifying the research approach

As has already been mentioned earlier, most prior research on technology acceptance has been conducted from the positivist perspective of attempting to predict and control social behaviour. In the following few pages, I will re-visit some of the main reasons why I opted for a CST research framework despite it being a framework that has rarely being adopted by technology acceptance research. I feel there is a need to defend my choice in approach since many critics will attempt to find fault with me having rejected the use of more established technology acceptance-specific theories. Although some of the limitations of predictive models have already been discussed in *Chapter 2.1.5.3.*, it is worth discussing some of the issues that compelled me to choose the CST perspective instead of attempting to fit my study into a credible, but unsuitable, framework.

It has been argued already that researchers who advocate the use of predictive models in matters of the social world can be classified as functionalist (or positivist) in their approach. Hirschheim & Klein [1994] classify a functionalist as someone that, theoretically at least, perceives himself / herself to be a remote observer, and thus does not interfere with the subjects and life processes he / she is studying. Bearing in mind the notion of a researcher as a "remote observer", it follows that it would have made little sense for me to have adopted a similar functionalist approach when one considers the extent of my involvement in most aspects of the project. I could argue that had it not been for my involvement in the project, the story may have followed a different path. In stating that, I am not implying that things would have turned out better or worse, but merely that it would have been different. If one were to judge things critically, I could not have been any further from being a "remote observer" — in my role as chief agent of change, I worked, interacted, and socialised with the product inspectors through almost every step of the GTP implementation process. In addition, as their trainer and system mentor, I was given a platform from which I was able to influence the attitude and behaviour of my group of inspectors, while, in turn, as my research subjects, the inspectors were able to shape my previously conformist views of technology acceptance.

Despite what detractors of CST may say, they may find it difficult to argue against the fact that only CST could have been able to expose the underlying political tensions that were so central in this implementation project. Without a proper appreciation of these power struggles, I believe that the resulting acceptance (by all stakeholders) of the system may not have been so successful. With South Africa being one of those countries whose history is inexorably so linked with struggles of inequitable power distribution, could we have afforded to overlook the political struggles involved in introducing an IS to a previously disenfranchised group of individuals? Would the use of a theoretical model such as TAM been as effective at highlighting these issues? Under the right circumstances, TAM would certainly have provided some answers, but for those interested at looking a little bit deeper than the surface, would it have provided the necessary insight?

Another factor that favoured the rejection of using a predictive model such as TAM in this study is the lack of flexibility it demonstrated when it came to measuring the user perceptions that are so central to it. As has already been mentioned, the pilot study that preceded the main study showed up how difficult it can be to accurately measure the *usefulness* and *ease of use* perceptions of users who have little appreciation for, or knowledge of, such concepts. Studies in the developed world take it for granted that anyone will be able to fill out a questionnaire that will accurately depict the opinions of that person. I found that self-reporting measures were not as successful in the context of South African shop-floor workers.

There were a couple of questions, borrowed directly from Davis [1989] that the respondents of the pilot study were not able to understand. For example, some individuals did not understand the concept of “effectiveness”, as in “Using GTP would enhance my effectiveness on the job”. Another item that caused problems was “I would find GTP to be flexible to interact with”. In addition to the problems of comprehension, the trust factor weighed heavily on the respondents’ minds. As one inspector jokingly told me, “*The Man* is going to try to use this against me!” All jokes aside, however, what he articulated is what many of his colleagues were thinking anyway. With application of predictive models being so reliant on user information acquired from such questionnaires, would it have made sense to rely on information

that had such credibility issues? It is also important to note that the average South African has not (yet) been as heavily exposed to the culture of phone or user satisfaction surveys as may be the case with North Americans, for example. This is particularly true for individuals from poorer socio-economic backgrounds. Whereas the average South African from the suburbs may have been asked to fill out questionnaires at the supermarket, or has had to put up with phone calls from the car dealership regarding service quality, those of lower socio-economic status generally miss out on this type of interaction. The combination of all these factors lead me to realise that I would have to find an alternative means of extracting the subjective opinions of my research subjects, but that doing so would result in leaving TAM out of the equation.

With the benefit of hindsight, looking back at the research process now, it certainly seems that it would have been a mistake to attempt to fit this study within an inflexible functionalist framework such as TAM or UTAUT, since it is highly probable that the resulting findings would have been academically flawed. Ironically, by rejecting the established technology acceptance framework, this thesis actually opens itself up to far more criticism than would have been the case if it followed convention. These critics should realise that CST recognises the difference between *observing nature* and *observing people* [Ngwenyama, 1991]. Since there can be little argument that this thesis deals with the study of people in their social world, a critical researcher would counter-argue that it would be ontologically inappropriate to observe them through the same lens used as when observing the natural world.

In conclusion, by adopting a critical perspective, a researcher undertakes to focus on what is wrong with the world, whether it be political inequity, underprivileged groups of people, or inherent structural injustices, rather than what is right with it [Walsham, 2005]. At the same time one cannot deny that the place for research about what is right in the world is equally justified. For this reason, I believe that the perspective adopted in this thesis should be seen as complementary to all previous work done in this field, and not in opposition to them.

5.2. Broadening the horizons

Over the decades, TAM has evolved into a more complex model with the number of variables that it uses to predict system usage growing from five to ten in TAM2, and nine in the case of UTAUT. This trend may indicate that there is a good probability that any further updates may involve the integration of even more variables. Is this growing complexity a good sign for this group of predictive models, or not? Looking at it superficially, one would imagine that a model that incorporates more variables allows for more accurate prediction — a model that provides a better fit, as statisticians would say. This seems to be the case with UTAUT, the latest incarnation of TAM, which, according to its creators, explains approximately 70% of variance. However, when looking at this expansion in the number of variables a little bit more deeply, one could also come to the conclusion that technology acceptance researchers are beginning to realise that there may be more to technology acceptance than they had originally thought. Could it be that they are realising that *perceived usefulness* and *perceived ease of use*, are not as central to technology acceptance as they have lead us to believe? Furthermore, a model comprising of more variables normally signifies more complexity when it comes to its application, as has already been discovered with TPB.

In the case study presented in the previous chapter, it was argued that user perceptions of the emancipatory potential of the new system played a major role in its successful acceptance. I believe that due to the technical interest that underpins the enquiry of current technology acceptance research, potential emancipatory drivers of acceptance have, so far, gone largely unnoticed. That is why I agree with the view that a CST approach presents a more holistic view of technology acceptance, since CST supports a multi-disciplinary approach to IS research. Even though CST may not be as appropriate as other technology acceptance models at measuring traditional elements like *perceived ease of use*, it proved appropriate at highlighting certain aspects like emancipation. It is due to this broader research scope that I believe I was able to present a richer picture of technology acceptance than would have been the case with solely making use of TAM or UTAUT.

Furthermore, one has to wonder whether it would have made sense to attempt to predict the product inspectors' actual system use (as this is what predictive models like TAM attempt to do). Given the fact that use of the GTP system is compulsory, there was no need for TAM to predict whether the product inspectors would be using the new technology because, in reality, they had no choice on the matter. The inspectors' managers had already warned them before system implementation that if they chose not to use the system, they would be "free to find other employment".

So should the Information Systems field be restricted to viewing technology acceptance through the lens of positivism only? Surely cases where system usage is compulsory should not be dismissed merely because *actual system use* does not need to be measured? This begs the question of whether it should be the only measure with which to determine the successful introduction of a new technology. While it is not being argued that *actual system use* should not be a measure, in the case study there were other behaviours that could have been used to measure the level of technology acceptance too: the product inspectors' increased sense of self-worth, increased enjoyment levels, and productivity are just three of the measures that would have provided an indication of the positive influence that the new technology had on their work lives.

The CST perspective and Habermas' emancipatory interest, in particular, added a completely new dimension to the technology acceptance story recounted in this thesis since the primary objective of CST is the improvement of the human condition. The improvement of the human condition is achieved by finding more desirable alternatives to existing social conditions [Habermas, 1972]. The GTP system proved to be the desirable alternative in the case study due to the different levels of emancipatory potential that it provided the product inspectors using the system. With the aid of GTP the product inspectors managed to become, for the first time in their working life, the masters of their own destiny. Within their organisational context, at least, the inspectors now have the means and the capability to change their own situation.

Habermas' *Theory of Communicative Action* (TCA) highlights another important role that the new system played in terms of social discourse. TCA states that all

participants in social discourse should benefit from an equal opportunity to initiate and sustain communication, with the communications process being as transparent as possible [Heng & de Moor, 2003]. The GTP system has gone a long way towards redressing the injustice being felt by the inspectors when it came to decisions regarding product quality. The reader is reminded of how the team leaders would regularly overrule calls made by the inspectors in the days prior to GTP. A large part of the responsibility for that distorted communication process lay with the lack of transparency with this process. The management team certainly had no idea or, at least, no hard evidence that such practices were going on. This was another classic case of the more powerful enjoying more than their fair share of control due to an inadequately transparent process of communication.

By embracing their new GTP system, the product inspectors, both as individuals and as a group, have slowly begun the process through they can remove the many obstacles that have long stood in their way of achieving emancipation. The CST perspective provided the focus with which to expose and overcome the unwarranted internal and external compulsions that have kept them from achieving their full potential as human beings. As has been illustrated already, many of these compulsions were overt forms of social domination institutionalised by both their country and company. One inspector expressed that his near 30 years of employment at the organisation has, in many ways, felt very much like a life sentence, likening the shop-floor to a prison from which he could not escape. He explained how during his time at the company, he has been doing the same job since he was unqualified to do anything else. At the end of the day, he is forced to stay there because at least he earns just enough money to keep his family of six alive.

While on the point of liberty, one point that has not been covered in this thesis so far is the *repressive* potential that the new information system could have for the product inspectors. Klein & Huynh [2004:32] remind us that a major goal of implementing IS in an organisation is “to support various forms of social compliance through administrative or managerial measurements and reports.” The GTP system will, as has already been explained to the product inspectors, make them more accountable for their actions than ever before. Every result saved, as well as every inspection missed, will be glaringly obvious to their managers and team leaders in the form of the quality

management reports that the system makes available (refer to *Appendix I* for an example). Only time will tell if these reports will become another type of social domination from which the product inspectors will seek emancipation in the near future. In the meantime, however, only a couple of isolated incidents of management intervention have taken place. To be fair to the management team, these few incidents involved individuals who were not doing the work they are paid to do. As a first transgression, they were fortunate not to have disciplinary action taken, but surely it cannot be fair for these few individuals to expect emancipation while, at the same time, being unwilling to do the work they are being paid to do. What should be kept in mind, though, is that the increased monitoring (or policing) that is taking place because of the GTP reports does not only expose underperforming inspectors, but any welder, manager, engineer and team-leader that is not pulling their weight. If that is the only drawback to increased efficiency and quality control, then monitoring may not be as bad as the term initially suggests.

5.3. Generalisability

Qualitative and quantitative researchers have opposing views on what constitutes generalisability. Simply put, the term 'generalisability' can be defined as the degree to which the findings from study sample can be generalised to the wider population. In interpretive research, for example, it is perfectly legitimate to generalise within a single setting since the aim is to make rich description possible and not to codify abstract regularities or generalise across cases [Lee & Baskerville, 2003]. In positivist research, on the other hand, the ultimate aim of studying across many contexts would be to come up with universal laws, by means of inductive reasoning, that explain and govern everything. Inductive reasoning is a reasoning process which begins with statements of facts being concluded with a general statement.

However, empiricists have yet to satisfactorily deal with 18th century Scottish philosopher David Hume's problem of induction. While most people assume that knowledge gained from past events can serve as a reliable guide for predicting similar future events, Hume challenged that assumption on the basis that induction itself cannot be established as a valid means of empirical investigation [Lee & Baskerville, 2003]. He reasoned that inductive conclusions could only be made from "premises

(such as the uniformity of nature) that themselves required inductive warrant, or from arguments that were inductive in the first place" [Rosenberg, 1993:75].

The conclusion that can be drawn from Hume's problem of induction is that induction (or generalisation) cannot be logically justified. Therefore, the stated aim of positivist research, which is to come up with universal laws that can be applied to any context, is undermined by its assumption that induction is a valid means of proving its theories. The fact that it is this self-same assumption that underpins the existing theories in IS technology acceptance serves as a reminder that generalisability across contexts may not be as important as many researchers believe it to be. The end result is that a theory may never be generalised to a setting where it has not yet been empirically tested. I do not believe my study is of any lesser value because it does not attempt to generalise across different contexts. As it turns out, the predictive models developed from empirical methods need one instance of non-conformance to break the perception that it is generalisable across different contexts. In the case of TAM, for example, a few of the studies reviewed in *Chapter 2.1.5.1.* demonstrate its shortcomings in that regard.

However, with all these factors in mind, the question remains whether the research framework adopted in this thesis may be applicable to some other studies. What if the variables that seemed to make this case study unique, were, in fact, not so unique? Could other scenarios exist that would also benefit from a CST perspective being applied to technology acceptance?

The story told in the case study is an account of how the shop-floor worker, victim of previous oppression and injustices, aspires to the hope of a better life through the emancipatory potential that a new information system offers him. Is it a uniquely South African story of the how the perennially oppressed get a one final chance to prove to everyone that they really are worth something? Even though the type of research done for this thesis is not really interested in generalising outside its setting, it would be interesting to see what type of results would emerge from different geographical settings such as China, Brazil, India, or elsewhere in Africa; somewhere where the gulf between the "haves" and the "have-nots" is equally substantial.

Obviously, the assumption being made here is that it is that political dynamic that revealed the emancipatory potential drivers of technology acceptance.

Indeed, to view results of studies done in different industrial settings within South Africa itself may also be of interest. Could it happen that a situation where users who view the adoption of new technologies as a chance for emancipation not even be unique to the automotive industry? How about industries such as clothing and textile, mining, agriculture, and construction, to name but a few? What these industries have in common is their heavy reliance on the mostly unskilled black labour market to do the unskilled jobs it requires. Could it be found that individuals may exist in these contexts who share similar ambitions to the CARCO product inspectors?

6. Conclusion

When referring back to the research objectives stated in *Chapter 1.4.*, the reader is reminded that one of the intentions of this study was to present a case for broadening the scope for technology acceptance beyond the conventional predictive models like TAM and UTAUT. Since this thesis deals with only one case study that exhibited a relation between emancipatory interest and technology acceptance, it cannot endeavour to completely establish every aspect that a new, all-embracing theory on technology acceptance would have to cover. However, it does take that first step towards the development of such a theory by offering a fresh angle, based on a CST research perspective, from which to view technology acceptance.

Another of the stated objectives was to attempt to present a balanced viewpoint by contrasting conventional technology acceptance theories (and their underlying theoretical assumptions) with CST thinking. As was stated at that point in time, this approach was adopted in an attempt to convince the reader that the CST perspective provided the more balanced and detailed explanation of the specific technology acceptance study covered in this thesis. One consequence of taking this approach was that the weaknesses of the positivist theoretical foundations of current research on technology acceptance were discussed at length. The reason for discussions taking place at all was due to the inability of TAM to provide a comprehensive explanation as to *why* the product inspectors in the case study decided to embrace their new information system. By viewing the case study through the lens of CST, however, it emerged that it was the potential for emancipation that the new system offered them that lead to a successful acceptance. It is perhaps unsurprising that technology acceptance research from the positivist perspective has never addressed the issues concerning emancipation and the redressing of political disparity.

Before covering the subject of the emancipatory potential of the new system, it was essential for the reader to understand the organisational and social reality of the product inspectors, meaning that the bulk of the fourth chapter had to be dedicated to describing their organisational environment, work processes, and power relationships. Once that context was established, it was then a simple matter of describing the new

system, the technical and political changes it would effect, and the potential the product inspectors saw in the system to improve their lives.

By choosing to embrace their new GTP system, the product inspectors have taken the first step towards removing the many obstacles that have long stood in their way of achieving emancipation. As put forward in *Chapter 4.6.*, the GTP system promises three levels of emancipation, each level taking an inspector closer to his ideal of being better able to provide for his loved ones. Eighteen months after this study originally started, it seems that the majority are in the process of achieving at least a couple of these proposed emancipation levels.

Throughout my participation in this research, I did not seek to deduce simplistic, universal laws or theories, for the simple reason that I had an appreciation for the unique conditions that all the individuals (myself included) found themselves in. Therefore it cannot reasonably be expected that the results of this study can ever be replicated or generalised in the same way that positivist research would let us believe is possible. Even so, there may be no denying that certain insights gained during the study could be applicable in other situations where similar conditions are experienced.

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Definition of terms

Assembly plant: The manufacturing facility where the mechanical, electrical and electronic components are fitted to the vehicle, as well as the drive-train and trimming.

Body-In-White*:* The new name for the manufacturing facility where outer metal shell of Plant Industryville's new model range is assembled.

Checking fixture: A device used to verify the dimensional integrity of a finished product.

Connection: The generic term used to describe the joins created by welding operations when fusing metal parts together.

CKD: see *Completely knocked down*

Completely knocked down (CKD): An automotive term for assembly components shipped into a country to be assembled there.

Critical Social Theory: A label used by the members of the *Institute for Social Research* of the *University of Frankfurt* (*a.k.a.* the *Frankfurt School*) to describe their orientation toward radical social change.

CST: see *Critical Social Theory*

Emancipation: The act of setting an individual, or group, free from the power of an oppressive force, be it slavery, subjection, dependence, or other controlling influence.

Emancipatory interest: The cognitive interest oriented towards exposing, and, subsequently, overcoming unwarranted internal and external compulsions [Ngwenyama & Lee, 1997].

Emancipatory potential: The potential that an information system has to free its user from the unwarranted internal and external compulsions that keeps them from achieving their full potential as human beings.

Empirical: Something that is derived from experiment and observation instead of theory.

Floor Group cell: The first production area in *Body-In-White* where the three sub-assemblies (*viz*. *Front End*, *Rear End*, and *Centre Floor*), which constitute the lower half of the vehicle, are made.

Floor Group Complete line: The production line in Body-In-White where the three sub-assemblies from the Floor Group cell are joined.

Graphical Test Plans: The information system which links to a database which contains all the productive connection data used in the Body-In-White manufacturing process.

GTP: see **G**raphical **T**est **P**lans

Hanger system: This system is responsible for picking up units from their current location and moving them to a new location that is not necessarily the next step in the production sequence for the. For instance when a unit requires reworking, the inspector will request the hanger system to pick the unit off the production line and take it to the rework station.

Inspection cycle: The (usually) pre-determined period of time taken to perform one inspection. This cycle varies depending on inspection type and inspection station.

Inspection station: A designated area where units are inspected by the product inspectors for quality problems and defects.

Inspector: see *Product inspectors*

Inspection schedule sheet: The sheet that indicates to the product inspector what his inspection schedule and sequence will be for a given day.

Inspection station: The designated work-area on the shop-floor where inspections take place.

Likkert scale: A questionnaire format that require respondents to specify their level of agreement to each of a list of statements.

Main Line: The production area in *Body-In-White* where the structural outer parts of a vehicle, such as the side frames, back panel and roof, are added to the floor group.

Neo-humanist: Someone who supports radical transformation at personal, social, and governmental levels, but in a non-violent manner. A neo-humanist believes that those in position of power attempt to hoard all of it, while at the same time fighting to keep the *status quo*.

Operator: A generic CARCO term used to describe someone who does manual labour on the production line.

Paint Shop: The manufacturing facility where the body shells go through paint preparation and application.

Perceived ease of use: "The degree to which a person believes that using a particular system would be free of effort" [Davis, 1989:320].

Perceived usefulness: "The degree to which a person believes that using a particular system would enhance his or her job performance" [Davis, 1989:320].

Perceptron: A laser scanning robot that can nearly instantly inspect bodies for defects check if all alignments and measurements fall within allowed tolerance.

Process control console: A screen found on the shop-floor which offers the user the functionality with which to program or over-ride the production process control systems.

Product inspectors: The shop-floor personnel responsible for quality assurance of manufactured units.

Production cycle: The pre-determined amount of time (220 seconds at time of writing) taken for a production unit to move from the one manufacturing process to the next.

Product Verification Card: A paper card on which a product inspector notes defects found during his inspection.

Production line: The mechanical system on which the production unit is transported through various places where successive operations are performed on it.

PVC: see *Product Verification Card*

QSYS: The quality control information system used in the Assembly plants of the CARCO Group.

Reworking: The process of rectifying defects or quality problems on a unit.

Rework station: The designated work-area on the shop-floor where reworks take place.

RF radio: The 2-way radio communication medium used in the production environment.

Roll–out: The initial public exhibition of a new information system.

SAP: An enterprise information and management package that makes it possible to track and manage an organisation's sales, production, accounting and human resources.

Shop-floor: A term used to describe the ordinary workers in the plant, as well as the workplace.

Side-tracking: The action of taking a unit off the production line to be either inspected or reworked.

Sub-assemblies: The add-on parts of the body shell, i.e. side-frames, roof, etc.

TAM: see *Technology Acceptance Model*

Technology Acceptance Model: Originally developed by Fred Davis and Richard Bagozzi, the *Technology Acceptance Model* (TAM) is one of the most influential extensions of Ajzen and Fishbein's *Theory of Reasoned Action* (TRA) in information systems literature. TAM replaces many of TRA's attitude measures with two technology acceptance measures — ease of use and usefulness.

Team leader: A shop-floor leader of teams of operators and product inspectors.

User acceptance testing: The kind of testing where monitored users establish whether a system meets all their requirements and will support the business process for which it was designed.