Business to Business Process Integration: Technical and Social implementation considerations

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Abstract

The purpose of this study is to understand the technical and social considerations of implementing business to business processes integration. In order to do so, a study was undertaken of two processes used by a local vehicle manufacturer to integrate their operations with those of their suppliers. Structuration theory was used to situate the findings. It was found that technology is a powerful enabler, but can also constrain human agency in terms of process execution. Competitive advantage, identified as the main driver for business to business process integration, is enabled by technological and process structures, but can only be maintained by enabling human agency.

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Table of Contents

List of Figures

List of Tables

Acronyms

API   Application Programming Interface

B2B   Business to Business

BPM   Business Process Management

BPR   Business Process Re-engineering

DCSA DaimlerChrysler(South Africa)

EAI   Enterprise Architecture Integration

EDI   Electronic Data Interchange

ERP   Enterprise Resource Planning

ISO   International Standards Organisation

IT   Information Technology

JAD   Joint Application Development

VAN   Value Added Network

Chapter 1: The problem and its setting

*"Experience is, for me, the highest authority. The
touchstone of validity is my own experience. No
other person's ideas, and none of my own ideas,
are as authoritative as my experience. It is to
experience that I must return again and again, to
discover a closer approximation to truth as it is in
the process of becoming in me."*

(Rogers, 1961: 14)

This paper started as an idea: an idea that business-to-business process
integration is the panacea of business models. The researcher was lucky
enough to be given an opportunity to experience business to business
process integration by working in a company that integrate their processes
with other companies in a variety of ways. Through this experience it was
found that the ideal of integrating processes across organisations is not easily
achievable. There are limits in the form of available technology. There are
organisational cultural issues to consider as well as the social aspects that
include the individuals who participate in the process.

In writing this paper, the researcher shares her experiences to "discover a
closer approximation to truth" (Rogers, 1961: 14). In order to make sense of
these experiences, Chapter 1 describes the context as well as the theoretical
background that informed the conclusions drawn from this study. Describing
these experiences is a direct result of the rationalisation of the researcher as
an agent in discursive reflection. The 'truth' is therefore only valid for the
specific time and place as described in Chapter 1 and not an ultimate or
universal truth that can be discovered.

The rapidly changing IT environment causes the technological landscape and
its related social implications to constantly shift in meaning. Because of these
constant changes it is essential to take a snapshot of this context to provide

an accurate background against which business to business process integration can be studied. The background not only consists of a description of the specific time and space in which the integration occurs, but also the theory that informs how this is interpreted.

The main purpose of this chapter is to provide the necessary background to situate process integration within a larger context. The writer's world view of this context is also described as this will provide further contextual information that will form the basis for the rest of the paper.

1.1 The Problem

The widespread availability of internet and communication technologies has opened up new possibilities for companies to do business. In a competitive business environment it is unlikely for companies to succeed if they have not adopted some form of e-business strategy (Rodgers *et al.*, 2002). E-commerce allows companies to focus on their customers while e-business expands the connectivity that companies have with their suppliers, employees and business partners (Rodgers *et al.*, 2002). Adopting e-commerce has resulted in increased customer service, increased profitability and increased competitive advantage (Rodgers *et al.*, 2002). The competitive advantage gained through e-commerce is however not sustainable as business conditions change rapidly and competitors soon catch up by deploying the same technology (Nonaka, 1986). It is therefore necessary to identify ways in which competitive advantage can be sustained.

In order to respond speedily to changing business conditions, an increased level of connectivity is necessary. This has created a need for internal and external business applications, systems and staff to be effectively linked (Zhu *et al.*, 2004). Currently, large companies are spending over 30% of their IT budget on integrating business applications internally to bring together the fragments of their 'stovepipe applications' (Baker *et al.*, 2002). Integration outside the organisational boundary has however been limited to interactions which include file transfer, EDI, message queuing, B2B gateways, direct database access and custom point-to-point coded interfaces (Baker *et al.*,

2002). The result of this has been a partial integration which, although increasing efficiency, has created 'pockets of integrations' across the value chain with some areas remaining un-integrated (Baker *et al.,* 2002).

Baker *et al.* (2002) identifies the supply (value) chain as the key for gaining competitive advantage, since various companies are involved in delivering goods and services to customers. Rapidly changing business conditions means that companies are still reliant on their suppliers to provide what is needed at the right time (Chen *et al.,* 2004). In order to respond effectively to rapidly changing business pressures, it therefore stands to reason that the entire supply chain needs to be managed in a way that provides competitive advantage. Hammer (2001: 13) identifies streamlined cross-company processes as the next frontier for "reducing costs, enhancing quality and speeding operations". The focus of the integration effort should therefore be on end-to-end business processes rather than the technical integration of applications and data.

That being said however, the methodologies for the technical integration of applications and data are well documented. Documentation of the technical integration of end-to-end business processes are however not so prolific. Many companies have only recently started discovering and modelling their own processes as the first step of moving towards business process management. The internal level of technical integration necessary for process management must necessarily precede any integration with external parties.

A process however does not only consist of technical aspects. Despite the success stories documented, Hammer and Stanton (1995) report that as many as 70% of companies who performed a self assessment, admitted that their Business Process Re-engineering Projects (BPR) failed. Katzenstein and Lerch (2000) equate these failures to the people within the organisation being ignored. The social aspects are not always well defined or understood. Some writers (Greasley, 2003; Chang, 2004) group all social aspects under the heading 'change management'. This includes communicating changes,

including stakeholders in decision making, advocating the benefits resulting from the change and being honest about the less desirable effects. Although change management is of vital importance when making any process changes, there are numerous social aspects that need to be considered in day-to-day operations.

Katzenstein and Lerch (2000) provides a good overview of the social aspects when making process changes during a project phase, but little is said about the social aspects that users of the process have to deal with on a daily basis. Aspects such as organisational power and politics; organisational structure and culture; and, legal compliance and globalisation are often not emphasised enough to ensure that process integration is maintained in an operational phase.

The manufacturing environment provides an ideal opportunity to investigate how cross-company processes can be used as leverage to gain a higher level of competitive advantage. Vehicle manufacturers need to improve the way they do business in order to maintain a competitive business model (Car manufacturing, 2001). One way employed by manufacturers is 'lean manufacturing'. Lean manufacturing is a holistic management programme that is designed to eliminate waste (Liker, 2003). The key principles include:

- Pull processing - products are pulled from the consumer end, not pushed from the production end
- Perfect first-time quality - quest for zero defects, revealing & solving problems at the source
- Waste minimization – eliminating all activities that do not add value & safety nets, maximize use of scarce resources (capital, people and land)
- Continuous improvement – reducing costs, improving quality, increasing productivity and information sharing
- Flexibility – producing different mixes or greater diversity of products quickly, without sacrificing efficiency at lower volumes of production

- Building and maintaining a long term relationship with suppliers through collaborative risk sharing, cost sharing and information sharing arrangements (Liker, 2003)

The implementation of programmes such as 'lean manufacturing' results in fewer opportunities for improvement within the boundaries of the manufacturing plant. It therefore stands to reason that manufacturers will start looking elsewhere to make themselves more competitive. As a result, the supply chain becomes the most logical place to look for improvements. By setting up collaborative and co-operative relationships with their suppliers (the differences in these relationships will be discussed in section 3.2.2), local vehicle manufacturers focus on finding ways to integrate their processes with those of their suppliers. This is being attempted in various ways with varying rates of success.

In conclusion, embarking on business to business process integration is not a simple exercise. High levels of integration need to be in place internally before processes can be extended to include external partners. There are various technical tools available to facilitate process integration on a technical level. The social level has however been neglected and few tools and methods are in place to manage these aspects. The social aspects are further complicated when seen against the background of globalization.

The purpose of this paper is to understand and describe the technical and social aspects associated with integrating processes across the entire value chain.

For the purposes of this paper, the focus will be on one local vehicle manufacturer. Two separate processes used by the manufacturer to integrate their processes with those of their suppliers, have been identified. These processes are: a) Ordering parts from a local supplier; and, b) Ordering parts from an overseas supplier; these processes were specifically chosen because of their similarities in terms of process execution, but their differences in terms of their social implications and the technologies that support them.

By describing these processes and interviewing the role players who support and execute them, an attempt will be made to provide a depiction of the technical and social aspects of the specific processes. From there, common themes will be identified that will provide a contextual basis for understanding what these aspects are.

The next section will describe the research methodology. These theoretical underpinnings will provide the context from which the available literature will be reviewed. A full description of the processes mentioned above will be provided in section 4.3 to facilitate the discussion of each of the identified themes.

1.2 Research Methodology

1.2.1 Definition of Information systems

Information systems is a relatively new field of study and the definition thereof varies depending on the perspective from which it is defined. Due to the rapid development of information technology and its influence on the social and organisational aspects of daily life, information systems can not be separated from its technical or social context. Although the academic roots of information systems are traced back more directly to computer science and software engineering, its influence on organisations and strategic management can not be ignored (Conford & Smithson, 1996).

The study of information systems is therefore dialectic in its nature to cater for both technical as well as social perspectives. The technological side provides information on specific components, referring to aspects such as hardware, software, databases, networks and procedures (Turban *et al.*, 2002). On the social side, the general aim is to understand the human influence on and usage of the technology (Conford & Smithson, 1996).

In their evaluation of various definitions of information systems, Conford and Smithson (1996) note four distinctive themes that emerge. These are:

1. The idea of purposefulness, goal direction and a defined need
2. The notion of information itself, its flow and its use in decision making
3. The relationship with organisations as the host environment within which we find information systems
4. The distinct parts of information systems containing manual procedures, databases, computers, interfaces and software.

In their definition of Information Systems Turban *et al.* (2002) explains that information systems collect, process, store, analyze and disseminates information for a specific purpose. They also highlight the importance of the social context within which information systems are located. This context is determined by the culture of the people and groups involved in using the system (Aranda *et al.*, 1998).

1.2.2 Research philosophy

According to Mingers (2003), most published IS research is underpinned by positivism. Positivism developed as a result of the scientific revolution and is based on scientific methods such as experiments, observation, experience and induction. The hypothetico-deductive model, depicted below, shows how some philosophers of science understand progress to occur. Incorrect theories are rejected based on empirical evidence that allow correct theories to be developed (Terre Blanche & Durrheim, 1999).

I N D U C T I O N

Theory

Hypothesis

D E D U C T I O N

Interpretation
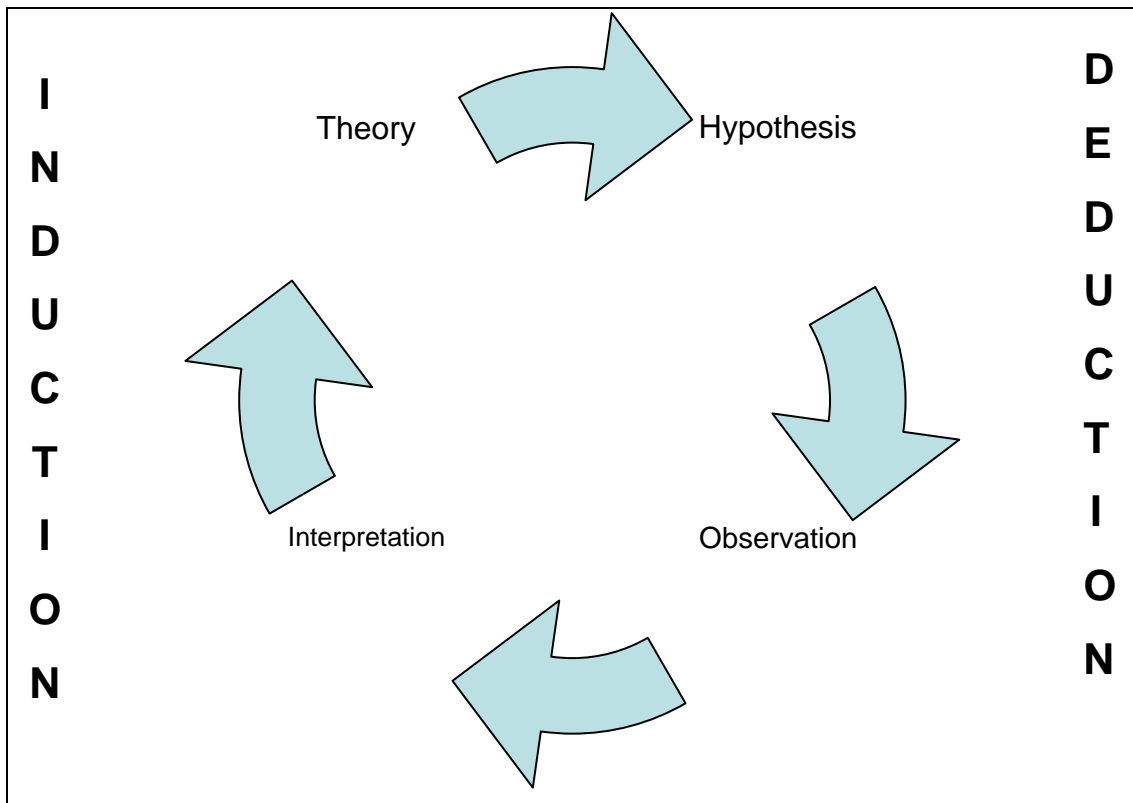
Observation

Figure 1 - The hypothetico-deductive model (Terre Blanche & Durrheim, 1999)

This model also illuminates the philosophical belief of rationalism since it assumes that prior knowledge categories and concepts exist and that these can be observed and logically deduced if enough rigor is applied (Terre Blanche & Durrheim, 1999).

On an ontological level, positivism believes that a stable external reality that abides to rules can be observed. This will allow a researcher to adopt an objective, detached epistemological stance. The aim of positivist research is to accurately describe the laws and mechanism that determine the observed outcomes. This can be done through quantitative studies, experiments or hypothesis testing (Terre Blanche & Durrheim, 1999).

Interpretivism departs from positivism by recognising that social research does not conform to scientific research paradigms. The intersubjectivity of the researcher in interpreting social action is based on an internal reality of subjective experience (Terre Blanche & Durrheim, 1999). The importance of the context is also acknowledged in understanding the action itself which can

be interpreted by the observer. This view is not specific to interpretivism, as more traditional scientific research is also starting to acknowledge the position of the observer as a non-neutral participant. Schools of thought developing in quantum physics, for example relative state formulation, also known as theory of the universal wavefunction or many-universes interpretation, recognises the historical and contextual aspects of phenomena (Barrett, 1999).

The aim of interpretivist research is to attempt to explain subjective reasons and meanings of actions. Researchers usually conduct qualitative studies that rely on interaction between the researcher and the subjects using methods such as interviews or participant observation (Terre Blanche & Durrheim, 1999). Qualitative Researchers are aware that they are interpreting data and that since interpretation is a process, interpretation will continue to occur as their relation to the world keeps changing (Bannister, 1994). Qualitative analysis can therefore also be seen as a debate rather than a fixed truth (Bannister, 1994).

The development of a social theory within the qualitative field can be traced back to the prominence of sociology during the Second World War. Earlier work done by Durkheim, Weber and Pareto in defining the 'action frame of reference' was further elaborated by Talcott Parsons to develop a social theory that was based on functionalism and a naturalistic conception of sociology (Giddens, 1984). Although Talcott Parsons felt that human actions are distinctive, he still believed that the social sciences share the same logical framework as the natural sciences. This view was criticized by Dahrendorf, Lockwood and Rex as being one sided. The influence of Marxism on their work is clear as they believed that their predecessors neglected the influence of class division, power and conflict. When the differences between Marxism and sociologists became more apparent in the late 1960s and 1970s, other influences such as symbolic interactionism, phenomenology and critical theory were given more focus. Although various points of view were being explored, a general shift was taking place in the way the relationship between the individual and the world was being viewed. Initially the individual was seen as powerlessly reacting to forces of the world that he or she does not

control or understand. However, the development of most of the social schools of thought such as structuralism casted the individual as actively participating and reflecting on the world around him or her. The importance of language as a means for individuals to reflect and take part in activities was furthermore emphasised as an integral part of this school of thought. In addition, the importance of empiricism also declined substantially during this period of development. Philosophers such as Popper and Kuhn were influential in this by rejecting empiricism based on their conclusions that problems being investigated arise from specific contexts. According to these philosophers, the hypotheses in themselves are generated by the researcher's prior knowledge and imagination (Terre Blanche & Durrheim, 1999).

Within this context, Giddens developed structuration theory. In structuration theory, Giddens presents structure and human agency as a mutually constitutive duality (Jones, 2004). It is an attempt to bring together the seemingly opposing points of views of Functionalism and Structuralism on the one hand and Hermeneutics and other interpretive sociological schools of thought. From a functional and structural point of view the social whole is more pre-eminent than individual parts (Giddens, 1984). Hermeneutics however emphasises that subjective and individual experiences are easier to grasp than 'nature'. From this perspective both the action and its meaning is important (Giddens, 1984). Structuration Theory does not only look at the existence of societal totality or the experience of the individual actor, but rather social practices ordered across space and time.

The basic tenets of structuration theory are as follows:
- Agency
- Structure
- Duality of structure
- Structuration
- Social integration and system integration, time space distanciation, routinisation

Each of these will be discussed briefly below.

1.2.2.1 Agency

Agency refers to the ability to make a difference (Giddens, 1984). One of the defining characteristics of agency is the ability to exploit resources in order to effect change. Resources can be grouped according to their ability to be authoritive (derived from the co-ordination of human activity) or allocative (control of material products or aspects of the natural world) (Giddens, 1984).

1.2.2.2 Structure

Giddens defines structure as "rules and resources recursively implicated in social reproduction; institutionalized features of social systems have structural properties in the sense that relationships are stabilised across time and space" (1984: xxxi). Structures exist in that they provide the ability of societal practices to exist within a structural form across a period of time. Structures are not only enabling, but also constraining. In the case of applying structuration theory to information technology, Orlikowsky and Robey (1991: 8) propose that technology should be seen "an occasion for structuring, because its presence provokes human interactions that may subsequently effect revised social structures."

1.2.2.3 Duality of structure

Structure and agency are dependent on each other and influence each other in a recursive way (Giddens, 1984). Social systems have structural properties that are "both medium and outcome of the practices they recursively organise" (Giddens, 1984: 25). Structure and human interaction are broken down into three dimensions (see Figure 2) and the relationship between them is shown as modalities.
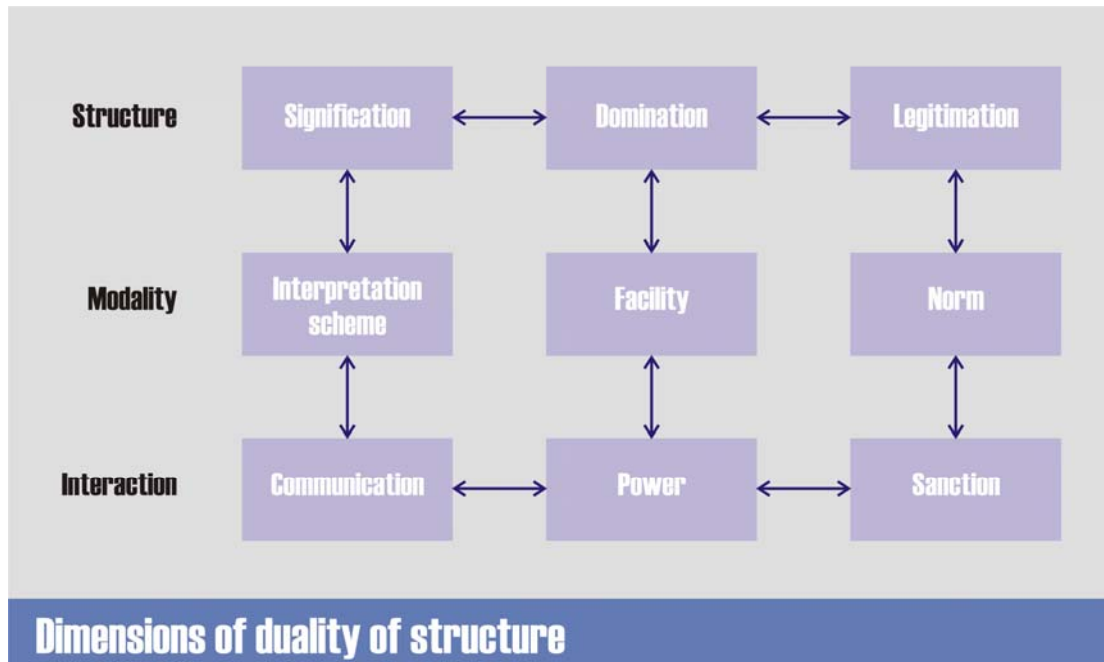
Figure 2 – Dimensions of duality of structure

The signification of a concept (produces meaning through semantic codes) borrows from and contributes to its legitimisation (produces a moral order via societal norms, values and standards) that co-ordinates forms of domination (which produces and is an exercise of power, originating from the control of resources).

1.2.2.4 Structuration

The process whereby duality of structure evolves and is reproduced over time and space is defined as Structuration. Structures are produced, reproduced and developed through human action which in turn is both constrained and enabled by existing structures. Giddens explains that "reflexive monitoring of action in situations of co-presence is the main anchoring feature of social integration" (1984: 191).

1.2.2.5 Social integration and System integration, Time space distanciation, routinisation

Social integration refers to "the reflexive monitoring of action in situations of co-presence" (Giddens, 1984: 191). System integration is however not dependent on face-to-face interactions. This helps to replicate social practices on a wider scale across time and space.

Social and systems integration allows for the embedding of social systems across time and space. As these are extended, the embeddedness of the integration is increased. This is important since structural properties of social systems will only exist "in so far as forms of social conduct are reproduced chronically across time and space (Giddens, 1984: xxi). Stability of these social practices across time and space will result in routines being formed. This constitutes the "habitual, taken-for-granted character of the vast bulk of the activities of day-to-day social life" (Giddens, 1984: 376).

Biazzo (2000) identifies four structural dimensions influenced by constraints and resources (as defined by Giddens (1984) - see Chapter 1). These dimensions are:

1. The technological dimension, which refers to the material artifacts (various hardware and software configurations) used by the actors in their work;
2. The power dimension (which is related to the asymmetric distribution of those resources that can be activated in order to influence behaviour).
3. The organisational rules dimension, that is, those specific formal norms that are developed within a given organisation which condition the individual's behaviour;
4. The ritual or cultural dimension;

As noted in section 1.2.2, there are different ways of doing research. For the purposes of this paper, the researcher has chosen an interpretivist approach. There is therefore an acknowledgement that the views expressed within this paper are socially constructed.

Giddens (1984) differentiates between different levels of consciousness including that which is tacitly known (practical consciousness), that which can be discussed (discursive consciousness) as well as the unconscious that is not known. Although the practical consciousness is not directly accessible, the researcher further recognizes that this tacit knowledge will influence this paper. Research conducted in a different way or by a different person, may therefore lead to different understandings.

For purposes of this study, structuration theory offers the capability of investigating both the technical as well as social aspects of business to business process integration through the duality of structure and agency. A process being executed in itself is a social practice; the 'how' something is done. In order to integrate processes either internally or externally, structures need to be put in place as enablers. Organisational structures and culture provide contextual rules and resources to allow actors to make sense of their actions (Orlikowsky & Robey, 2003). According to Giddens (1984) however, structures can also constrain social action. Political structures such as policies become structures within which processes need to operate in order to comply to either legal or organisational requirements. Human action is mediated by these rules and resources. As these rules and resources are used, they are reaffirmed and constituted (Giddens, 1984). Human action is therefore situated within the context in which they occur. Structures are also not independent of human actions and interpretations. Human agents, in and through their activities, produce and reproduce the conditions that makes those activities possible (Giddens, 1984).

Biazzo (2000) relates this to processes in two ways. These are:
- the conception of processes as a sequence of actions embedded in structures which are, simultaneously, both enabling and constraining;
- the recognition of the situated nature of the action.

These concepts will be further explored in the discussion of the case study in Chapter 5.

Structuration theory is essentially a social science theory which initially paid little attention to Information Technology (Wade & Schneberger, 2006). A study by Pozzebon and Pinsonneault (2001) found that IS Researchers used structuration theory in different ways. When categorizing 15 years of IS Research using Burrell and Morgan's (1979) categories they found that researchers applied Giddens' ideas in three different ways, namely:
1. Adaptive structuration

2. Mutual shaping
3. Actor's organizing

Carlsson (2003) bases his criticism of structuration theory on Reed (cited in Carlsson, 2003). According to Carlsson (2003), "Giddens' view on agency and structure is problematic when studying artefacts in IS" (2003: 3) due to its duality (the inability to separate agency and structure from each other). This criticism is based on comments from Reed (cited in Carlsson, 2003: 3) who accuses structuration theory to be too narrow-mindedly focussed on "situated interaction and local conversational routines" to provide the necessary institutional underpinnings or context. In order to understand the relationship between organisations and information technology, Orlikowsky and Roby (1991) however places information technology centrally in the process of structuration. The duality of information technology is both constituted and constitutive of organisational action (Orlikowksy & Robey, 1991). It would therefore be problematic to study artefacts in IS without taking its duality into account.

Reed's (cited in Carlsson, 2003) criticism is specifically relevant for this study as a narrow minded focus on locality, although providing communicative meaning, necessarily has to be expanded when considering the end-to-end nature of business processes. This is especially true when looking at business processes across the entire value chain. Archer (1990) and Layder (1987) argue that Giddens undermines the pre-existence of structures without the determination of action.

Rose and Scheepers (2001) believe that Structuration theory is too complex to be applied in its entirety. They therefore suggest that "relevant concepts must be selected and adapted" to have value for the IS Community (Rose & Scheepers, 2001: 219). The lack of a discursive basis relevant to IS is noted as one of the main criticisms against using Giddens' work for an information systems study (Rose & Scheepers, 2001).

Giddens' focus is on the ontological content of social theory; however he does not provide the researchers with tools to apply this (Rose & Scheepers, 2001). Structuration theory, according to Rose and Scheepers (2001: 228), does not provide "normative models for practice, nor explicit models of change". The result of this is the ability to analyse social practice, but not define it.

These criticisms withstanding, the researcher, together with Orlikowsky and Robey (1991) believe that structuration theory provides a good theoretical basis from which to investigate the relationship between information technology, organisations and the processes that bind them. The duality of information technology focuses attention on how information technology, which is a product of human action, provides structural opportunities and constraints that shapes human behaviour. For the purposes of this study, the duality of technology, as described by Orlikowsky and Robey (1991), is also extrapolated to include the duality of business processes. Both technology, as well as processes, is the product of subjective human action within a specific context. At the same time, technology and processes also act as a set of objective rules that constrain and enable human action. Due to the duality outlined above, it was decided that structuration theory will be the most appropriate way to investigate business to business process integration.

1.2.3 Methodology used

A literature survey will provide the background information for this study. Although there is a dearth of academic writing available on Business to Business Process integration per se, there is a substantial amount of writings available on the various fields that enable and influence this 'ability'. The literature survey will gather the relevant comments in order to provide an overall view that can sufficiently describe the various aspects of Business-to-Business-Process integration.

The literature survey will provide the relevant knowledge base to investigate the various instances where business processes are integrated across the value chain at a vehicle manufacturing plant and its suppliers. Two specific

processes have been identified to study in more detail. A more detailed account of these processes is given in section 4.3.

The researcher is involved in supporting these processes on a day-to-day basis and is therefore able to participate in as well as observe and interpret the activities that take place to enable and constrain these processes. Other participants within the cases will be interviewed in both an informal and formal manner to provide additional interpretations of the cases under review. The participants were chosen to represent people who are closely involved with the processes as well as managers who oversee the work that takes place. It is anticipated that this will provide a more multi-dimensional description of the processes since these snapshots will be combined in a meta-narrative based on the researcher's interpretation. This meta-narrative will then be subjected to interpretation through the lens of structuration theory.

The researcher has been involved in the specific area for approximately one year. The level of participation over this year has changed as the role of the researcher adapted. At first the focus was on understanding the processes involved and documenting these. This established the structure in which the agents operate. Later a more focussed approach was taken when the researcher became involved in direct system support to specific areas of the processes. This focus provided a clear understanding of the more detailed aspects that are involved in integrating business processes across the value chain.

According to Terre Blanche and Durrheim, this type of participant observation "gets you closer to the action" (1999: 134). Although there are benefits to being closely involved with the area being researched, this also has its drawbacks. Existing relationships between the researcher and participants as well as the social context of the interaction largely dictated the way in which interviews took place. Where the researcher had a well established relationship with participants that were based on a good working relationship, the participants were far more willing to share their personal insights and provide their own opinions. In other situations, where the working relationship

was strained, participants were more guarded with their responses. Being involved with the processes on a daily basis provided an ideal opportunity to observe the processes "at work", however, personal successes and failures also influenced the interpretation of events. In order to verify interpretations they were shared with other participants to construct this paper.

The organisation that acted as the host for the case study is a global organisation that interacts with various customers and suppliers overseas as well as locally. Although the researcher was based in only one setting, the nature of the project necessitated that the global context be kept in mind at all times.

A total of 15 formal informants were used during the interviews to form the interpretations as captured in this document. Although these informants are classified as 'formal', the interview technique used included a narrative approach. In this the researcher was influenced by Mischler (1986) who described this approach as less restrictive for the respondent, thereby empowering them to say what they believe is important, rather than focussing only on the topics identified by the researcher. This having been said however, does not include the number of informal contributors who in some way, by their day-to-day comments, influenced the researcher to interpret the various cases differently.

The informal contributors to some extent can be seen as the most influential as their interaction (through their day-to-day work) with the researcher to a large extent influenced what aspects the researcher focussed on. Because of the participative nature of this case study, the researcher had an already established professional relationship with the various informants (informal as well as formal). The nature in which interactions took place was therefore less forced and more open. This also contributed to providing unguarded accounts of the current situation which allowed for the interpretive study to develop over the year of the involvement of the researcher. It was appropriate to use these accounts based on the work of Clandinin and Connelly (2000) who believe this type of interaction leads to both a cognitive

and affective involvement. Because of the direct involvement of the researcher with systems' support, the cognitive and affective involvement will assist in creating a better understanding of the circumstances under which informants operate.

There were also more formal settings where participants of the process were interviewed using a Joint Application Development (JAD) approach to document the processes involved. The formal documentation was added to the DaimlerChrysler(SA) process library after it was signed off by the relevant process owners.

The information provided in this chapter focused on describing the current situation that enables business to business process integration to emerge as a viable way of gaining competitive advantage. It also identified some of the broader technical and social implications of adopting business to business process integration. The way, which informs how these implications will be explored further in Chapter 2, was also described to acknowledge the position from which the writer will interpret these implications.

The structure of this paper will be as follows: Chapter 2 focuses on providing definitions and descriptions of the concepts that form the basis of this study. In Chapter 3, these concepts are further unpacked by looking at the specific aspects surrounding process integration on a technical as well as social level, as identified by various other writers. A real life situation (as experienced by the researcher) is then described in Chapter 4. This case study allows for the comparison between the aspects identified by other writers and the described case study in Chapter 5 before the final chapter documents the conclusions made.

Chapter 2: Business-to-Business Process Integration defined

Studies that focus on processes can be written from various different disciplines including organizational management, information technology, sociology and quality management to name a few. The way in which each of these disciplines defines processes depend on the point they want to bring across. Different definitions will result in different results being achieved. Traditional organizational management definitions of processes focus on the goal-directedness of processes whereas definitions from an information technology view define processes from a systems perspective. Writers such as Demming and Oakland provide an operational view of processes from a quality perspective (Pritchard & Armistead, 1999). Since this study includes both the social and the technological aspects of business to business process integration, a definition is necessary that will include more than just the goal-directedness and systems view of processes. The purpose of this chapter is to filter and combine many of the existing definitions to explain how business to business process integration is interpreted for the purposes of this study.

With the onset of Business Process Re-engineering (BPR) in the early 1990's, Hammer and Champy (1993) proposed that the reengineering effort provided a new business model. They were however challenged by writers such as Earl and Kahn (1994), Jones (1995) and Peppard and Preece (1995) who believed that BPR simply linked existing improvement programmes together in a novel way.

This debate has once again been brought into the spotlight due to the increased interest in business processes. Frankel (2003) believes that business process tools evolved from technologies used in Workflow and Enterprise Architecture Integration (EAI). Smith and Fingar (2003) criticize this viewpoint by explaining that although some vendor solutions have recognised the importance of process-centric solutions, some technologies cannot necessarily evolve as process solutions.

The variety of approaches provided from a process perspective only adds to the various discussions and debates. Kettinger *et al.,* (1997) identified more than 25 methodologies, 72 techniques and 102 tools for the modeling aspect of processes. Processes also form the basis for many International Standards Organisation (ISO) quality programmes (Melao & Pidd, 2000). At DaimlerChrysler South Africa (DCSA) the process documentation is used as a basis from which ISO certification, in the form of TS16949 (specific technical specification) compliance is monitored and controlled. The importance of this type of compliance will be discussed in more detail in section 5.2 of this paper. The popularity surrounding processes has created an opportunity for many vendors, practitioners and academics to air their views. Most role players however do not fully define what their understanding of a process is.

Melao and Pidd (2000) investigate the various process definitions and group these around four themes. In defining these themes, the authors recognize that definitions are multifaceted and therefore aim to provide a framework from which to discuss the main assumptions underlying BPM. These themes are particularly useful in terms of this paper as each definition highlights specific areas while obscuring others. In combination however they create a complementary, yet competing view from which business processes can be understood. Each definition will be briefly discussed below:

- **Business Processes as deterministic machines** – Authors such as Davenport and Short (1990), Hammer and Champy (1993), Armistead and Rowland (1996) and Kock and McQueen (1996) gives definitions of processes that are executed as a fixed sequence of activities that convert inputs into outputs to accomplish a goal. The drawbacks of this definition according to Melao and Pidd (2000) are that it ignores the human elements that participate in organization and sociopolitical aspects of processes. It also sees processes as static and ignores dynamic behaviour. The static nature in which processes are seen makes is easy to model (Melao & Pidd, 2000). This view is often used in a manufacturing environment where each task can be performed by an interchangeable person and managed by optimal organization.

- **Business Processes as complex dynamic systems** – In this view authors such as Earl and Kahn (1994), later works from Hammer (1996) and Zairi and Sinclair (1995) view processes in terms of their interactions and sees processes in a holistic view. Processes are seen as subsystems of people, tasks, structure, technology, etc. that all interact with one another in a specific environment that is demarcated by a boundary (Melao & Pidd, 2000). It relies on simulation to demonstrate the complexities and dynamics of processes. This view regards the human element as a resource and as with the previous definition, this one may not account for the organizational and sociopolitical aspects of human behaviour (Melao & Pidd, 2000). The cost and complexity of simulation is a further drawback.

- **Business Processes and interactive feedback loops** – This view is similar to the previous theme. The difference however is that the complex, dynamic system view uses an open systems approach, whereas this view claims that intrinsic controls are put in place by closed loop systems (Melao & Pidd, 2000). This view attempts to take internal structures and policies into account. Authors such as Pidd (1996); Vennix (1996) and van Ackere *et al.* (1993) all contribute to this view. Melao and Pidd (2000) criticize this view as it relies on a Systems Dynamic approach that is difficult to apply and thus very little evidence is found of how it is used.

- **Business Processes as social constructs** – The focus of this view is on the subjective and human aspects of business processes. People have different values, expectations and agendas resulting in processes being abstractions with meanings and judgements that are a result of subjective construction (Melao & Pidd, 2000). This view is useful when looking at strategic or less tangible processes where human activity is the main driver. Authors that support this view are Tinaikar *et al.* (1995), Galliers (1994), Patching (1995) and Chan and Choi (1997). Many of these authors also suggest using Checkland's soft systems methodology as a basis for modeling processes. Efficient designs may be inhibited by what Melao and Pidd refers as "the stress on cultural

feasibility" (2000:121). Although this view recognizes the political environment, it does not provide a method for dealing with the complexities of applying this viewpoint (Melao & Pidd, 2000).

Critics (Kettinger *et al.*, 1997) believe that the evolution of BPM has not resolved the internal contradictions of BPR and that BPM is simply BPR re-packaged in a new application. Although they are writing from a practitioner rather than academic point of view, Smith and Fingar (2003) disagree. Firstly, Smith and Fingar (2003) disagree with the definition of BPM as an application. Rather, they see BPM as an architecture for enterprise software systems (Smith, 2002b). Secondly, what Smith and Fingar (2002a) term the 'Third Wave' of Business Process Management, attempts to apply reengineering principles in a modern day business environment. The Butler Group (2004) agrees, but believes that BPM should distance itself as far as possible from BPR. By the mid-1990's, BPR had gained the reputation of being a downsizing tool with negative connotations (Butler Group, 2004). BPM can differentiate itself from BPR by capitalising on its strengths which are its modelling capabilities and interfaces in a model-centric architecture. In addition, the focus of BPM on inter-organisational processes will provide the necessary capabilities to look beyond the company's internal boundaries.

Various lessons were learnt from the earlier implementation of BPR. Academics such as Davenport and Stoddard (1994), Burke and Peppard (1995) and Grover and Kettinger (1995) have challenged the central tenets of BPR. This has resulted in a number of issues that currently form the basis for the process debates. The BPR tenets that form the basis for this dialogue are:

1. Radical versus Incremental
2. Clean Slate versus Existing Processes
3. Top-down versus Bottom-up
4. Broad versus Narrow
5. Mechanistic versus Holistic
6. Dramatic versus Modest
7. Inspiration versus Methodology
8. IT-led versus IT enabled

Although these debates specifically focus on re-engineering, the arguments also apply to general process methodologies. Each of these debates will be further discussed to define business to business process integration.

2.1.1 Radical versus Incremental

Hammer and Champy (cited in Ferrara *et al.*, 2001: 5) defined reengineering as: "The fundamental rethinking and radical redesign of business processes to achieve dramatic improvements". Turban *et al.* (1999) states that BPR is used when change is rapid and large whereas continuous improvement is used when change is slower.

Radical initiatives theoretically streamlined processes, but imposing them on cultures that were not ready for the change created more problems than it solved (Grover, 2003). Armistead and Machin (1997) found that BPR initiatives, which were insensitive to organizational culture, were in some instances directly involved in the failure of the projects. People resisted the changes that were being imposed, especially since BPR was seen as the reason for downsizing (Butler Group, 2002).

Neal *et al.* (2001: 40) identify four stages in the evolution of business processes:

- Business Reengineering
- Enterprise Resource Planning and workflow
- Development of tools for capture, editing and design of business processes, and
- The emergence of a common language to describe business processes and a Business Process Management System to execute and evolve them.

The first two stages saw process change as a one-time event due to the inflexibility of IT infrastructure and the rigidity of designed processes. The third stage captures business processes as data that can be edited and thus increase the ability to deal with change (Neal *et al.*, 2001).

Hammer and Champy (1993), however, viewed reengineering as more than a one-time event. Its goal is to put an operating model in place that encompasses process, organizational structure, management systems and cultural aspects. Once this model is in place, participants can use quality management techniques to improve processes. Reengineering is thus never finished (Ferrara *et al.*, 2001). One of the main tasks of a process oriented organisation is to continuously appraise processes to determine if they can be improved.

Ferrara *et al.* (2001) believes that lessons from past reengineering projects provide a good basis to build on for implementing effective and efficient processes today. According to the Butler Group (2002) it is not the approach of BPR that is outdated, but more the technology that was used to support it. The technical and cultural environment that currently prevails is more conducive to successful implementation of process methodologies. Technologies such as the Internet have been developed and deployed widely and customers, suppliers and employees to a large extent have adopted the use of technology (Ferrara *et al.*, 2001).

2.1.2 Clean Slate versus Existing Process

The 'clean slate' approach advocates discontinuous thinking to enable change (Grover, 2003). For BPR to be successful, the way in which work was done had to be 'obliterated' (Smith & Fingar, 2003). New processes had to be designed to radically improve the efficiency and effectiveness of goal achievement (Turban *et al.*, 1999).

The third wave of BPM (Smith & Fingar, 2002b) attempts to arbitrate this debate by providing practitioners with the option of either designing new processes or changing existing processes. Bishoff (2004) suggests three ways in which processes can be designed. They are: using current processes, using vendor templates or using a clean slate (Bishoff, 2004). Each of these has advantages as well as disadvantages which are summarized in the table below:

Table 1 - Process Design options

Technique	Advantage	Disadvantage
Current environment	Maintains the best of the current environment, known quantity, safe	Can lead to analysis paralysis, political competition, resistance to change and models that do not actually reflect the current state
Vendor templates	Enables full exploitation of applications, provides a good starting point	Slanted toward the specific application, newer vendors have yet to establish best practice
Clean Slate	Provides a chance for the organisation to think 'outside the box'	Puts too much importance on the modelling process, can be overly political, does not honour existing process work

Grover (2003) warns that the overemphasis on existing processes can be problematic and become counter-productive. Organizations can spend excessive time in documenting processes that do not work (Grover, 2003). In addition, companies find it difficult to discover their existing processes (Francis, 2004). The first step in implementing any process methodology should be to analyse the process (Butler Group, 2002). Often however, it takes such a long time to discover processes that by the time they are documented, the processes have already spontaneously changed (Francis, 2004a). Real-world processes have a life of their own according to Smith and Fingar (2002a, p. 2): "they grow, join, morph, shrink and split, representing the ever-changing face of business".

2.1.3 Top-down versus Bottom-up

Process management methodologies can be implemented using either a top-down approach where a "clean slate" philosophy is applied or a bottom-up approach which identifies existing processes to be managed (Butler Group, 2002). The top-down approach is a technological view seen as a new way in defining software architectures and applications (Lachal, 2004).

The Butler Group (2004) warns that the bottom-up approach could focus too much on applications, components, workflow, rules and logic. This could lead to value added human activities (which according to the Butler Group (2004) are the only source for competitive advantage) not being adequately included into the management of business processes (Butler Group, 2004). The focus of each has been documented in the table below:

Table 2 - Top down versus Bottom-up view of BPM

Top-down	Bottom-up
Solutions designed to meet business needs	Solutions designed to exploit existing technology investment
Process integration strengths – handles complex human interactions, workflow and task management	Application integration strengths – legacy integration, and can handle complex architectures
Supports cultural change and incorporates continual process improvement	Focus on technical change
Can seem ambiguous	Not business focused

Ericson (2003) believes that the drivers for change start from the top. Management are the only people in the organisation who are mandated to initiate change, but they are also the people that are most disconnected from the process. It is therefore also important for the users of the process to be involved in its design (Ericson, 2003). Ferrara *et al.* (2002: 65) recommends that a business vision is built top-down, but that the business case is built bottom-up.

This debate also touches on the organisational structure of the organisation. Most organisations are structured according to cost-centres or functional areas (Francis, 2004). Since processes cut across various functional areas, the management of end-to-end processes could therefore become problematic. This becomes an important issue since process performance is dependent on a process 'owner' who takes responsibility for the process

(Francis, 2004). The process perspective that the organisation subscribes to, will in turn also be determined by the organisational structure (Pritchard & Armistead, 1999).

This problem becomes magnified once attempts are made to integrate processes across more than one organisational boundary. Lines of responsibility can become blurred and organisational boundaries may inhibit full integration. It is therefore important to apply Ferrara *et al.*'s (2002) recommendation to build a vision top down by agreeing on common philosophies between organisations.

2.1.4 Broad versus Narrow

The relationship between processes also influences whether the intervention involves cross-functional activities or single function activities. The original notion of BPR was a large scale redesign of cross-functional activities (Melão & Pidd, 2000). Research by Zairi and Sinclair (1995), however, found that BPR initiatives within a single function still provided significant improvements.

A wider focus is, however, necessary in today's competitive environment where internet technologies allow for the co-ordination and integration of cross-functional activities across organisational boundaries (McIvor *et al.*, 2000). Where the main focus of BPR was on intra-organisational business process improvements, the main focus of business processes at the moment is on inter-organisational business processes (Dayal *et al.*, 2001; Ferrara *et al.*, 2002).

The Butler Group (2004) warns that the inter-relatedness of processes should not be ignored. A change in a single process may not have the desired effect or could even have a detrimental effect on the overall way in which the business functions. When considering changing processes therefore, it is imperative that a broad view is taken to ensure that all aspects have been considered (Butler Group, 2004). These aspects include strategy, structure, people and roles and IT (Grover, 2003). If some of these aspects are ignored,

Grover (2003) warns that the process will not be reinforced and will eventually break down.

The Butler Group (2004) believes that as process methodologies mature they can help businesses integrate process management, performance and information management strategies. This will widen the focus of process management.

2.1.5 Mechanistic versus Holistic

The original BPR literature refers to BPR in terms of hard systems thinking which ignores people and organizational issues (Melão & Pidd, 2000). This mechanistic view considers a process as a "fixed sequence of well defined activities" (Melão & Pidd, 2000: 112). The activities are performed by humans in order to convert inputs to outputs based on specific goals that have to be achieved (Melão & Pidd, 2000). This static approach lends itself easily to be modelled using techniques such as Workflow (Melão & Pidd, 2000).

This view emphasises the technical aspect of processes and largely disregards the socio-political aspects. The mechanistic nature of hard systems thinking is seen by Checkland (1995) as the exception to the rule, where soft systems thinking, which includes the context, is seen as the more general approach. Davenport and Short (1990) believes that ignoring the socio-political aspects could lead to resistance which would undermine the process' effectiveness. In addition, business processes are not static, but have to behave in a dynamic way (Melão & Pidd, 2000).

Harmon (2004: 3) believes that process management is about "people, culture, management, measurement and technology". This is specifically true in the current business environment where organisations collaborate to provide a better service to customers. When managing a process with other companies, the whole business has to shift its perspective from managing processes internally to sharing activities between organisations (Ferrara *et al.*, 2002). This not only requires processes to be managed externally, but also

for internal processes to be geared towards more effective collaboration (Ferrara *et al.*, 2002).

A business process does not exist in a vacuum. It needs the support of metrics, measurement systems, culture, organisation and technology to operate (Ferrara *et al.*, 2002). Hammer and Champy (1993) use a business diamond to illustrate the interrelatedness of these aspects.
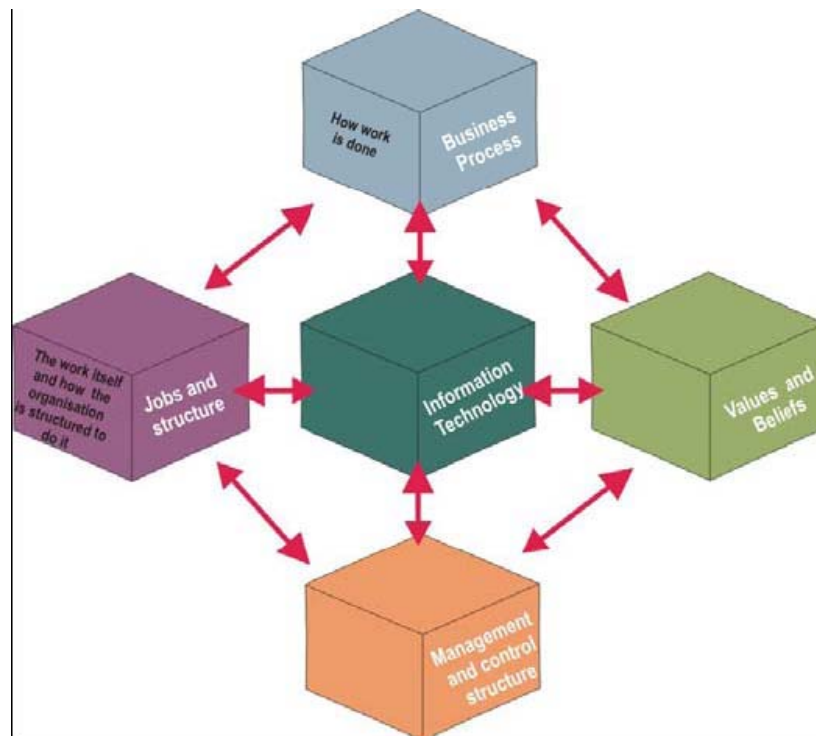
Figure 3 - The Business Diamond

2.1.6 Dramatic versus Modest

The implementation of BPR called for a dramatic change in how businesses operate (Turban *et al.*, 1999). The BPR pioneers contend that it is only by radically changing processes that dramatic results are achieved.

The Butler Group (2004) however recommends that complex, end-to-end processes should rather be broken down into smaller components. The risks associated with applying a dramatic change to this type of process will be compounded by the challenge of developing the required knowledge of that process (Butler Group, 2004). In addition, the Butler Group (2004) proposes that quick modest interventions would also demonstrate the value of the process tools. Modest interventions, as discussed in section 2.1.1 above, can

also control changes to contain any unanticipated negative impacts (Butler Group, 2004)

BPM is being put forward by vendors as an approach that will revolutionise the way a business operates (Butler Group, 2004). The Butler Group (2004) however questions this dramatic view. They feel that the main benefits of BPM would be an increased level of control and management of processes as well as the simplification of adapting processes in line with business strategy (Butler Group, 2004).

2.1.7 Inspiration versus Methodology

BPR postulated that methodologies stifle the creativity that can lead to the improvement of processes (Turban *et al.*, 1999). Grover (2003) however warns that process cycles can grow abstract quickly without detailed methodologies. Lachal (2004) agrees and proposes that a measured, methodical approach to implementing BPM is the only way to realize real and valuable benefits. The Butler Group (2004) supports this view and believes that the lack of methodology applied during BPR initiatives failed to incorporate a wider set of inputs.

It is however difficult to obtain tried and tested methodologies since these are protected by intellectual property rights (Grover, 2003). Even case studies provided by Ferrara *et al.* (2002) and other publishers (Neal *et al.*, 2001; Baker *et al.*, 2002) as well as conference proceedings (Smee, 2004; Robb, 2004; Hayden, 2004), do not specify the implementation methodology, but rather focuses on the benefits of BPM over other methods.

2.1.8 IT-led versus IT-enabled

BPR relied heavily on IT to lead the way (Turban *et al.*, 1999). The recognition of the possibilities of IT enabled the evaluation of processes in terms of technological possibilities (Turban *et al.*, 1999). This focus on automation has been the basis of the criticism of BPR. In automating processes, too much emphasis was placed on the process and too little time on practice (how the work is done and why) (Ferrara *et al.*, 2002).

Grover (2003) believes that IT-centric solutions ignored organizational adaptations. Lacal (2004) believes that one of the reasons for the low success rate is that an IT-centric programme ignores people. Radically redesigned processes that use new technologies will inevitably affect jobs, structures, values, beliefs, management and measurement systems (Ferrara *et al.*, 2002).

The focus should be on processes rather than IT (Harmon, 2004). Automating an inefficient process will not make it more efficient just because it is using technology (Harmon, 2004). There is also a danger in over-automation (Butler Group, 2004). This could lead to mistakes going unnoticed and a reduction in the efficiency of a process.

This does not however mean that IT does not have a significant role to play in BPM. IT should enable people by providing "information on demand, analysis tools to turn data into actionable information and a secure space for collaboration with other members of the value chain" (Ferrara *et al.*, 2002: 8). People should therefore be responsible for tasks that are distinctly human which will include interpretation, decision making and innovation. Their contribution is crucial to the enterprise and Ferrara *et al.* (2002) feel that their contribution should be made as valuable as possible. The role of technology in BPM should be two-fold: firstly, automation should continue, especially for tasks that do not require human interaction and secondly, by providing people with the tools that they will require to perform their jobs (Ferrara *et al.*, 2002).

This is no easy task since keeping technology synchronized with the capabilities of people is very challenging (Ferrara *et al.*, 2002). Most organizations that have had a measure of success have done so due to a well defined business and IT architectures based on components (Ferrara *et al.*, 2002). Components provide a level of flexibility that allows organizations to rapidly react to changes in the environment and provide customised solutions to customers.

The various debates described in this chapter provide a holistic overview of how business to business process integration is defined for the purposes of this study. The chapter also provided an indication of some of the aspects of business-to-business process integration. The following chapter will look at these aspects more closely as this will form the basis against which the case study in Chapter 4 will be compared.

Chapter 3: The technical and social aspects of Business-to-Business Process Integration

The previous chapter focussed on providing a working definition of business to business process integration as it emerges through the descriptions of the debates that centre on processes. This definition allows for the further exploration of meaning with specific reference to the technical and social aspects of business to business process integration. This chapter is divided into two sections and aims to describe first the technical and then the social aspects. The reason for this distinction is purely practical in order to ensure that one aspect does not dominate the discussion of the other. However, making the distinction between what should be classified as technical with that of social becomes arbitrary since these aspects overlap and cannot easily be separated.

The following section will use Biazzo's (2000) dimensions as described in Chapter 1 as a framework from which the discussion will be organised.

The traditional focus of the Information Systems Department in business is to develop functional specific applications that support isolated business requirements. However, as indicated earlier, a higher level of integration is required for businesses to gain competitive advantage. In order to support this business need, the focus of the Information System department has to change to integrate disparate systems in order to extract the most value from each system (Goethals *et al.*, 2005). Large scale ERP systems and EAI projects focus specifically on providing the necessary integration within the organisation. Weil (1998) believes that the integration provided by ERP systems saves money, speeds up communication and improves decision making. Additional value can be extracted from applications if this integration is extended beyond the company boundaries to include other role players within the supply chain.

Integration previously centred on a data level only. This was mainly due to the ease at which data could be exchanged using technologies such as FTP

and EDI. Developments in the field of workflow management systems expanded the technical ability to integrate not only data, but also applications. Further developments in the field of business process management is currently facilitating the integration of business processes and are therefore making integration on other levels possible. Figure 4 below illustrates the different stages of development on an infrastructural level.
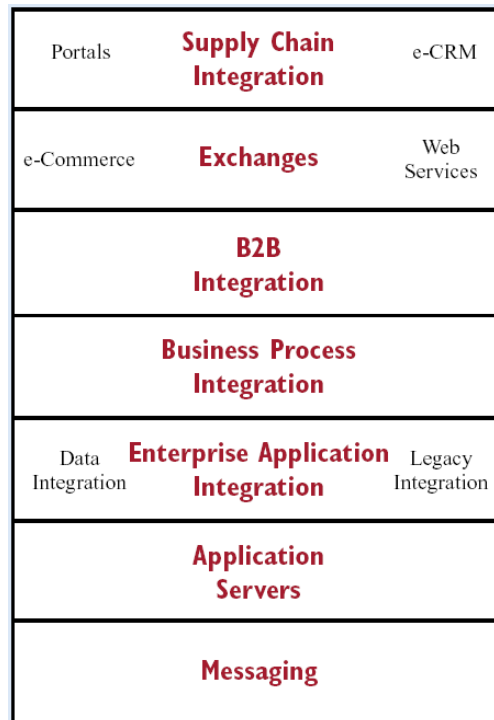
Figure 4 - e-Business Infrastructure Stack (Schultz, 2001)

According to Davenport *et al.* (2004), few organisations have managed to master integrating their processes with their customers' or suppliers'. In their study conducted in 2004 across 191 organisations, only 30% of organisations had some experience in this type of integration. It is therefore seen as an ongoing activity that will continue for many years to come.

3.1 Technical Aspects of B2BPi

This section will briefly outline the developments on a technical level that have led to the ability to integrate processes across business boundaries. Biazzo (2000) describes the technological dimension as the material artefacts used by actors in their work. A short description of each artefact (e.g. FTP, EDI, etc.) that highlighted technological development will be given.

3.1.1 Data Integration tools

Data integration allows for companies to share data that has been identified as strategically important for their relationship. Because the focus is on sharing data rather than business logic, it is not necessary to manipulate any application logic.

Data integration is an established way of integration and is therefore used quite widely (Rosenberg, 2004). It is also relatively quick to implement and users are not faced with any visible 'integration'. End-users are therefore less resistant as they do not see this as a major change. Middleware applications to assist with setting up the integration are also widely available.

It is however essential to understand the data flows to ensure that data isn't overwritten and although integrity checks are non-negotiable, they may sometimes prohibit successful integration of data. Data may also not be compatible between systems and their meaning may be different between the different databases (e.g. reference number can mean an internal reference number for the one company whereas it may mean an external reference number to another company).

It is important to decide on the level of coupling between the different organisations. This will determine the frequency as well as the method of data interchange. The type of data that will be exchanged should also be determined.

3.1.1.1 File Transfer Protocol (FTP)

File Transfer Protocol (FTP) is an extension of the TCP/IP internet protocol that allows for files to be transferred via a communication link. Often data files will be generated and set via this communication method. FTP is however not a preferred way of communication, as data is not encrypted (Turban *et al.*, 1999).

3.1.1.2 Electronic Data Interchange (EDI)

Electronic Data Interchange (EDI) is defined by Turban *et al.* as the "electronic movement of specially formatted standard business documents sent between business partners" (1999: 67). Data is formatted by the sender in a pre-defined format, sent via a communication link (e.g. a value added network (VAN) or the internet) and read by the receiver. EDI is characterised by the following:

- EDI is used mainly for transferring standard, repetitive business transactions

- Because of its repetitive nature, formatting standards can be used to shorten the length of a message and eliminate data entry errors

- EDI translators are used to convert data into standard EDI formats (examples of this is ANSI X.12 – used in the United States of America and Canada and EDIFACT used as an international standard)

- EDI can be used via a VAN or the internet.

Although EDI provides a way for companies to exchange data quickly, a high level of co-ordination and integration is still necessary with the back-end processing system to ensure that data is correct and up-to-date. The investment necessary in terms of cost and commitment to refine the system over time also makes it more suitable for businesses that have an established long term relationship.

3.1.2 Application Integration tools

Application Integration uses Application Programming Interfaces (API) to "bind different resources together using standard or proprietary interfaces" (Rosenberg, 2004: 12). An interface is an agreed upon boundary used by different applications to communicate with each other. Connections to different resources are based on API. API's are exposed to enable access to system processes and data without having to use user interfaces or directly accessing databases. It is a prescribed method by which an application can make requests to another programme. Access can be provided to business services (i.e. business logic embedded in an application), data services (encapsulation of data with business logic) or a combination of the two. The

level of integration is determined by the dependency of the systems on each other. If the systems can operate independently, they are described as loosely coupled. If the systems are tightly coupled, the two systems are reliant on each other either for some piece of logic or for some data. If one of the systems is therefore unavailable, the system can not operate since its tightly coupled integration style means that it is completely reliant on "local, homogenous system environments" (Silver, 2003: 4).

Because of its prescribed method, using API provides a standard way for accessing data and or business logic. There are also many development tools that support standardised API's. This is however hampered by heterogeneous business applications and the added threat to security. API's also do not provide much flexibility for meeting dynamic business needs (Rosenberg, 2004). There is also often a disconnect between the 'real world' and the 'ideal world' for which the API is designed. The converse of this is also true in that the 'real world' situation may be prevented from being executed because the system does not 'allow' for that specific behaviour (Rosenberg, 2004).

The increased need to integrate applications has led to the emergence of Enterprise Architecture Integration (EAI). The Butler Group (2002: 64) defines EAI as a "business computing term for plans, methodologies and tools aimed at modernizing, consolidating, and co-coordinating the computer applications in an enterprise environment." Application integration is achieved through central middleware (Butler Group, 2004). Adapters are used to bridge the gap between the different interfaces between applications. Messages from applications are sent to a central location (similar to a backbone of a network) which is then translated and formatted into a common language before it is sent on to the destination application (Butler Group, 2004).

3.1.3 Process Integration Tools

The advancement in the technical abilities of the abovementioned tools as well as the focus placed on the importance of processes, has allowed for the development of process management tools. These process management

tools were developed for the purpose of managing processes which include IT as well as human elements (Smith, 2002a). Silver (2003: 3) describes process tools as a combination of EAI, Business-to-Business Integration (B2Bi) and Workflow in an "integrated modeling and execution environment based on web technology standards".

3.1.3.1 Workflow

Historically, workflow software dealt with process automation which included interactive as well as fully automated activities (Silver, 2003). A workflow engine will sequence the different steps and activities between individuals in a process and provide the tools necessary to complete each step (Butler Group, 2002).

Although Smith (2002a: 3) describes workflow as a system which "embeds a fixed model of one type of process, namely a workflow process", Silver (2003) believes that workflow has provided useful innovations and artifacts to the way processes are managed. He lists these as: graphical flow models, state management and role-based task distribution (Silver, 2003).

Workflows may be adaptable to changes in work patterns, but are less able to support changes in an application environment (Smith, 2002a). A workflow system will typically assign a case or a document to a specific person, wait for the person to make a decision and once the task is completed, the system will pass the case or document on to the next person in the process.

Workflow however lacks the ability to integrate functions due to its tightly coupled integration style. Integration is provided by low-level Application Programming Interfaces (API) between different systems that are required to complete assigned tasks (Silver, 2003).

3.1.3.2 Enterprise Resource Planning (ERP)

Enterprise Resource Planning (ERP) packages are software applications that connect and manage information flows within and across organisations (Davenport *et al.*, 2004). An example of a widely used ERP system is SAP. It

is often made up of different modules that support specific functional areas within an organisation (Turban *et al.*, 1999). ERP systems (also sometimes referred to as Enterprise Systems) originally were used mainly to integrate transaction intensive "back-office" functions (Davenport *et al.*, 2004). Implementation is however not seen as a finite, once-off activity. In a study conducted by Davenport *et al.* (2004) it was found that most organizations still continued to expand the functionality of their ERP system by adding more and more modules to their existing implementation.

ERP systems have been criticized in that they are costly to implement and often companies need to change their business processes to fit the format of the ERP system (Turban *et al.*, 1999). Melao and Pidd (2000) disagree with Turban *et al.* (1999) since processes provide the basis of implementing enterprise resource planning tools. An example of this is the inclusion of Aris (a process modelling tool) in SAP. This provides full business process management functionality through SAP's integration tool (XI). SAP, for example, also prides themselves on basing their standard processes on proven 'best practice' processes gathered from various industries (Anderson & Larocca, 2006).

In contrast to the criticism from Turban *et al.* (1999), Davenport *et al.* (2004) found that the key value drivers for an ERP system can only be realised once companies "make the processes their own" by combining the raw components in the unique way that the company needs it to operate. Davenport *et al.* (2004) identify three key value drivers that provide the most return on investment. These are: integrate, optimise and informate. Each of these will be discussed briefly below:

Integrate

This is defined as using the company's existing processes to mould and shape the ERP system to better meet the needs of the customers and suppliers

Optimise

This is defined as standardising processes to best practices, but also taking into consideration the unique and strategic processes of the company. These

processes then have to be examined regularly. Although system deployment is managed centrally, process improvements are made within the local context of the operating unit.

An example of this is how DaimlerChrysler production plants are upgrading their current SAP systems. Processes are evaluated and the best practices identified. Where possible, plants are urged to conform to these standardised processes. The components that support these processes are shared amongst the various plants.

Informate

Informate is a term coined by Zuboff (cited in Davenport, 2004) which means using information to transform work. The data within the ERP system can be transformed to provide contextual data for analysis purposes that can lead to creating a competitive advantage. Often however, the standard reporting functionality within the ERP system does not provide the data required by business users to truly fulfil their information needs. In these cases, business warehouses, ad hoc reporting and portals can be used to bridge this gap (Davenport *et al.*, 2004).

Another criticism levied against ERP systems is that they generally focus on business transactions rather than the "real-time changes in supply, demand, labour and capacity" (Turban *et al.*, 1999: 255). Thus often the focus is on the business process and not necessarily the system process. System processes are reliant on business processes, but are at a far lower level of abstraction.

In order to become more flexible, ERP systems unbundle their processes to form specific services. Each enterprise service can work together with other enterprise services, but also provides users with the ability to reconstitute processes in different ways. The emergence of Service Oriented Architecture (SOA) has enabled functions to be grouped in logical units and then presented as services. These services are often exposed using web services.

Web services are loosely coupled applications that use web-based protocols and eXtensible Mark-up Language (XML) for the widest possible reach (Wall & Lader, 2002). These represent services that can be accessed from any

platform or programming language using a common medium (XML). The XML is broadcast using a Simple Object Access Protocol (SOAP) header in the message. The receiver then processes the information in the header and then defines how the data packet should be handled (Wall & Lader, 2002).

Web services communicate by using Hypertext Transfer Protocol (HTTP) to make business data available over a network, either the intranet or internet. They expose business objects (COM objects, JavaBeans, etc.) to SOAP calls over HTTP and execute remote function calls. In this fashion Web service consumers are able to invoke method calls on remote objects by using SOAP and HTTP over the Web (Wall & Lader, 2002).

3.2 Social and Business Aspects of B2Bpi

Business to business process integration is at its core a social endeavour: it is developed by people to be used by other people. Different authors place different emphasis on the specific social aspects that need to be considered: The Standish Group (2001) emphasise the importance of the executive sponsor; Maguire (2000) focuses on including business users in the development of systems; Bussen and Meyers (1997) widen the context to include factors such as the political, economical and social contexts within which the organisation operates; and Ewusi-Mensah (1991) states that organisational politics and disagreements need to be managed.

The holistic view of Goulielmos (2003) however provides for identifying and including all the elements that make up a process, social as well as technical. Goulielmos' (2003) description of processes as a sub-system of an organisation (which in turn can be a sub-system to a larger system), provides for the investigation of not only these systems, but also the relationships between them.

For the purposes of this paper, the discussion of social and business aspects of business to business process integration will be limited to three relevant aspects as these will have the most bearing on the case study in Chapter 4.

These aspects are: Power and Politics; Organisational Structure and Culture; and, Globalisation.

3.2.1 Power and Politics

When looking at the social aspects of any academic study it is important to include power as an influential factor in human behaviour. Walsham states that "power is endemic to all human activities" (2001: 56). The relational view of power described by Walsham (2001) will also be used in this study. Power will therefore be seen as "manifested in shifting power relationships with others" (Walsham, 2001: 56). Power relations become a resource like any other used to achieve particular results in the political arena (Walsham, 2001). Biazzo (2000) cites power as one of the dimensions that are influenced by constraints and resources. He describes power as the "asymmetrical distribution of those resources that can be activated in order to influence behaviour" (Biazzo, 2000: 9).

Pfeffer (1981: 1) cites Lasswell's definition of politics as "the study of who gets what, when and how". Davenport *et al.* (1992) note that information is one of an organisation's most critical resources that will significantly increase business performance by the access, usage and enhanced quality of information. Information is often not freely shared within organisations. Davenport *et al.* ascribes this to the lack of management of organisational politics. They argue that as information becomes the "basis for organisational structure and functions, politics will increasingly come into play" (1992: 2). Information becomes power and organisational roles can be defined based on the information held by the owner. Sharing of information is however actively discouraged by legislation that enforces segregation of duties to avoid fraudulent activities (see discussion on the Foreign Corrupt Practices Act later in this section). It is therefore important to balance the need for information to enable effective process execution while being legally compliant.

Process tools based on technology also provide a means of observing behaviour. Employees' activities can be monitored, which threatens their independence and ability to be innovative (Kling, 1996). This behaviour is

often compared to Foucault's pentacnicon where behaviour is changed through the implication that there may be an observer. The observer therefore holds the power whereas the observed becomes its own observer. Although the intention of free flowing information is to empower workers to make decisions, this power is compromised by the ability of management to observe worker behaviour. This is also encompassed by structuration theory since management observation is a legitimate action, yet the effect of this observation could lead to dominance.

Davenport *et al.* (1992) notes that organisations not only want to safeguard their information, but also the processes that generate this information. To some extent this aspect of safeguarding processes has been addressed by the Sarbanes-Oxley act which determines that all American businesses as well as organisations doing business with American firms need to be able to demonstrate the processes which they used to produce information. In addition, the Foreign Corrupt Practices Act (FCPA) (also an American policy) ensures that processes apply the proper segregation of duties to ensure that fraudulent and unethical behaviour is controlled. The act requires that process activities are segregated to ensure that one person is not fully responsible for the initiation as well as the approval of any transaction.

Davenport *et al.* (1992) identify five models of information politics. They are briefly summarised below:

Table 3- Information politics models

Technocratic Utopianism	A heavily technical approach to information management stressing categorisation and modelling of an organisation's full information assets with heavy reliance on emerging technology
Anarchy	The absence of any overall information management policy leaving individuals to obtain and manage their own information
Feudalism	The management of information by individual business units of functions which define their own information needs and report only limited information to the overall corporation
Monarchy	The definition of information categories and

	reporting structures by the firm's leaders who may or may not share the information willingly after collecting it
Federalism	An approach to information management based on consensus and negotiation on the organisation's key information elements and reporting structures

Davenport *et al.* (1992) continues by providing a model for managing information politics. In order to do so they suggest selecting an information state. This entails identifying the current situation of information politics in the firm and then selecting the preferred model. Davenport *et al.* (1992) suggests that monarchy and federalism are the only two viable options.

The section above concentrated mainly on managing intra-organisational politics. These problems are increased when looking at relationships among different companies (Davenport *et al.*, 1992). Katzenstein and Lerch (2000) suggest that there are three inter-related areas that need to be analysed when attempting to integrate processes across organizational boundaries. The answers to these questions may provide an insight as to the conflicting and competing forces for autonomy. These are:

- the characteristics of the territorial rationalities held by the territorial entities involved,
- the combinations of the modes of transformation among the participating territorial entities, and
- the platform of the contending themes of territorial entities.

According to Katzenstein and Lerch (2000: 385) the answers to these questions will "speed up the integration process and enhance the understanding of both technological and organizational demands and capacity, which in turn make institutional transformation and technology diffusion more effective". This also ties in with Giddens' (1984) definition of 'locales' where the location forms part of the context and is therefore an integral part of the structure that informs behaviour.

In addition, Davenport *et al.* (1992) also suggest that information politics should match the organisational culture and that technology factors are

considered carefully. It is also important to appoint a suitable information politician who will manage the responsibility of facilitating the effective use of information. The responsibilities for managing the control of information should be shared to ensure that no information empires are built (Davenport *et al.*, 1992). This is especially true for processes that run across organisational business units.

The next section will explore organisational structure and cultural aspects in more detail.

3.2.2 Organisational structure and culture

According to Armistead and Machin (1997: 894), "the issue of process definition at a top level is a view of how organisations work to satisfy strategic intents". This top level architecture is then translated into an operational reality. Operations are influenced by aspects of "organisational culture which affect both organisational co-ordination and organisational structure" (Armistead & Machin, 1997: 895).

Business to business process integration often includes an aspect of process automation. In this regard Liker, Haddad and Karlin (1999) differentiate between workers who are replaced by robotic machines and workers whose work opportunities are increased through the possibilities posed by technology. This view is further explored by Burris (1998) who found that professions are recategorised and the boundaries of certain occupations have been redefined through technological changes. The production environment especially has been criticised by Cockburn (cited in Burris, 1998) as de-skilling employees, increasing managerial control and polarizing people based on race and gender.

Since the use of technology has influenced how processes are performed, it stands to reason that work will also be co-ordinated and managed in different ways. The effectiveness of the traditional hierarchical organisational structure in supporting the new way of working is therefore challenged. As the need for middle managers decreases, flatter organisational structures are emerging.

Turban *et al.* (1999) considers this an improvement due to technology. They see IT's most important contribution as the delivery of the "right information at the right time, at the right quality and cost" (Turban *et al,* 1999: 374). This empowers employees to make decisions and therefore eliminate the need for middle managers (Turban *et al.,* 1999).

Kling (1996) however questions the role of technology in the emergence of flatter organisational structures. Rather, he attributes this new organisational structure to the inevitable restructuring of organisations to cope with downsizing. Burris (1998) agrees that other factors also play a role. She proposes that the type of technology together with managerial policies and choices and the nature of the product or service influence the organisational structure. This causes organisational structures to be less formal and the possibility of promotion for less skilled workers is reduced (Burris, 1998).

Liker *et al.* (1999) cites Perrow's classification of the complexity of technology at departmental level. This classification system proposes that tasks with less certainty are associated with less structured organisational forms, whereas tasks with more certainty are more strictly and bureaucratically managed (Liker *et al.*, 1999). The same is true for processes as the more structured processes are easily automated.

Aranda *et al.* (1998) suggest implementing an organisational structure that is both fluid and stable to ensure that it is robust enough to respond to rapid changes. Drucker (1992) agrees with this view and believes that the creation of knowledge workers has led to the creation of knowledge organisations. Knowledge organisations' biggest asset is its people since knowledge is located within the individual (Drucker, 1992).

Technology has enabled organisations to decentralise its operations yet still maintain central control (Turban *et al.*, 1999). Boundaries between organisations are becoming more permeable to allow for greater collaboration (Kling, 1996). This has also allowed for the emergence of virtual organisations where temporary or more permanent alliances are formed to

attain a specific goal (Turban *et al.*, 1999). Mumford (2003) however warns that this global interlinking of organisations may result in problems experienced in one country spreading to other countries.

Literature often describes the extended enterprise as a type of network organisation. When looking at the extended enterprise, a distinction is made between a collaborative extended enterprise and a co-ordinated extended enterprise (Goethals *et al.,* 2005). The collaborative extended enterprise indicates various organisations that have such strong ties to each other that it can be seen as a collection of organisations. The co-ordinated extended enterprise however is described as one organisation that "reaches out to its suppliers, customers and partners" (Goethals *et al.,* 2005: 4).

Organisational culture is changing due to the ability to work in geographically dispersed areas on a 24/7/365 basis. Culture needs to be defined therefore within a team and an organisation as well as between organisations due to the increased collaboration between different workforces.

Turban *et al.* (1999) define culture as a pattern of shared basic assumptions. Culture is the key to external adaptation and internal integration and is based on values, rituals and learning (Aranda *et al.*, 1998). Schein (1985) defines organisational culture as a learned product of group experience. This definition relies on the stability of teams in order for culture to develop. As groups share experiences and embed behaviours, the culture emerges. Avison and Myers (1995) criticise this view as being too simplistic since they believe that culture is invented and reinvented through social life. This is in line with structuration theory where culture as a structure is influenced by agents and vice versa.

Avison and Myers (1995) further criticise Schein's claim that culture can be managed and changed. They believe that the interpretations and reactions of workers to these managerial actions will pose many problems

Liker *et al.* (1999) believes that organisational culture is determined by the philosophical orientation of the organisation's management. The four paradigms that they identify are: technological determinist, modern capitalist, technology management and interpretivist. The prevailing culture for each is summarised below:

Table 4 - Philosophical orientation that determines organisational culture

Technological Determinist	Values traditional engineering thinking Mechanical principles will enhance productivity and reduce costs
Modern Capitalist	Highly authoritarian with conflict between workers and management. Workers can achieve informal power through bargaining and skill. Trust, communication and morale are low. Technology places power in the hands of managers and is thus distrusted by the workers
Technology Management	Emphasises planning for change to minimize unpredictability. Technology is seen as adding transparency and providing a means of sharing.
Interpretivist	This paradigm does not assume any specific type of technology, but rather aims to understand the predominant culture within the organisation

In order to remain competitively viable, companies need to encourage a culture of innovation (Kling, 1996). IT has changed the way in which people work and the rapid changes that continue to increase, challenges the status quo. Kling (1996) observes that people find changes in their work methodologies threatening. Cultural change is identified by Lee and Dale (1998) as one of the most intractable aspects of process management. The main areas of resistance to change are:

1. threats to individual jobs
2. short term contract increases
3. lack of promotion prospects (Lee & Dale, 1998)

Organisational structure and culture determines the normative rules and rituals that in turn determine how agents behave (Aranda *et al.,* 1998). Biazzo (2000) categorises these structural under the dimension of organisational rule and the ritual and cultural dimension (see Chapter 1). As illustrated above, each dimension is influenced by its own constraints and resources.

3.2.3 Globalisation

Robertson (cited in Walsham, 2001: 18) defines globalisation as "a concept (that) refers both to the compression of the world and the intensification of consciousness of the world as a whole". Beck (cited in Walsham, 2001: 19) prefers to look at globalisation as "the processes of interconnection and influence between national states and international actors such as transnational corporations".

Authors differ as to what the implications of globalisation will be. On the one hand it is anticipated that globalisation will bring about a homogenous way of 'doing things' with a less diverse cultural world. Other authors (Roberston; Beck; Appadurai cited in Walsham, 2001) have argued that ideas are often adapted or rejected by different cultures in specific ways. From an economic perspective, many countries can not participate fairly as their initial economical conditions are not on a par with other countries. The general assumption is that global trends will be appropriated in a local way.

The impact this has on process integration has far reaching consequences. An end-to-end process change may result in a 'black-box' of activities when it is handed over to a global partner who may appropriate the process inputs in a local fashion. This is not negative in any way as the unique diversity brought to the process through its localisation is what may give companies their competitive advantage.

From a legislative perspective, globalisation has also had far reaching impacts. The Sarbanes Oxley Act and FCPA discussed in section 3.2.1 illustrate how the legal framework in one country (in this case the United States of America) can have an effect globally. Companies that do not

comply with these acts are prevented from being listed on the New York stock exchange as well as doing business with any American registered company. If a process originates in one country (with its own legal framework) and crosses over the national boundaries to continue its activities in a different country with a different legal framework, the legalities of both countries will apply (Wagner & Dittmar, 2006). As a result a whole new set of skills to evaluate and ensure legal compliance emerged. Standard 'blue-print' processes become the safe option since these have been subjected to compliance testing.

According to Qiu (2004: i) "globalisation and commoditisation are the two dominant trends in manufacturing". The Case Study described in Chapter 4 will describe some of the processes that are enabled through globalisation.

The next chapter will provide a practical example of how some of these aspects, as cited in the reviewed literature, are evident in a local vehicle manufacturer. Further discussions in light of Structuration theory will follow in Chapter 5.

Chapter 4: Business-to-Business Process Integration between an automobile manufacturer and parts supplier (Case Study)

The next section will describe some of the processes used by DaimlerChrysler South Africa to collaborate with DaimlerChrysler AG and to co-ordinate their efforts with suppliers locally.

As indicated in section 3.1.3.2, business processes are a generalised form of system processes. At DaimlerChrysler South Africa, a library of business processes has been documented. This has been useful in that it provides an overview of how the business operates. However system processes need to be documented in far more detail to enable a full understanding of what the system requirements are. The reason for documenting processes is also important here. If processes are documented to form the basis of system enhancements, a lower level of detail is crucial in order to fulfil that need. Brown (2004) believes that the value in process documentation lies in the relationship between data models, object models and process models that provide different worldviews, that on their own are not sufficient in achieving process management capabilities. This detail is also necessary when one has to identify the interfaces for integration projects.

In addition to the more practical reasons for documenting processes, the library also provides a basis from which the processes are audited to ensure compliance to international standards. ISO provides requirements and assessment mechanisms to ensure that products are manufactured according to benchmark standards. DaimlerChrysler(SA) participates in annual external ISO audits to ensure that their processes meet or exceed the standards set out by ISO. In addition, the process documentation is also used as a basis for compliance to Sarbanes Oxley and FCPA (as discussed in section 3.2.2).

The process library was used extensively as a resource to inform this case study. The processes, documented as part of that library, are a direct reflection of how the work is done with rich narrative descriptions that

Business-to-Business Process Integration   Liezl van Rensburg

Chapter 4: Business-to-Business Process Integration between an automobile manufacturer and parts supplier (Case Study)   - 52 -   25418956

accompany the process flows. Processes are documented in a collaborative fashion by interviewing the people who work with these processes on a daily basis.

4.1 Context

East London is located on the eastern coast of South Africa and has a population of approximately 1.4 million people. Its river port makes it an ideal place from which to export locally produced goods. East London was chosen as the location for the DaimlerChrysler plant (then CDA) in 1948. Since then, the plant has undergone various changes as it built various cars and models. Currently, the East London plant employs approximately 3 800 people. In 1998 DaimlerChrysler(AG) announced a R1.4 billion investment in the East London plant. Additional investments have been made subsequent to that, with the latest investment, the new body shop presently under construction.

The new C-class Mercedes Benz will be launched worldwide in 2007. While this study was undertaken, the ramp-up phase was implemented to prepare for building the new model at the East London plant.

This project phase provided an ideal opportunity for the business to evaluate current operations to identify possible process changes in order to optimise the existing processes. It also provided a complex dynamic between maintaining the necessary operational efficiency of producing the current model (W203) and designing new processes to support the building of the future model, referred to as W204.

Weighing up the importance of operational efficiency with the importance of optimising for a new model had a direct impact on the IT section. The current operational systems have to continue to operate in an environment where high demand is essential, yet, new requirements also have to be catered for in order to ensure that sufficient system support will be in place for the launch of the project phase.

It was also decided to build engineering trial units in South Africa for the new model. It is the first time that engineering trials are being attempted in South Africa and all the necessary systems and structures have to be put in place in order to support this endeavour. In order to build these trial units sample parts have to be ordered. Since this has never been done before, the processes for ordering these samples created many new challenges that had to be addressed.

4.2 The Information Technology Landscape

When analysing the IT landscape, it is useful to differentiate between the activities that enable the manufacturing process and the manufacturing process itself. The enabling processes include processes such as parts ordering and inventory management whereas the manufacturing process is the actual fitment of the parts. The enabling manufacturing processes are largely supported by SAP while the bulk of the shop floor processes are supported by in-house developed systems that interface to SAP.

Various interfaces are also defined between SAP and the systems used by DaimlerChrysler(AG) to which all DaimlerChrysler plants report. These systems include engineering systems (DIALOG) and vehicle order systems (PAD) to name a few.

The current SAP version will be upgraded in 2008. All new developments in support of the new model are therefore also being evaluated in terms of the availability of new functionality in the upgraded SAP version.

4.3 Relationship between DaimlerChrysler(AG), DaimlerChrysler(SA) and local suppliers

DaimlerChysler(SA) is a subsidiary which is wholly owned by DaimlerChrysler(AG). In South Africa DaimlerChrysler consists of three different companies which include debis Fleet Management (dFM), DaimlerChrysler Financial Services (DCFS) and DaimlerChrysler South Africa (DCSA). DCSA is further divided in its operating model into a Marketing Performance Centre (MPC) and a Manufacturing Plant. The Manufacturing

Business-to-Business Process Integration   Liezl van Rensburg

Chapter 4: Business-to-Business Process Integration between an automobile manufacturer and parts supplier (Case Study)   - 54 -   25418956

Plant is located in East London and currently produces approximately 200 C-Class Mercedes-Benz cars daily. The size of the East London plant is insignificant when comparing it to other Mercedes Benz plants worldwide. Other plants generally produce more than one model (e.g. the C-Class, S-Class and E-Class), whereas the East London plant's Mercedes Benz operations focus on the C-Class only.

The East London plant is made more economically viable because of incentives and rebates from the South African government as well as the favourable exchange rate of the ZAR currency. Incentive schemes from the SA government include the Motor Industry Development Plan (MIDP) that attempts to supplement local development with imports to ensure that South African manufacturers can develop the necessary specialization required to meet international standards. In essence, the MIDP is calculated based on the value of the vehicles exported less the foreign content used in producing that vehicle. Import Rebate Credit Certificates are then issued on the balance that will allow the company to import qualifying components to that value without paying duties. MIDP was introduced in 1995 at a rate of 65%. This rate is reduced each year to encourage investment in local component manufacturers.

In addition to the MIDP, the Africa Growth and Opportunity Act (AGOA) provides further incentives. The AGOA agreement between the United States and various Sub-Saharan African countries allows for duty free imports to the United States for approved products that contain at least 35% local (where it is manufactured) content. With this agreement in place, it makes sense for vehicles to be exported to the United States from South Africa, rather than Germany. This incentive makes the collaboration with local suppliers particularly crucial to the East London Manufacturing plant.

There are various different ways in which DaimlerChrysler(SA) invest in their local suppliers to ensure that the benefits from MIDP and AGOA can be attained. In many cases where special tools are required to manufacture

Business-to-Business Process Integration   Liezl van Rensburg

Chapter 4: Business-to-Business Process Integration between an automobile manufacturer and parts supplier (Case Study)   - 55 -   25418956

required parts, these tools will be provided by the supplier. Supplier development is also provided to ensure that suppliers have the necessary processes in place with which to produce the required number of parts to the quality specified. Regular monitoring and monthly reporting ensures that suppliers are provided with formative evaluations that can be used for measurement purposes.

Even though there is a great emphasis on developing local suppliers, the majority of parts used on the C-class are imported. Imported parts are ordered systematically from a central parts co-ordination section (MBCC) that handles part ordering for plants throughout the world. This process will be described in more detail to illustrate the workings of a collaborative extended enterprise in contrast to the local ordering process that will illustrate how DaimlerChrysler(SA) and local suppliers operate in a co-ordinated extended enterprise manner.

The highly configurable nature of the C-class means that each customer can customize their vehicle to suit their needs. In order to meet this demand, each C-class is built according to these specifications. Customers order vehicles from dealers throughout the world. These orders are then collated and sent to a central ordering system in Germany. Based on various factors such as the location of the order, the incentive schemes and existing export agreements, the order is allocated to a specific plant. For example, an order for a C-Class Mercedes Benzes originating in South Africa will be allocated to the East London Manufacturing plant, but since the East London plant is not equipped to build the A-Class, most A-Classes will be built in Brazil and imported to South Africa.

Building each order as it is placed, will however be problematic as vehicle sales fluctuate throughout the year. If vehicles are therefore only built on orders, the production line will have to be continuously adjusted to produce only the number of cars required resulting in some days where there will be no production, while on other days the line will not be able to build the

required number of units. This constitutes a massive change and will have labour as well as practical functioning implications. Market forecasts are therefore also used to smooth out production by placing market related orders on the plant. Plant demand is calculated for a year in advance with volume allocations being done 9 months in advance. These volumes are then broken down into monthly, weekly and daily volumes based on anticipated demand and optimal sequencing. Sequencing constraints include parameters such as only six consecutive units can be fitted with a sunroof each (due to the constant movement of the production line, the buffer time allocated to this function is only sufficient for six units). Based on the daily forecasted requirements, planned orders are created systematically using SAP's material resource planning (MRP) function. This data is communicated to suppliers (local as well as import). Planned orders are continually updated as forecasts fluctuate. Once the specific lead time for a part is reached, the planned order is firmed and a delivery date for the part is fixed. Because the plant does not build to capacity as many other vehicle manufacturers do, each part required (excluding bulk parts such as screws), is therefore ordered individually.

There are approximately 4 000 parts on a C-Class Mercedes Benz (depending on the model and options chosen). Each of these parts is identified by a unique part number. Engineers at DaimlerChrysler(AG) are responsible for the design and specification for each part. Once it is decided that a part will be introduced, the part information is released in a central mainframe system. The parts relevant to the DaimlerChrysler(SA) plant are then downloaded via an interface from the German system to a local installation of SAP.

Parts are evaluated based on criteria to determine whether they should be supplied locally or whether they should be imported. Criteria to determine if a part is locally supplied include considerations such as:

- The nature of its supply (e.g. Just-In-Time (JIT) or Just-In-Sequence (JIS))
- Practicality (fragile parts such as windscreens)

Business-to-Business Process Integration   Liezl van Rensburg

Chapter 4: Business-to-Business Process Integration between an automobile manufacturer and parts supplier (Case Study)   - 57 -   25418956

- Investment (the ability to leverage existing investment with suppliers)

Not all local business is allocated based on the above criteria. However, for the purposes of this study, JIT and JIS parts have been identified because of the high level of integration required between the manufacturer and the supplier.

In both the cases (locally supplied as well as imported parts) the high-level process is the same. The process is triggered based on a demand for a specific part. The demand is communicated to the supplier who will produce the part, package and ship the part. The part is then received and consumed.

The specific sub-processes relevant to this study will include:
- The consumption of parts that trigger demand
- The communication of the demand to the supplier
- Confirmation from the supplier that the demand has been received

4.3.1 Part consumption

The production line is laid out to follow a logical sequence of events that will allow for parts to be fitted as the vehicle passes through each line station. Each line station groups a sequence of events that need to take place as it is performed by the operator. Where a part must be fitted, the operator will select the part and follow a standard work instruction to fit the part. The vehicle will then move to the next line station where the next part will be fitted.

Each vehicle is tracked as it passes various places on the line by messages sent via a bar code scanner to the production controlling system. Order information of the vehicle that details its configuration is matched with the data from the production controlling system to calculate what parts have been consumed. This data is then used to determine the payment due to the supplier of each consumed part.

4.3.2 Communicating the demand to a supplier

As described in section 4.1 above, planned orders are sent to suppliers 9 months in advance. These orders are triggered by a daily MRP run that creates an interface document called an I-Doc (standard SAP method for communication). For imported parts the I-Doc is sent to MBCC in Germany via EDI using MQSeries. MBCC is then responsible for co-ordinating orders worldwide with their suppliers.

In the case of local suppliers, long term agreements called Scheduling Agreements are in place that serve as contractual agreements. Local orders are based on a source list linked to the scheduling agreement that indicates various validity periods with their associated prices. Based on planned usage of parts, schedule lines are created to notify suppliers of the demand. Orders are communicated in a variety of ways including a Supplier Portal (integrated with the SAP system) and the Collaborative eXchange website.

4.3.2.1 The supplier portal

The supplier portal is an interface provided from DaimlerChrysler(SA) to its local suppliers. The main function of the portal is to provide two-way communication with local suppliers. The portal can support large parts of the process from sending out Request for Quotations (RFQ) to providing suppliers with order information.

The portal is based on SAP Netweaver that is a platform for building, extending and integrating enterprise applications (Anderson & Larocca, 2006). Because the portal is fully integrated with SAP, data is presented to suppliers with limited human intervention.

4.3.2.2 Collaborative eXchange (CX)

Local OEM's (Original Equipment Manufacturers) launched the Collaborative eXchange (CX) website to act as a single entry point for local part suppliers. All manufacturers send part orders to CX who then collates the orders and provides a consolidated view of all orders to local suppliers.

Business-to-Business Process Integration   Liezl van Rensburg

Chapter 4: Business-to-Business Process Integration between an automobile manufacturer and parts supplier (Case Study)   - 59 -   25418956

DaimlerChrysler(SA) makes use of CX by sending order data via EDI that CX in turn makes available on their website to local suppliers.

Planned orders do not constitute actual orders, but rather the intention of an order. Orders are firmed based on the specific lead time required for each part to be manufactured and shipped to the plant. In the case of imported parts, the lead time is significantly increased in order to utilise the most cost-efficient shipping method.

The daily material resource planning (MRP) run indicates whether an order is planned or firmed. Once the order has been firmed, suppliers are required to deliver the ordered quantity of parts as per the agreed date. In the case of JIT or JIS supply, trigger points at various places on the production line sends EDI messages to suppliers. JIT and JIS suppliers, similar to other suppliers, receive planned orders. However, in order to fulfil their obligation of supplying parts just-in-time or just-in-sequence, additional communication is needed as to the whereabouts of the vehicle they have to supply parts for.

When vehicles leave the paint shop, they are sequenced based on customer orders. Sequencing is also done before vehicles enter the paint shop, but this will not be discussed here, as it is not relevant to this study. As a customer orders a vehicle, they are provided with a delivery date. The delivery date is then used to calculate the day the vehicle has to pass through the various points in order to be delivered on time. In addition to the delivery date, vehicle sequencing is constrained by factors such as the time it takes to fit each part and the speed at which the production line moves. The production line moves continuously and line stoppages only occur in the event of an emergency. The amount of work that must be performed by each operator at a specific line station has been calculated and will determine the speed at which the production line moves. The production line speed in turn also determines the amount of work required to be performed at each line station. To fit a sunroof, for example takes an additional 8 minutes. As not all vehicle orders require

sunroofs, vehicles must be sequenced in such a way that the required buffer time is accumulated to allow for a sunroof to be fitted.

Based on the sequencing constraints, vehicle bodies are placed in the order that they will be built before they go onto the assembly line. As vehicles enter the assembly area, a message is sent to the JIT or JIS supplier via EDI to confirm the order with the configuration that will be required for that specific vehicle. JIS supply is typically used for sub-assemblies such as the cockpit where the configuration is determined by the option chosen by the customer (i.e. 180, AMG or sports pack accessories). The ordered sub-assemblies are delivered directly to the line station where it will be consumed.

In the case of imported parts, suppliers deliver the ordered parts to a temporary warehouse in Stuttgart. A description of the subsequent steps of this process will follow in Section 4.3.3.

4.3.3 Feedback Loop to confirm that demand will be filled

Once imported parts are delivered at the warehouse in Stuttgart, they are packaged in pallets assigned to specific containers. Containers are loaded on ships as cargo and advanced shipping notices (ASN) are sent to DaimlerChrysler(SA) to confirm the shipment details.

The preceding section described the processes involved in an ideal state. Based on the context described earlier in this chapter, the challenges that surround the execution of these processes will now be described in more detail in the next section.

4.4 Challenges when importing parts

DaimlerChrysler(SA) have no direct contact with imported part suppliers as all interactions are managed by MBCC. Once an order is placed with MBCC, the subsequent process steps are not visible to DaimlerChrysler(SA) until such time as an ASN is received to confirm the delivery date of an order. The lack of transparency in this process prevents DaimlerChrysler(SA) from managing

Business-to-Business Process Integration   Liezl van Rensburg

Chapter 4: Business-to-Business Process Integration between an automobile manufacturer and parts supplier (Case Study)   - 61 -   25418956

the possible risks involved directly and necessitates the company to rely on MBCC.

Imported parts are also subject to scrutiny by port control's customs and exports section. In an attempt to operate as efficiently as possible and reap the benefits of a just-in-time strategy, even imported parts are ordered to arrive as close as possible to the time when they are needed. Delays in custom and export inspections have caused delays in the past when entire shipments were bonded due to a query on one container.

4.5 Challenges when ordering local parts

The lifecycle of a model is approximately 7 years. During this period there are further changes known as facelifts or model year changes where the design of the vehicle is updated. In addition to this, smaller changes are made throughout the lifetime of a model to integrate newer technology or to prepare surrounding parts to fit these changes.

For each change, the drawing of that specific part is updated. Drawing numbers are indicative of the technical level of that specific part. In some cases the technical level of a part makes it incompatible with parts that are on previous technical levels, which means that the introduction of these changes has to be co-ordinated to ensure that parts fit properly.

Under normal operational procedures, these changes can be controlled with ease as the proper systems and processes have been put in place to deal with the expected number of changes. During the introduction of a new model such as W204 however, the changes are far more prolific. These changes will start stabilising as the model is in production. However during the engineering trial period, frequent changes in the technical level of parts will continue. For the eight units that will be built at three different technical levels to accommodate the maturing model, the ordering of the correct parts at the correct technical level is crucial. Parts at different technical levels may not fit and could provide inconsistent data during the trails.

Business-to-Business Process Integration   Liezl van Rensburg

Chapter 4: Business-to-Business Process Integration between an automobile manufacturer and parts supplier (Case Study)   - 62 -   25418956

In order to communicate changes that will have an effect on the technical level, data has to flow between at least three systems in Germany before it is transmitted to the systems in South Africa. Often this intervention does not happen as expected. In these cases human intervention can enhance this process in a positive way through communication. Relationships between local and international counterparts are already established and are often a source to identify changes that have not yet been communicated via the system. This information is then used to trigger the appropriate response.

Local systems that support these processes during the operational phase have been customised to ensure that rapid changes in technical levels can be sufficiently supported. In all these processes however there are also human elements that are not as desirable. Often due to a lack of awareness, users do not use the rapid processing functionality provided because they do not understand the impact of using this option.

Due to the longer lead time required to bring in parts from overseas, parts for each engineering trial have to be ordered approximately 90 days before the planned date of building. Local parts are not subjected to this extended lead time. However, it is essential that all parts are on the same technical level for each engineering trial. The complication comes in not so much on the part level, but on the tool development. Tools need to be updated to produce parts as specified on the latest technical level. There is a significant investment required to have these tools made. If a tool is made to produce a part on a technical level and has to be changed at a later stage, further investment will be required. In addition, tools are manufactured in Europe which means that making a tool to produce a part on one technical level, shipping it to the supplier in South Africa to make the parts required at that technical level could result in that tool having to be shipped back to Europe to be updated based on the latest technical level.

Co-ordination of these various aspects is hugely challenging. As many as six different departments within DaimlerChrysler(SA) need to work together to ensure that the correct projects for local parts supply are identified; that business is allocated to the correct supplier; that tools are manufactured according to the correct specification; that sample parts are tested and meet all required standards; and, that suppliers have sufficient logistical resources to supply the correct number of parts. A system has been put in place to support each of these processes and integrate the data from one process to another. In addition to supporting the internal process, this system has also been expanded to include support to suppliers for managing part prices, managing sample part requirements and providing order information. Sample parts have to be subjected to a rigorous testing process in Germany. The system has therefore been further expanded to provide sample part data required by the German-based systems and to accept sample part test results.

The above discussion is aimed at providing the necessary background for the discussion that will follow in the next chapter. The processes described will be evaluated based on specific themes and related to the theoretical underpinnings of structuration theory.

Business-to-Business Process Integration   Liezl van Rensburg

Chapter 4: Business-to-Business Process Integration between an automobile manufacturer and parts supplier (Case Study)   - 64 -   25418956

Chapter 5: Discussion and Findings

The case study described in Chapter 4 provides a number of examples where structure and agency are at play. This section will highlight these examples and discuss the structural and agent influences in more detail particularly looking at the following aspects:

- The parent company as a structure within the local context
- The regulatory and incentive framework as a structure
- The enabling technology as a structure
- IT as an agent for collaboration and co-ordination
- The relationship between the company and the local supplier as a structure
- The relationship between the company and the imported parts supplier as a structure
- Providing agency to suppliers via the use of the supplier portal
- Processes as agents

Structuration theory provides a good 'fit' for investigating business-to-business process integration. Each business involved in the integration effort consists of structures and agents. The structures are created by the agents and the agency of the agents is determined by the structures. The agents in each structure need the structure in order to "communicate"/ "integrate" with the agents in the other structure. Business to business process integration necessitates two structures to interact with each other, but they can only do this through creating a third structure in the way they communicate.

Similarly, using a case study provides the opportunity for gathering data over a longer period of time when compared to other research methods (Terreblance & Durrheim, 1999). Although this case study is situated in one organisation and only investigates two processes, it provides "rich, ideographic information" (Terreblanche & Durrheim, 1999: 255) that can promote critical reflection on existing theories.

The context in which this interaction takes place is also important since this will determine the level of agency that is possible. In each of the discussions below, the context (as described in Chapter 4) forms an integral part of the described content.

5.1 The parent company as a structure

DaimlerChrysler(SA) is wholly owned by DaimlerChrysler(AG). Although it is registered as a separate legal entity, the operational management is largely dictated by the parent company. Thus, a number of German ex-patriots hold key positions within the organisation. Generally these ex-patriots will stay in South Africa for four years before they return to Germany. Giddens (1984) explains that regionality will influence what are enclosed and disclosed. Ex-patriots bring with them the social structures of their German institutions. Since they will be returning to these institutions, these social structures are not easily influenced by the new locale (what Giddens' (1984) refers to as the setting of interaction) that people find themselves in.

The organisation is also fragmented in that divisions locally will report to their respective organisational divisions overseas. In most cases, the reporting lines are to Germany, but in some cases to Singapore. Different business strategies and targets are therefore determined outside the local organisation and have to then be amalgamated and brokered in order to define the local strategy. These strategies are measured by strict targets based on international trends at each level, locally in terms of the plant as well as globally in terms of each division. Individual areas report on their targets and these performance targets are then rolled up to form a consolidated view that is reported globally using the balanced score card methodology. The different settings of interaction will, according to Giddens (1984) provide different meanings to communicative action. Ensuring that measurements are accurate and measuring the intended performance is therefore challenging.

Many operational procedures have to be adjusted because the context does not always make it practical to work in the same way as the parent company. The next section will look at the legal and compliance framework and how that

affects the operational procedures. In addition, the workforce also has a powerful input with regard to how the local subsidiary operates. In an attempt to gain a better understanding of the conditions that workers have to endure, the management team was invited to experience 'a day in the life of the operator'. This initiative meant that the management team had to leave work and use the public transport system to travel to the local township, Mdantsane. Once they arrived there, they were given tasks to do to allow them to experience life in the township. One of the experiences that had a significant impact on the management team was based on the solidarity that the community showed towards a local supermarket chain. At the time of the visit, there was a labour dispute against this supermarket chain as workers demanded higher wages. Although the area outside the supermarket was bustling with activity, no-one entered the supermarket to buy their products. The message was clear that the community would not support the supermarket while members of the group were suffering.   Through experiencing this, the management team realised that their leadership positions are not solely determined by the appointment made by the parent company, but that they are in a leadership position, because the worker community allows them to be.

The above provides an example of routinized intersections of practices which are transformation points in structural relations. Although the parent company provides a rigid structure in which the local subsidiary has to operate, the community has a strong sense of agency that can influence how that structure is legitimized.

5.2 The regulatory and incentive framework as a structure

Since the burst of the dot com bubble, regulations have become more and more prolific. DaimlerChrysler(AG) is listed on the New York stock exchange which necessitates all subsidiaries to comply with the Sarbanes-Oxley (SOX) act. Compliance ensures that the company can operate as well as have business dealings in the United States of America. A large portion of DaimlerChrysler(SA)'s revenue will be generated by exporting C-Class

vehicles to the United States which would make compliance to Sarbanes-Oxley mandatory.

A similar statute is the Foreign Corrupt Practices Act (FCPA) that aims at putting policies in place to prevent fraudulent behaviour. All employees are required to familiarise themselves with the policies and management team members are required to sign a document that will hold them personally responsible should they or any of their team members transgress.

In addition to SOX and FCPA, ISO compliance is also mandatory. As described in section 4.1, ISO compliance ensures that a certain quality level is maintained. In order to do so, business processes have to be documented and adhered to. Adherence to processes would make the outcomes repeatable which in turn ensures that a standard is maintained.

The above scenarios all indicate the structures used to prohibit agency by regulating behaviour. Structures can however also promote agency. The description of the MIDP in section 4.1 is a good example of how this applied. By providing incentives to organisations, the MIDP allows for suppliers to be developed and investments to be made. Investments go further than just providing tools, because supporting local suppliers also provide jobs. These structures also instil a culture of buying locally produced products.

The Broad Based Black Economic Empowerment Act (BBBEE) also encourages companies to invest in previously disadvantages people. In addition to maintaining equity amongst races and gender when employing individuals, the BBBEE Act also encourages the use of suppliers who meet BBBEE requirements. By putting a legal policy in place, this creates a structure in which previously disadvantaged people are given agency to participate on an equal footing. DaimlerChrysler(SA) has met its targets for creating equal opportunities by exceeding national targets.

The regulatory and incentive framework provides a complex set of structures that on the one hand can control and on another, empower agents. The

convergence of these different modes of institutionalized practices reproduces systems and structures that provide normative elements to social behaviour.

5.3 The enabling technology as a structure

Business to Business process integration is largely dependent on the technology that connects the different organisations. No matter what level of integration is chosen (see Chapter 3), technology will always be the enabling (or constraining) structure that allows for data, applications or processes to interact.

In the case study described in Chapter 4, the technology that acts as a structure includes the IDoc transmissions via MQSeries, the supplier portal and the CX website. These technologies all provide a pre-determined format that controls the interaction between the different organisations.

5.4 IT as an agent for collaboration and co-ordination

Although IT provides the structure that enables the communication, it can also act as an agent. We differentiated between two different extended enterprises in Chapter 3: the collaborative extended enterprise and the co-ordinated extended enterprise. In the Case Study in Chapter 4 examples of these extended enterprises were given in the form of importing parts from MBCC or purchasing parts from local suppliers.

In this situation, IT acts as a broker that co-ordinates and collaborates on behalf of the organisation.

5.5 The relationship between the company and the local supplier as a structure

In order for the relationship between DaimlerChrysler(SA) and their suppliers to work, the terms must be mutually beneficial. In terms of cost, the benefits to DaimlerChrysler must be economically viable and not necessarily the lowest price at which a part can be procured. It is in DaimlerChrysler(SA)'s interest to ensure that suppliers maintain a high enough operating profit to maintain the standards at which they produce parts and remain operational.

Open book calculations are used as a basis for negotiation. The pricing process is therefore completely integrated between the supplies and the plant.

Within the economical context of East London, very few industries do not have some dealings with DaimlerChrysler(SA). In some cases, the only reason why some of these companies have outlets in East London is because of the proximity to the plant. The agency of the supplier is severely limited by the structure that is in place since the dependency of the supplier on DaimlerChrysler(SA) provides an unequal power relationship. The uneven balance of power between the supplier and DaimlerChrysler(SA) creates a modality of domination. Not only because of the dependency of the supplier on the plant, but also because the 'power' of withholding certain information, such as the cost breakdown of each part (including operational costs and profit) is not an option.

The process for payment of suppliers is based on consumption. Suppliers therefore do not invoice DaimlerChrysler(SA). Once a part is consumed at a specific line station, a consumption point triggers the financial system to report the usage of a specific part based on the vehicle sequencing. Consumption is calculated over a period of time and payment is affected by an agreed upon due date. This process is a further example of how legitimisation can lead to domination since the supplier does not control what they charge the company in the form of an invoice, rather the company tells the supplier what they will be paid.

Having said that however, the power exerted by DaimlerChrysler(SA) is one of empowerment rather than a domineering power. DaimlerChrysler's commitment to invest economically in South Africa is evident in the building of a new state of the art body shop to produce the new C-Class model. In addition, various industries are provided with tools, equipment and a host of other forms of support including process designs and training to enable them to produce the necessary parts.

5.6 Providing agency to suppliers via the use of the supplier portal

The supplier portal as described in Chapter 4 provides suppliers with a means of managing their agreement with DaimlerChrysler(SA). Currently the most common use of the portal is for business allocation and for price updates.

The new model demanded that all agreements with suppliers be updated. There are almost 200 local suppliers. Approximately 1 389 RFQ's were sent out to ensure that business could be allocated. By placing the RFQ's with its relevant datapacks on the portal, suppliers had access to the latest information instantaneously. The portal also enabled suppliers to submit their RFQ's electronically.

Once business has been allocated, suppliers are expected to maintain their prices. With the recent fluctuation of the foreign exchange rate, prices of parts with foreign content could change with as much as 30%. Suppliers could therefore ensure that the prices reflect the most recent costs.

Due to licensing costs and data integrity controls, one individual within the supplier organisation is trained in the use of the portal. This person is provided with a specific logon and password to manage the interactions of the supplier with the plant. In this way the person identified is signified in their practice that contributes to their legitimatization in the context of this relationship. This can form domination within the supplier organisation since this person is provided with the relevant knowledge and power (in the sense of the logon details).

By integrating these processes, the suppliers are empowered to manage their relationship with DaimlerChrysler(SA). However, the power relationship within the supplier organisation is also influenced by the portal usage practices prescribed by DaimlerChrysler(SA), who in this case, is outside the supplier organisation.

5.7 Processes as a duality of structure and agency

When looking at the definitions of processes highlighted in Chapter 2, it is apparent that processes provide structure by describing the activities that should take place in order to reach a goal. What may not be as apparent is how processes operate as a duality of structure and agency.

On a superficial level, processes are really just representations of 'how' something works. Adam Smith introduced the division of labour. Henry Ford took this one step further by producing the assembly line concept used in mass production. In this way an agent did something in a particular way which resulted in the general acceptance of that way of doing things. Thus processes are created by agents, but when executed by these agents, they become structures.

On a technological level (as described in Chapter 3), processes have to be clearly defined to allow for successful integration. The process, for example, of ordering parts from suppliers (local or import) rely on specific data formats to enable its execution. Changing any of the processes will result in large investments to be made to update the technological structure in which these processes are executed. In order to capitalise on the agency of processes, dynamic views that extract the full potential of existing interfaces are necessary. The supplier portal (described in Chapter 4) is a prime example of how this level of process agency can be achieved.

On a social level, however, people operating successfully in their context provide the opportunity for continuous improvement and innovation. The structure of the context in which the process is executed has to be such that people are given the agency to innovate. Through innovation, people exercise their right to agency and form the next structures that will enable the improved execution of the process.

The discussion above highlights that there are various structures influencing how processes are integrated. Agency is however equally important in influencing how structures are formed.

Chapter 6: Conclusions and Recommendations for further research

Business to business process integration provides an ideal opportunity to leverage the opportunities within the supply chain to gain a competitive advantage. Integration needs to be considered from two aspects, technical and social. The technological integration alone is not enough to maintain a competitive advantage, which after all is the driving force behind business-to-business process integration. For DaimlerChrylser(SA) the competitive edge of providing technology to suppliers is already negated by the Collaborate eXchange website (see Chapter 4). The question then becomes: how do companies not only gain a competitive advantage, but maintain that advantage?

Different authors have different views on this: Ferrara *et al.* (2002) indicate that focussing on process improvements will provide a company with innovative ideas that will keep them ahead of their competitors; Chen *et al.* (2004) feels that the secret lies in optimising the supply chain; Goethals *et al.* (2005) proposes the creative use of standards.

The concept of benchmarking and applying best practice, as implied by using standards, negates process innovation since a process can only be benchmarked or recognised as best practice if it is already operational, which means that someone is already reaping the benefits from it. The value of process benchmarking lies rather in the fact that it instils a culture of continuous improvement in the stakeholders of the process.

The Butler Group (2004) believes that the only true source of competitive advantage is people. As a result of this paper, the researcher concludes that this view is true, however people can only provide this competitive advantage if the necessary technology is in place to empower them to become innovative 'knowledge workers' (as defined by Davenport (2004)). As the focus of process optimisation extends to include end-to-end processes across the

value chain, the implications on a technological as well as social level need to be considered.

These implications include the need to integrate disparate systems within the organisational boundaries as well as extending the integration effort to include the extended enterprise. Enabling technologies that use pre-determined formats create a structure that will either enable or constrain information flows between companies. When integrating systems, the organisations need to decide on the level and type of integration that will make most sense in their context.

Existing technologies to facilitate integration abound, but companies need to make the technology 'their own' in terms of customisation to drive value creation. In this instance, IT becomes an agent that uses existing resources to collaborate and co-ordinate enterprise activities.

Business processes change rapidly and system processes need to be flexible enough to respond to changing business needs in order to capitalise on any available competitive advantage. Technology should therefore act as an opportunity of structuration since its presence can influence and invoke agency.

From a social aspect, there is a need to manage power and the legitimisation of power. When managed, these will become structures that will ensure information flows are enabled rather than restricted.

The behaviour of agents is also conditioned by the norms that are determined by the organisational structure and culture. The strategic decision of DaimlerChrysler to appoint ex-patriots to key management positions at the local subsidiary attempts to determine the norms that are expected. The organisational structure and culture are influenced by the philosophy applied by the organisation's management team, as well as from the context (locale) of the organisation. The context can not be ignored, as was illustrated by the agency demonstrated to the management team when they visited the local

township to experience 'a day in the life of the operator'. To instil a culture of process innovation, it is necessary to provide the enabling cultural norms as structures to influence agents.

Globalisation, and the legislative framework that is a result thereof, provides a means for monitoring social interactions in a reflexive manner. Agents are expected to exploit these authoritive resources to ensure that companies remain compliant while searching for opportunities to improve their processes like in the case of BBBEE and MIDP incentives.

At the outset of this research study, the researcher set out to understand the implementation implications of business to business process integration from a technical as well as social perspective. She therefore documented her understanding based on her experiences of the integration of two processes between a local vehicle manufacturer and its suppliers. In order to make sense of these experiences, structuration theory was used to evaluate and situate the findings. It was found that the main driver for business to business process integration is the search for competitive advantage. Although competitive advantage is achievable, sustaining this advantage is still problematic.

It was found that sustainable competitive advantage will rely heavily on technology being in place. This advantage will however only be maintained by using the interactions that people have with process and the agency they apply in their process usage as a means of influencing the development of structures. Little research is available on how the social aspects of business to business process integration should be managed. Further research should take this aspect one step further to identify ways in which agency can be harnessed to ensure that companies can maintain their knowledge workers and provide them with the legitimate power to continually optimise the way in which they work. This could lead to a practical framework for implementation and the actions necessary to implement business to business process integration. Only then will companies be able to harness the power of

business to business process integration as a source for sustained competitive advantage.

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