

**THE IMPLEMENTATION OF VIRTUAL TEAMS:
A THEORETICAL FRAMEWORK**

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NOTE

The reader is reminded of the following:

- The references as well as the editorial style as prescribed by the Publication Manual (5th edition) of the American Psychological Association (APA) were followed in this mini-dissertation. This practice is in line with the policy of the Programme in Industrial Psychology of the PU for CHE to use APA style in all scientific documents as from January 1999.
- The mini-dissertation is submitted in the form of a research article. The editorial style specified by the South African Journal of Industrial Psychology (which agrees largely with the APA style) is used, but the APA guidelines were followed in the construction of tables.
- The name of the supervisor appears on the manuscript (article). However, the work in the manuscript was done by the student.

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My family and fiancé, for their face-to-face support and encouragement.

SUMMARY

**SUBJECT: THE IMPLEMENTATION OF VIRTUAL TEAMS:
A THEORETICAL FRAMEWORK**

KEY TERMS: Virtual work, telework, virtual organisation, virtual work designs, virtual teams, business process redesign, implementation, virtual team development, project-based designs, technology.

The impact of globalisation and advanced information technology on service and knowledge-based industries in South Africa contributes to these workplaces becoming increasingly virtual. Virtual teams can be seen as a mechanism that organisations could use to increase their orientation for change through enhancing and integrating key organisational resources such as people, space and information technology to deliver greater business value. The findings of several studies suggest that the implementation of virtual teams is associated with benefits such as cost and time saving, increased employee productivity and employee empowerment. There are however salient barriers to effective virtual teamwork that organisations need to address before engaging in the transformational process towards virtual teamwork. The literature review identified ineffective leadership practices, factors relating to virtual team development, inadequate use of information technology and a paucity of social and organisational cultural integration, as the most salient features that impede effective virtual teamwork.

The objective of this research was to develop a basic theoretical framework for the implementation of virtual teams. Since virtual teams emanate from a relatively new area of research an inductive methodology, based on a literature review, was used to achieve the research objective. Several theoretical models on virtual teams and their effectiveness thereon were explored to conceptualise the dynamic nature of virtual teams and the requirements for implementing them in the workplace.

The results of the study indicated that an emergent approach to change be followed and that the following factors be addressed to determine an organisation's readiness for the

implementation of virtual teams, namely: the degree of interdependence between tasks, structural requirements, technological requirements, process redesign and the selection of appropriate people. A methodology for work transformation towards virtual teamwork was suggested based on an integration of these factors.

Recommendations for future research have been made.

OPSOMMING

**ONDERWERP: DIE IMPLEMENTERING VAN VIRTUELE SPANNE:
'N TEORETIESE RAAMWERK**

KERN TERME: Virtuele werk, telewerk, virtuele organisasies, virtuele werksontwerpe, virtuele spanne, herontwerp van besigheidsprosesse, implementering, virtuele spanontwikkeling, projek-gebaseerde ontwerpe, tegnologie.

Die impak van globalisering en gevorderde inligtingstegnologie op die diens- en kennis intensiewe industrieë in Suid-Afrika het tot gevolg dat hierdie werksplekke toenemend virtueel word. Virtuele spanne kan beskou word as 'n meganisme waardeur organisasies hul oriëntasie tot verandering kan verhoog deur belangrike hulpbronne soos mense, spasio en informasietegnologie te integreer en te optimaliseer om sodoende meer besigheidswaarde toe te voeg. Uit die resultate van verskeie studies wil dit voorkom of die implementering van virtuele spanne gepaard gaan met voordele soos byvoorbeeld: tyd- en kostebesparing, 'n toename in werknemer produktiwiteit en die optimisering van werksisteme wat 'n bydrae lewer tot organisasie-effektiwiteit. Daar is egter beduidende hindernisse wat effektiewe virtuele spanwerk kan inperk en moet oorkom word voordat Suid-Afrikaanse organisasies 'n transformasie tot virtuele spanwerk kan inisieer. Van hierdie uitdagings sluit in: oneffektiewe leierskappraktyke, faktore wat virtuele spanontwikkeling inperk, ontoepaslike gebruik van informasietegnologie asook 'n gebrek aan meganismes vir sosiale en kulturele integrasie.

Die doelstelling van hierdie navorsing was om 'n teoretiese raamwerk daar te stel wat as 'n riglyn kan dien vir die implementering van virtuele spanne in die werksplek. Aangesien virtuele spanne 'n relatief nuwe verskynsel is, is 'n induktiewe metodologie van bestaande literatuur gebruik om die navorsingsdoelstelling te bereik. Verskeie teoretiese modelle wat handel oor virtuele spanne was ondersoek om die dinamiese aard en voorvereistes vir die implementering van virtuele spanne in die werksplek te konseptualiseer.

Die resultate van die studie dui aan dat 'n buigbare benadering tot verandering gevolg word en dat die volgende faktore aangespreek moet word om organisasies se gereedheid vir die

implementering van virtuele spanne te peil, naamlik: die mate van interafhanklikheid tussen werkstake, strukturele vereistes, die herstrukturering van prosesse, tegnologiese vereistes asook die keuring van gepaste spanlede. Op grond van 'n integrasie van bogenoemde faktore is 'n metodologie vir die implementering van virtuele spanne voorgestel.

Aanbevelings vir toekomstige navorsing is aan die hand gedoen.

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CHAPTER 1

INTRODUCTION

This mini-dissertation focuses on a theoretical framework for the implementation of virtual teams.

This chapter contains the problem statement, research objectives and research methodology employed. In addition, the chapter division of the mini-dissertation is presented.

1.1 PROBLEM STATEMENT

The transition from the industrial age to the current information and electronic age is forcing organisations to become more dynamic in their operations and adopt innovative approaches to survive and be competitive in the global market (Arnison & Miller, 2002; Denton & Vloeberghs, 2003; Furnham, 2000). A major challenge for South African organisations is their capacity to compete in a "new" economy where advanced information technology and the power of digital networks have the potential for real-time information availability, greater knowledge sharing and customised relationships with stakeholders.

The following are manifestations of the type of virtual environment that South African organisations are facing:

- competitors exploiting advanced information technologies to create faster-paced workflow with greater flexibility and less dependence on the traditional office concept;
- rising customer expectations and new pressures on organisations to develop interdependent relationships with customers to respond, personalise and initiate solutions that result in customer growth; and
- modern e-workplaces using the benefits of teams to gain the market advantage (Arnison & Miller, 2002; Bellingham, 2001; Lipnack & Stamps, 1993).

The emergence of more complex and fast changing business environments necessitates that organisations develop the ability to learn, to acquire information quickly and to build their collective reservoir of expert knowledge and skills to remain competitive. Denton and Vloeberghs (2003) propose that South African organisations move away from autocratic, controlling forms of management towards team structures that enable empowerment, entrepreneurship, flexibility, responsiveness, innovation, speed and creativity. Organisational structures therefore need to change from mechanistic and bureaucratic to more organic and flatter structures to increase their competitiveness and capability to adapt and respond quickly to the changing conditions of their environment. Organisations with organic structures tend to have decentralised decision making; less horizontal and vertical differentiation and more personal and spatial differentiation with a higher capacity for information processing to respond quickly, flexibly and adaptively in complex and uncertain business environments (Gordon, 1999). Organisations can therefore increase their flexibility and capacity for learning by making structural changes internally, using team-based units either in addition to a formal hierarchy or replacing current bureaucratic hierarchies.

Organisations also respond to uncertain business environments by specialising their divisions. There is, for example, an increasing trend in South African organisations to incorporate external resources which develop outside the organisation's boundaries by outsourcing certain organisational functions or generating separate business units (Denton & Vloeberghs, 2003). These external organisational activities break the traditional value chain and gives rise to the concept of virtual organisation having a strong market orientation (Davidow & Malone, 1992; Domingo, Lucia & Margaritae, 2003). Products (goods and/or services) are increasingly based on information and knowledge, in such a way that their sale and even their delivery are carried out by virtual means (Skyrme, 1998).

Concepts such as networking and interdependence are often associated with organisations' virtualisation as new forms of collaboration between business units and/or organisations develop to obtain specialised knowledge and/or skills. The term "virtual" is not only associated with fundamental changes in the business environment in which physical presence is substituted with virtual presence, but also the extensive use of advanced information technology (Powell, 1990; Skyrme, 1998). Tarabour (1999) defines information technologies as an umbrella concept that consists of a broad range of communication media and devices which link people and information systems such as voice mail, e-mail, voice conferencing,

video conferencing, the internet, GroupWare and intranets. It seems that information technology can be strategically used to bring people with different competencies situated in different geographic locations, working collaboratively on specific tasks. Specialisation can therefore be obtained internally or between organisations through the use of virtual teams in which information technology is used to facilitate the integration and coordination of different parts of the organisation for it to operate in synchrony (Qureshi & Vogel, 2000).

By forming virtual teams organisations can exploit both the competitive synergies of teamwork and the advancements in information and communication technologies. The extensive use of information technologies enable changes in the way work and tasks are structured to enable organisations to deal more effectively with complex business environments. Although information technology can assist conventional teams to increase their productivity and extend their capabilities, it also seems to contribute to an increase in work and task complexity. Virtual teams are for example, often associated with a greater level of complexity in tasks design than traditional co-located teams (Lipnack & Stamps, 2000; Warkentin, Sayeed & Hightower, 1997).

Several South African organisations are for example adopting telework arrangements, especially in the banking (Hodgson, 2002) and insurance industries (Hale & Whitlam, 1997), which denotes a type of virtual and/or flexible work arrangement often associated with virtual teams. From a macro perspective the term "virtual" seem to emphasise the dispersion of organisational activities and the collaboration between people and organisations. Some authors such as Palmer and Speier (1997) go so far as to define a virtual team as a permanent virtual organisational design in which individuals from the same organisation represents different organisational functions or department units that work together as a team on specific, ongoing tasks with very little face-to-face interactions.

Virtuality seem to relate to a work environment in which employees operate remotely from each other and from managers. Watson-Manheim and Belanger (2002) support this notion and describes it as an all-encompassing term representing work environments where employees are physically and/or temporally separated from their co-workers or their work location some or all of the time, and perform interdependent work activities. Since several virtual work arrangements such as telecommuting, home-workers, mobile workers and global

teams are associated with the concept of virtual teams it is necessary to distinguish virtual teams from other types of virtual work designs.

Virtual teams seem to be distinguished from conventional teams where the former consists of team members being physically located in different places on a national or global scale (Lipnack & Stamps, 1993). The proximity of a virtual team's members could therefore be used as a criteria to distinguish between different types of virtual teams such as geographically dispersed or global teams. Jennings (1997) views virtual teams as groups of people who collaborate closely and adds that members may or may not be separated by space, time, and organisational barriers. Arnison and Miller (2002) support Jennings's (1997) notion that team members do not need to be geographically separated to be considered virtual and emphasise the use of information technology as a criterion for virtuality. Conventional teams who are co-located in one office building can therefore also function as virtual teams by using these technologies.

Some authors such as Zigurs and Qureshi (2000) even suggest that the concept of virtual teams does not exist and that the term refers to individuals who are brought together through technology. It is therefore necessary to clarify the concept of virtual work and to set clear criteria to conceptualise virtual teams as a distinct construct. Without a clear distinction between virtual and co-located teams similar design factors could be used that do not take into account the complexity and organisational change involved in virtual team formations.

Robertson (2000) uses the term work transformation to refer to the process in which specific organisational resources such as people, space and information technology are enhanced to deliver greater business value. The implementation of virtual teams therefore involves work transformation with several organisational benefits and the potential for adding greater business value. A South African study conducted by Hoffman (2002) for example, found that the implementation of telework resulted in cost savings of up to 38% in office space, furniture, parking and support staff. According to Arnison and Miller (2002) as well as Elliott and Fontaine (2000) virtual teams can potentially increase the overall effectiveness of an organisation, more so than traditional teams. Virtual teams are associated with benefits such as reduced infrastructure cost; an increase in employee productivity and efficiency, the roll-out of new service products and deliverables on a global scale rather than a local scale, an increase in flexibility in work hours and job design, faster response times to tasks, increased

collaboration across organisational boundaries, the creation of employment opportunities for disabled employees, and best practices being shared from team members based in different locations and in various market areas. Advances in information and communication technology and specifically the decreasing costs of bandwidth are making virtual teams viable so as to facilitate the organisation's capability to work across organisational boundaries (Lipnack & Stamps, 2000). Clarke (2000) defines bandwidth as the amount of information that can be transmitted across a computer network in a given amount of time.

There is nonetheless, a high failure rate associated with the implementation of virtual teams (Bal & Foster, 2002). Authors such as Jarvenpaa and Shaw (1998) have found that typical challenges to effective virtual teamwork were difficulties in team development processes and computer-mediated communication. Since these studies were conducted within an educational context using simulated virtual teams they do not represent the complexities involved with actual virtual teams operating within a complex business environment. It is therefore important to identify the type of barriers to effective virtual teamwork that actual virtual teams experience in order to identify strategies to overcome them.

From the literature it is evident that the implementation of virtual teams is often explored within the Information Sciences where there is a strong emphasis on software application and technological requirements (Ocker, Hiltz, Turoff & Fjermerstad, 1996). Since virtual team members need to adjust to a new work context and new environmental demands, technological requirements alone do not seem to provide sufficient guidelines for the transformational change involved with the implementation of virtual teams. Without addressing organisational, process and people related requirements for a transformational work change, employees are likely to work in a new technological context in the same way they were accustomed to in their traditional co-located teams (Bal & Foster, 2000; Qureshi & Vogel, 2000). The result is often that the team experiences sub-optimal performance quality, lower satisfaction and interpersonal hostility which could impede the viability of virtual teams in the future.

Since the occurrence of virtual teams is only recently emerging within South African organisations it is imperative that research be aimed at conceptual approaches and processes which promote an understanding of the phenomenon of virtual teams. Although several virtual team models have been proposed in the literature (Bellingham, 2001; Duarte &

Snyder, 1999; Haywood, 1998; Henry & Hartzler, 1998; Lipnack & Stamps, 2000), they each seem to emphasise different aspects related to virtual team development, but do not present an approach to virtual team implementation.

It is also important that South African organisations have clear guidelines and tools to determine the viability of using virtual teams, and a methodology for transforming co-located teams into high performing virtual teams. A recent survey conducted to determine the degree to which South African organisations are making the shift to a "new" economy style of managing organisational and people performance, revealed that South African organisations predominantly have a traditional top-down management approach with poor change leadership practices for implementing change, and turning strategy into operational reality that delivers competitive performance (Sacht, Nel & Lamb, 2003). It is therefore necessary to develop a sound methodology for virtual team implementation which is based on an integrated theoretical framework depicting the process by which the strategy for virtual teams is formulated and used as a primary driver for work transformation towards high performing virtual teams.

Without the support of an integrated theoretical framework, implementation could render unsatisfactory results and perpetuate negative consequences such as mistrust, role confusion, lack of direction, conflict, high coordination costs and ambiguous communication.

1.2 RESEARCH OBJECTIVES

1.2.1 General objective

The general objective of this study is to develop a basic theoretical framework for the implementation of virtual teams.

1.2.2 Specific objectives

The specific objectives of this study are:

- to explain the impact of globalisation and advanced information technology on South African organisations

- to distinguish virtual from conventional teams and other virtual work designs based on the use of information technology
- to identify the type of task design and complexity involved in virtual teamwork
- to determine the potential barriers to actual virtual teamwork
- to develop a methodology for work transformation based on a sound theoretical model for virtual team implementation and
- to make recommendations on how organisations could approach effective virtual team implementation.

1.3 RESEARCH METHOD

In this study an inductive approach is followed by using the research method of a literature review. Bless and Higson-Smith (1995) define a literature review as an ongoing process of obtaining relevant information regarding the research topic.

In general, research may be classified in terms of positivist and anti-positivist studies. The positivist approach includes empirical research methods such as case study, survey, field test and experiments, while anti-positivist is based on an interpretative or inductive paradigm and includes research methods such as action research and literature reviews (Galliers & Land, 1987). Anti-positivism emphasises human interpretation and understanding as constituents of scientific knowledge. Qureshi and Vogel (1999) state that positivistic approach is reductionistic in nature since it investigates specific aspects of the phenomenon being investigated and thus builds an understanding of parts rather than the whole. An inductive approach therefore seems to be more suitable when broader organisational issues are investigated such as implementation of virtual teams.

Although a large number of research studies exist using positivist research in the use of electronic communication technologies very few research studies investigate organisational factors related to the implementation of virtual teams. Since the concept of virtual teams is relatively new and has not yet been clarified as a distinct construct very little theoretically based information is available to enhance an understanding of the concept of virtual teams. Huysamen (1994) recommends that in such circumstances the phenomenon being studied should first be described systematically in an attempt to unravel relationships and patterns. The intent of this research is to increase understanding of virtual teams within the broader

context of work transformation, which aligns with the anti-positivist research basis of a literature review.

This research method of a literature review aims to:

- establish a sound theoretical framework by taking an interdisciplinary perspective in delineating different theories and models found in the behavioural and information management sciences relating to virtual team implementation. Although there is a large body of literature on conventional face-to-face teamwork practices, there is only a limited amount of literature available on virtual teamwork
- use empirical results from previous studies to identify factors and variables that relate to virtual team effectiveness
- identify gaps in knowledge, as well as weaknesses in previous studies and
- discover connections and relations between different research results by comparing various investigations.

1.4 DIVISION OF CHAPTERS

Chapters are presented as follows in this mini-dissertation:

Chapter 1: Introduction

Chapter 2: Research article

Chapter 3: Conclusions, limitations and recommendations

1.5 CHAPTER SUMMARY

This chapter focuses on the importance of conducting this research as well as the proposed objectives. The research method that will be used in this research is explained.

The research article is presented in Chapter 2.

CHAPTER 2

RESEARCH ARTICLE

**THE IMPLEMENTATION OF VIRTUAL TEAMS:
A THEORETICAL FRAMEWORK**

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ABSTRACT

The objective of this research was to develop a basic theoretical framework as a guideline for the implementation of virtual teams in South African organisations. Several theoretical models on virtual teams and potential barriers to effective virtual teamwork were explored to conceptualise the dynamic nature of virtual teams and the requirements for the implementation of virtual teams. An inductive methodology was used to increase an understanding of virtual teams within the broader context of work transformation. The results indicated that the following factors should be addressed to determine an organisation's readiness for the implementation of virtual teams, namely: the degree of interdependence between tasks, structural requirements, technological requirements, process redesign and the selection of appropriate people. A methodology for the implementation of virtual teams was suggested based on an integration of these factors.

OPSOMMING

Die doelstelling van hierdie navorsing was om 'n teoretiese raamwerk daar te stel wat as 'n riglyn kan dien vir die implementering van virtuele spanne in Suid-Afrikaanse organisasies. Verskeie teoretiese modelle ten opsigte van virtuele spanne en potensiële hindernisse betreffende die effektiwiteit daarvan was ondersoek om die dinamiese aard en voorvereistes vir die implementering van virtuele spanne in die werksplek te konseptualiseer. 'n Induktiewe metodologie is gebruik om virtuele spanwerk binne die breër konteks van werk transformasie te begryp. Die resultate van die studie dui aan dat die volgende faktore aangespreek moet word om organisasies se gereedheid vir die implementering van virtuele spanne te peil, naamlik: die mate van interafhanklikheid tussen werkstake, strukturele vereistes, die herstrukturering van prosesse, tegnologiese vereistes asook die selektering van gepaste spanlede. Op grond van 'n integrasie van bogenoemde faktore is 'n metodologie vir die implementering van virtuele spanne voorgestel.

The transition from the industrial age to the current information and electronic ages is forcing organisations to become more dynamic in their operations and adopt innovative approaches to survive and be competitive in the global market (Arnison & Miller, 2002; Denton & Vloeberghs, 2003; Furnham, 2000). A major challenge for South African organisations is their capacity to compete in a "new" economy where advanced information technology and the power of digital networks have the potential for real-time information availability, greater knowledge sharing and customised relationships with stakeholders.

The following are manifestations of the type of virtual environment that South African organisations are facing:

- competitors exploiting advanced information technologies to create faster-paced workflow with greater flexibility, and less dependence on the traditional office concept
- rising customer expectations and new pressures on organisations to develop interdependent relationships with customers to respond, personalise and initiate solutions that result in customer growth and
- modern e-workplaces utilising the benefits of teams to gain the market advantage (Arnison & Miller, 2002; Bellingham, 2001; Lipnack & Stamps, 1993).

The emergence of more complex and fast changing business environments necessitates that organisations develop an ability to learn, to acquire information quickly and build their collective reservoir of expert knowledge and skills to remain competitive. Denton and Vloeberghs (2003) propose that South African organisations move away from autocratic, controlling forms of management towards team structures that enable empowerment, entrepreneurship, flexibility, responsiveness, innovation, speed and creativity. Organisational structures therefore need to change from mechanistic and bureaucratic to more organic and flatter structures to increase their competitiveness and capability to adapt and respond quickly to the changing conditions of their environment. Organisations with organic structures tend to have decentralised decision making; less horizontal and vertical differentiation and more personal and spatial differentiation with a higher capacity for information processing to respond quickly, flexibly and adaptively in complex and uncertain business environments (Gordon, 1999). Organisations can therefore increase their flexibility and capacity for learning by making structural changes internally by using team-based units either in addition to a formal hierarchy, or replacing current bureaucratic hierarchies.

Organisations also respond to uncertain business environments by specialising their divisions. There is for example, an increasing trend in South African organisations to incorporate external resources which develop outside the organisation's boundaries by outsourcing certain organisational functions, or generating separate business units (Denton & Vloeberghs, 2003). These external organisational activities break the traditional value chain and give rise to the concept of virtual organisation which has a strong market orientation (Davidow & Malone, 1992; Domingo, Lucia & Margaritae, 2003). Products (goods and/or services) are increasingly based on information and knowledge, in such a way that their sale and even their delivery are carried out by virtual means (Skyrme, 1998).

Concepts such as networking and interdependence are often associated with organisations' virtualisation as new forms of collaboration between business units and/or organisations develop to obtain specialised knowledge and/or skills. The term "virtual" is not only associated with fundamental changes in the business environment in which physical presence is substituted with virtual presence, but also the extensive use of advanced information technology (Powell, 1990; Skyrme, 1998). Tarabour (1999) defines information technologies as an umbrella concept that consists of a broad range of communication media and devices which link people and information systems such as voice mail, e-mail, voice conferencing, video conferencing, the internet, GroupWare and intranets. It seems that information technology can be strategically used to bring people with different competencies situated in different geographic locations, working collaboratively on specific tasks. Specialisation can therefore be obtained internally or between organisations through the use of virtual teams in which information technology is used to facilitate the integration and coordination of different parts of the organisation for it to operate in synchrony (Qureshi & Vogel, 2000).

By forming virtual teams, organisations can exploit both the competitive synergies of teamwork and the advancement in information and communication technologies. The extensive use of information technologies enables changes in the way in which work and tasks are structured to enable organisations to deal more effectively with complex business environments. Although information technology can assist conventional teams to increase their productivity and extend their capabilities, it also seems to contribute to an increase in work and task complexity. Virtual teams are for example, often associated with a greater level of complexity in tasks design, than traditional co-located teams (Lipnack & Stamps, 2000; Warkentin, Sayeed & Hightower, 1997).

Several South African organisations are adopting telework arrangements, especially in the banking (Hodgson, 2002) and insurance industries (Hale & Whitlam, 1997), which denotes a type of virtual and/or flexible work arrangement often associated with virtual teams. From a macro perspective the term "virtual" seems to emphasise the dispersion of organisational activities and the collaboration between people and organisations. Some authors such as Palmer and Speier (1997) go so far as to define a virtual team as a permanent virtual organisational design in which individuals from the same organisation represents different organisational functions or department units that work together as a team on specific, ongoing tasks with very little face-to-face interaction.

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Virtual teams seem to be distinguished from conventional teams where the former consists of team members being physically located in different places on a national or global scale (Lipnack & Stamps, 1993). The proximity of a virtual team's members could therefore be used as a criterion to distinguish between different types of virtual teams such as geographically dispersed or global teams. Jennings (1997) views virtual teams as groups of people who collaborate closely, and adds that members may or may not be separated by space, time, and organisational barriers. Arnison and Miller (2002) support Jennings's (1997) notion that team members do not need to be geographically separated to be considered virtual, and emphasise the use of information technology as a criterion for virtuality. Conventional teams who are co-located in one office building can therefore also function as virtual teams by using these technologies.

Some authors such as Zigurs and Qureshi (2000) even suggest that the concept of virtual teams does not exist and that the term refers to individuals who are brought together through technology. It is therefore necessary to clarify the concept of virtual work and to set clear

criteria to conceptualise virtual teams as a distinct construct. Without a clear distinction between virtual and co-located teams similar design factors could be used that do not take into account the complexity and organisational change involved in virtual team formations.

Robertson (2000) uses the term "work transformation" to refer to the process in which specific organisational resources such as people, space and information technology are enhanced to deliver greater business value. The implementation of virtual teams therefore involves work transformation with several organisational benefits and the potential for adding greater business value. A South African study conducted by Hoffman (2002) for example, found that the implementation of telework resulted in cost savings of up to 38% in office space, furniture, parking and support staff. Advances in information and communication technology and specifically the decreasing costs of bandwidth are making virtual teams viable to facilitate an organisation's capability to work across organisational boundaries (Lipnack & Stamps, 2000). Clarke (2000) defines bandwidth as the amount of information that can be transmitted across a computer network in a given amount of time.

There is nonetheless, a high failure rate associated with the implementation of virtual teams (Bal & Foster, 2002). Authors such as Jarvenpaa and Shaw (1998) have found that typical challenges to effective virtual teamwork were, difficulties in team development processes and computer-mediated communication. Since these studies were conducted within an educational context using simulated virtual teams they do not represent the complexities involved with actual virtual teams that operate within a complex business environment. It is therefore important to identify the type of barriers to effective virtual teamwork that actual virtual teams experience to be able to identify strategies to overcome them.

From the literature it is evident that the implementation of virtual teams is often explored within the Information Sciences where there is a strong emphasis on software application and technological requirements (Ocker, Hiltz, Turoff & Fjermerstad, 1996). Since virtual team members need to adjust to a new work context and new environmental demands, technological requirements alone do not seem to provide sufficient guidelines for the transformational change involved with the implementation of virtual teams. Without addressing organisational, process and people related requirements for a transformational work change, employees are likely to work in a new technological context in the same way in which they were accustomed to in their traditional co-located teams (Bal & Foster, 2000;

Qureshi & Vogel, 2000). The result is often that the team experiences sub-optimal performance quality, lower satisfaction and interpersonal hostility which could impede the viability of virtual teams in the future.

Since the occurrence of virtual teams is only recently emerging within South African organisations it is imperative that research be aimed at conceptual approaches and processes which promote an understanding of the phenomenon of virtual teams. Although several virtual team models have been proposed in the literature (Bellingham, 2001; Duarte & Snyder, 1999; Haywood, 1998; Henry & Hartzler, 1998; Lipnack & Stamps, 2000), they each seem to emphasise different aspects related to virtual team development, but do not present an approach to virtual team implementation.

It is also important that South African organisations have clear guidelines and tools to determine the viability of using virtual teams, and a methodology for transforming co-located teams into high performing virtual teams. A recent survey conducted to determine the degree to which South African organisations are making the shift to a "new" economy style of managing organisational and people performance, revealed that South African organisations predominantly have a traditional top-down management approach with poor change leadership practices for implementing change, and turning strategy into operational reality that delivers competitive performance (Sacht, Nel & Lamb, 2003). It is therefore necessary to develop a sound methodology for virtual team implementation which is based on an integrated theoretical framework depicting the process by which the strategy for virtual teams is formulated and used as a primary driver for work transformation towards high performing virtual teams.

Without the support of an integrated theoretical framework, implementation could render unsatisfactory results and perpetuate negative consequences such as mistrust, role confusion, lack of direction, conflict, high coordination costs and ambiguous communication.

The general objective of this study was to develop a basic theoretical framework for the implementation of virtual teams.

VIRTUAL TEAMS

Although virtual teams can be regarded as a relatively new concept, several South African studies have already been initiated to explore the intricacies related to virtual work arrangements as well as the leadership complexities found in virtual teams (Hodgson, 2002; De Oliveira, 2001). None of these studies present an integrated theoretical framework for the work transformation involved with the implementation of virtual teams. Due to the high failure rate of virtual teams, enabling conditions contributing to virtual team efficiency need to be delineated. One aspect that seems to impede theoretical development related to virtual team work is the different sets of criteria being used to distinguish virtual from traditional teams.

The term virtual is used interchangeably in literature with temporary and permanent virtual organisations, teleworking, virtual offices, home based or mobile working (Skyrme, 1998) and often denotes different characteristics related to virtual work. Virtuality for example is used to describe functional aspects such as information technology, different types of virtual work designs (Palmer & Speier, 1997) and is often used in relation to other business concepts, like knowledge management (DeSanctis & Poole, 1997), dynamic networking or business process redesign (Franke, 1999). The factor most commonly associated with the term virtual is the use of information technology which enables, geographically dispersed work activities to be carried out and more dynamic organisational structures and new flexible work arrangements to emerge.

Fritz and Manheim (1998) define the broader concept of virtual work as the interdependent work activities carried out by individuals working in different physical locations. Telework arrangements are for example a form of virtual work and are often referred to as home-based or mobile work (Domingo et al., 2003) because most of the work activities are not performed in a fixed office space but from remote locations at the individual's home or in their cars. Virtual teamwork is another form of virtual work but differs from Gray, Hodson and Gordon's (1993) original concept of telework which referred to a type of virtual work arrangement in which an individual performs independent tasks and uses information technology primarily as a tool to capture data and as a means to make contact with the organisation. A typical example is insurance brokers who use information technology as a

tool to do a financial needs analysis for their clients or receive information on booked appointments.

Virtual teams are associated in literature with geographically dispersed teams, where both terms often refer to the dispersion of team members over time and space. Lipnack and Stamps (2000) assert that the major conceptual difference between these two types of teams is that information technologies are specifically used in virtual teams to co-ordinate team processes but not in geographically dispersed teams. Kimble and Barlow (2000) support this notion and define virtual team as a micro-level form of work organisation in which a group of geographically dispersed workers is brought together to accomplish a specific organisational task, using information technology. Lipnack and Stamps (2000) add to this definition by defining a virtual team as a group of people who interact through interdependent tasks guided by a common purpose and who work across space, time and organisational boundaries by means of information and communication technologies.

West, Borrill and Unsworth (1998) suggested three criteria for a group to be considered a team:

- the group needs to have a defined organisational function and identity
- the group must possess shared objectives or goals, and
- the team members must have interdependent roles.

According to Gibson and Cohen (2003) and Haywood (1998) a team becomes virtual when any of the following conditions apply:

- team members work from different geographical locations
- team members represent different organisations or units of the same organisations
- team members work together as a team for different periods of time, and
- team members use technology supported communications more frequently than face-to-face communications to accomplish their tasks.

Conventional face-to-face teams who use computer driven information technology as an additional form of communication could therefore also be considered "virtual" (Arnison &

Miller, 2002). The degree of virtualness would however depend on the extent of media-richness of the communication technologies being used.

Unlike traditional teams, a virtual team works across dimensions of space, time and organisational boundaries with the aid of information and communication technologies (Lipnack & Stamps, 2000). While team membership within traditional teams is fixed, virtual teams are characterised by shifting team membership as teams form and reform continuously. Team members from virtual teams can also belong to multiple teams and have multiple reporting relationships with different units of the organisation at different times, unlike traditional teams where team members belong to one team and are managed by a single manager.

Virtual team types

Lipnack and Stamps (2000) uses space, time and structure (see Table 1) dimensions to differentiate between three types of virtual teams, namely: co-located cross-organisational teams, distributed teams, and distributed cross-organisational teams.

A co-located cross-organisational virtual team consists of a cross-functional group of experts and stakeholders that come together to solve a specific organisational problem or seize business opportunities that require co-operation across organisational boundaries. Although team members come from different organisations, they come together in the same place to work on a specific project within a set timeframe.

The second type of virtual team is a distributed team consisting of people in the same organisation who work in different places either interdependently (i.e. product development group) or separately (i.e. national and regional branches). In the same organisation virtual teams can form from specific functional, process or strategic business units within a larger organisation to perform virtual tasks (Palmer & Speier, 1997). Although membership in these teams varies, the form remains permanent within an organisation. Virtual teams can also be distributed based on the time dimension. For example, a virtual service team who are distributed across distance and time can provide network support for twenty-four hours by allocating team members to designated time zones (Bellingham, 2001).

The third type of virtual team is the distributed cross-organisational team consisting of team members from different organisations who work in different places and/or time zones to function and interact as a team at the same time (synchronously). Gibson and Cohen (2003) refer to the type of team that works in different geographical areas and across different time zones as global virtual teams. In extreme cases the team members of this type of virtual team will seldom meet each other face-to-face while working together on a project (Lipnack & Stamps, 2000).

Table 1

Virtual Team Types (Adapted from Lipnack & Stamps, 2000)

	Organisation	
Space/Time	Same	Different
Same	Co-located Teams	Co-located Cross-Organisational Teams
Different	Distributed teams	Distributed Cross-Organisational teams

Work teams in organisations therefore exist in a continuum of virtuality depending on the aforementioned number of dimensions that a team represents, the depth of the differences within each dimension and the team's dependency on using electronically-mediated communication instead of face-to-face interactions. In this paper the term virtual teams will be used collectively to refer to teams that are considered virtual based on four common criteria found in the literature (Duarte & Snyders, 1999; Gibson & Cohen, 2003; Lipnack & Stamps, 2000), namely:

- team members are geographically dispersed
- the team is driven by a common purpose within a temporary context
- the team is enabled by communication and information technologies, and
- the team is involved in cross-boundary collaboration within or between organisations.

According to Arnison and Miller (2002) as well as Elliott and Fontaine (2000) virtual teams can potentially increase the overall effectiveness of an organisation, more so than traditional

teams. Virtual teams are associated with benefits such as reduced infrastructure cost; an increase in employee productivity and efficiency, the roll-out of new service products and deliverables on a global scale rather than a local scale, an increase in flexibility in work hours and job design, faster response times to tasks; increased collaboration across organisational boundaries, the creation of employment opportunities for disabled employees, and best practices being shared from team members based in different locations and in various market areas.

Benefits of virtual teamwork

Several individual-, team- and organisational benefits are associated with the implementation of virtual teams.

- **Organisational benefits**

Since virtual team membership is fluid as it changes according to specific task requirements, virtual teams enable an organisation to respond swiftly to local and/or global market demands. The work design of virtual teams also allows organisations to manage a greater number of projects concurrently and involve cross-boundary collaboration within or between organisations on a national and global level with the purpose of achieving collective gains or minimising losses (Lines, 1997). Virtual teams are therefore a mechanism to increase the capacity of an organisation.

Okkonen (2002) argues that traditional organisational structures do not always advance the free flow of information and knowledge. The collaborative nature of virtual teams not only enables an organisation to have access to and retain specialised skills but also stimulates knowledge-sharing without being bound by time or the physical proximity of team members. Organisations could for example extend their market by enabling all regional offices to take on projects requiring expert knowledge only available in other offices (Lines, 1997). Virtual teams are therefore also a mechanism for the acquisition and dissemination of competence.

Best practices could also be preserved within the organisation since there is a strong focus on the measurement of contributions and outcomes of tasks, and a reduction of costs and non-value-adding activities such as travel and delays imposed by mail.

- **Team benefits**

Virtual teams have a strong potential advantage over co-located teams since information technologies not only contribute to a faster response time to tasks, but also enable team members to locate information and knowledge from multiple sources to bring about a broad knowledge base which can be leveraged towards innovative solutions to problems (Gibson & Cohen, 2003; Warkentin et al., 1997). By bringing virtual team members together from numerous locations synergetic interaction is enabled and duplication of effort and work at cross purposes is minimised. Tyran, Dennis, Vogel and Nunamaker (1992) also found that the use of information technologies such as discussion groups, facilitates a more equal and full representation of team-member inputs and that teams whose members participate equally tend to devise better decisions than team members who contribute unevenly.

- **Individual benefits**

Being able to work anytime, anywhere reflects the flexibility that exists in a virtual team members' work hours as well as their job design. Virtuality can also bring about increased effort and performance gains because it supports shared leadership, shared responsibility and collaboration which is more empowering to individuals compared to the competition for power typically found in the hierarchy of traditional teams with one appointed leader (Kurland & Bailey, 1999). An additional benefit to the implementation of virtual work in organisations is that it provides employment opportunities for physically disabled people who could not work in a traditional office environment.

Not every organisation however, is best suited for the implementation of virtual teams. It is therefore necessary to explore the type of organisations that are likely to gain greater business value through the strategic use of virtual teams.

Shin, Liu Sheng and Higa (2000) assert that virtual teams are not suitable for organisations with very centralised decision making and under-formalised job appraisal systems. Organisations with mechanistic structures characterised by high functional specialisation, high formalisation and extremely hierarchical structures of communication and control are more appropriate to stable business environments, while virtual team structures give greater access to organisational skills and flexibility to face dynamic, complex environments (Domingo et al., 2003).

Within dynamic and complex business environments there is greater emphasis on employees' knowledge and experience to carry out the tasks which in themselves requires continuous adjustment and redefinition. Cascio (2000) adds that knowledge- and service-oriented industries are best suited to virtual workplaces since they already have a high change orientation and evolve according to customer requirements.

Prasad and Akhilesh (2002) also view the implementation of virtual teams suitable for businesses whose products are predominantly digital in nature and require extensive pooling of resources and information; for example: software development; electronic media publishing; Internet-based services and the consulting industry. Virtual teams can therefore also be used as an infrastructure to implementing a strategy aimed at organisational change towards a service, knowledge or virtual oriented organisation.

THE VIRTUAL ORGANISATION MODEL

Mowshovitz (1997) argues that the virtual organisation is not a new type of organisational form but depicts a process of structuring and managing virtually organised tasks, which are goal-oriented. Saabeel, Verduijn, Hagdorn, Kumar and Strausak (2002) support this notion and refer to virtual organisation as a process of restructuring and change, while Hale and Whitlam (1997) define it as the name given to any organisation which is continually evolving, redefining and reinventing itself for practical business purposes. The implementation of virtual teams is therefore not specifically related to permanent and/ or temporary virtual organisations but also relevant to any organisation with a high change orientation.

Hale and Whitlam (1997) use the virtual organisation as a model to depict the following variables related to an organisation's orientation to change:

- **Direction.** Direction refers to the extent that employees are involved in formulating strategies, to ensure that the organisation's vision is shared by everyone in the organisation, from a strategic to an operational level.
- **Form.** Hale and Whitlam (1997) define form as the structure and processes by and through which management processes are achieved and include organisational designs. This dimension includes team-based structures within the organisation where work

groups/teams are centred on virtual tasks to achieve certain business objectives (Mowshovitz, 1997).

- **Communication:** Communication includes the organisational culture and consists of a number of activities aimed at gathering, sifting and collating information prior to the utilisation of it. In the traditional organisation communication tends to be restricted to unidirectional communication up and down the hierarchy (Hale & Whitlam, 1997). In the virtual organisational model an emphasis is placed on knowledge and the need to draw in information from the external environment as well as the processes of synthesising and disseminating information through information technology.
- **Adaptation.** Adaptation refers to enabling processes, adaptive behaviours and mechanisms for the delivery of individual learning experiences which in turn facilitate organisational adaptation. Compared to the concept of a "learning organisation" learning seem to be less formalised within the virtual organisational model and is fully integrated with everyday activities by all organisational members (Hale & Whitlam, 1997). According to Sole and Edmondson (2000) the implementation of virtual teams provide a mechanism for promoting organisational learning.

The implementation of virtual teams provides organisations with a strategic approach to increase their orientation to change. Information technology can thus be used to facilitate work changes, which allows for faster paced workflow as well as greater organisational flexibility and learning.

THE ROLE OF INFORMATION TECHNOLOGY IN WORK TRANSFORMATION

Robertson (2000) describes work transformation as a process of enhancing the key organisational resources of people, space and information technology to deliver greater business value. Weeks and Lessing (2001) accentuate the role of information technology as a resource and state that it should not just be viewed as support function or enabler to a business' strategy, but should play a strategic role in work transformation to such an extent that business objectives are enabled, supported and stimulated by information technology.

According to Dewett (2001), information technology moderates the effects of organisational characteristics on outcomes through its ability to generate information efficiencies and information synergies. Information efficiencies are defined as the cost and time saving when

information technology allows individuals to perform tasks at a higher level, assume additional tasks, and expand their roles in the organisation. On the other hand, information synergies are the performance gains that result when information technology allows virtual team members to pool their resources and co-operate and collaborate successfully across organisational or subunit boundaries.

Information efficiencies and gains are often stymied by technological applications becoming obsolete and/or discrepancies that exist between the current available technology and how it is accepted and/or utilised by employees (Veldsman, 2002). According to Watkins (1998), effective technology adoption can only be achieved if it is embedded in an organisation-wide change concept. Technology adoption typically occurs in stages. Morton (1991) describes the stages as automation, information and transformation.

Organisations initially invest in new technologies to achieve efficiencies and cost-savings with an emphasis on automating existing processes. Morton (1991) states that during this automation stage few technologies are employed and only minimal organisational changes are required.

In the second stage, the information stage, new information is gained through the use of technology. The number of technological applications and functions as well as the scope of organisational activities, increases to accommodate new market opportunities that present themselves. According to Morton (1991), broad learning is realised throughout the organisation as a result of new information that becomes available through technology.

In the transformation stage, technology is integrated into the organisational design. The emphasis during this stage is on organisational concepts and goals such as leadership, vision, and empowerment. Technology use in this stage is extensive and complex. Organisational learning is comprehensive and continuous, which indicates high organisational adaptation based on Hale and Whitlam's (1997) model of virtual organisations.

The initial high failure rate of virtual teams could therefore be the result of ineffective change management practices that prevent employees from effectively adopting technology to ensure work transformation. Virtual teamwork also presents potential barriers that virtual teams need to overcome to be successful (Hodgson, 2002). It is therefore necessary to identify the factors

that could impede the effectiveness of virtual teams and the development of information synergies to establish enabling organisational conditions for successful virtual team implementation.

BARRIERS TO EFFECTIVE VIRTUAL TEAMWORK

Sundstrom, De Meuse and Futrell (1990) define the effectiveness of teams as a combined measure of team performance and team viability. Team performance reflects the acceptability of team outputs (i.e. team products, services, information, decisions, or performance events) to customers within or outside the organisation, while team viability refers to team members' satisfaction, participation and willingness to continue working together. Team viability also includes aspects related to team maturity such as team cohesion, inter-member coordination, mature communication and problem-solving, and clear norms and roles.

Schachaf and Hara's (2002) add to these traditional measures of team effectiveness a virtual team's capability to create and maintain a shared digital space during team life-cycles. A virtual team's viability can be regarded both as an outcome and as a process, that manifests during the team's shared working period, when team members conduct their shared tasks, overcome conflicts and barriers to virtual team work. Virtual team viability is therefore a critical component of the team's collaborative work throughout the time that team members engage in shared tasks.

Pawar and Sharifi's (2000) identified the following factors that impede co-located teams' effectiveness, namely: delays from functional departments; bureaucratic company practices; different educational and training backgrounds; and poor communication outside the team. Their research also indicated that these factors were less frequently experienced in virtual teams. Virtual teams are confronted with different set of challenges compared to co-located teams, for example: the lack of close proximity of team members, working in a temporary context, team diversity, team dependency on information technologies and the requirement of extensive boundary spanning behaviour.

Table 2 represents a summary of research that was conducted in order to identify the barriers to effective virtual teamwork on actual virtual teams who operate in a dynamic and complex business environment. The findings depicted in Table 2 suggest that the geographical

dispersion of team members could contribute to difficulties in team processes. Virtual team members indicated that they experienced loss of social and or physical contact, difficulties in team development and conflict amongst team members. The ambiguous and multifaceted nature of the types of tasks that virtual teams typically address, predisposes virtual team members to miscommunication, cognitive and affective conflict surrounding both tasks and relationships (Hodgson, 2002). According to O'Hara-Devereaux and Johansen (1994) as well as Bodensteiner and Stecklein (2002), the physical distance between team members could pose a barrier to the development of trust as well as collaborative efforts among team members.

The temporary context in which virtual teams operate, and the cultural diversity among virtual team members makes it increasingly difficult for virtual teams to develop and maintain a shared understanding about their outcomes and means to achieve those outcomes (Gibson & Cohen, 2003; Sole & Edmondson, 2000). This is also evident from the results of virtual team barriers summarised in Table 2 in which virtual team members reported a lack of clarity on team objectives and a lack of job specification or job contract.

Within physically co-located teams, proximity of team members provide the context for ongoing monitoring of activities and events. Davenport and Pearlson (1998) state that control in a virtual context is different from that in a physical environment. Although virtual team work requires the explicit establishment of objectives between managers and employees the form of control is not based on the traditional control-demand approach but rather a form of control which is based on trust and enables team members to find ways to achieve the objectives themselves.

Similar to self-managed teams, but unlike traditional work groups, virtual teams usually have informal leaders or may share the leadership role among their members (Arnison & Miller, 2002). According to Lipnack and Stamps (1993), the attribute of virtual teams having multiple leaders enables the team to be more resilient compared to conventional teams with one appointed leader. Leadership within a virtual team therefore needs to support the collaborative nature of virtual teamwork. Vartiainen (2001) also found that leaders themselves are faced with unique challenges within a virtual work environment, for example: difficulties in anticipating future problems and monitoring team members' satisfaction without face-to-face contact. The virtuality of teams therefore brings forth increased com-

plexity in managing and leading teams since conventional team rules and philosophies need to change to the virtual team model.

Table 2

Summary of Different Authors' Findings on the Barriers to Effective Virtual Teamwork
(Adapted from Bal & Foster, 2000; Gibson & Cohen, 2003; Hodgson, 2002; Vartiainen, 2001)

	Authors			
	Bal and Foster (2000)	Vartiainen (2001)	Hodgson (2002)	Gibson and Cohen (2003)
Research Method	Quantitative research: survey	Qualitative research: case study method	Quantitative research: survey	Qualitative and quantitative research: longitudinal study
Type of virtual teams investigated	Distributed cross functional and organisational virtual team conducting concurrent engineering work in the automotive industry	Distributed cross-organisational project teams developing an information system	Virtual teams in a global information technology organisation	Global virtual teams from tele-communication, manufacturing, sales and computer hardware and soft-ware organisations
Barriers to effective virtual teamwork				
Leadership problems	x	x		
Organisational related cultural misunderstandings	x	x	x	x
Difficulties in establishing trust in a virtual team			x	x
Lack of clarity about team objectives	x	x		
Electronic communication being inadequate	x (phone, fax and data tapes)	x (mobile phones, net-meetings, e-mail and video-conferencing)	(Not specified)	x (audio- and video conferences as well as e-mail).
Loss of social and or physical contact	x	x	x	
Difficulties in team development			x	x
Conflict among team members			x	x

Table 2 also indicate potential barriers to effective virtual team work relating to the third criterion that distinguishes virtual from other teams, namely: the team's dependency on information technologies. Problems were reported with the use of information technologies, security authorisation and communication. Vartiainen (2001) for example, found that electronic communication was inadequate in highly complex or critical messages. Virtual team members identified several barriers relating to electronic communication such as the lack of body language and unclear meaning of tone of voice, information overload through e-mails, difficulty in describing and contextualising problems using mediums such as telephone, e-

mail and fax. Virtual team members therefore need to be proficient across a wide range of advanced information and communication technologies which refer to e-mail systems, message boards, GroupWare, Group Software Systems and knowledge management systems (Avolio, 2000). Hodgson (2002) as well as Watson-Manheim and Belanger (2002) who support this notion and also add the importance of a virtual team's ability to communicate consistently and match the form of communication technology to the specific group tasks. The inherent nature of virtual teams therefore requires a high level of integration between information technology systems and/or integration of knowledge, skills and abilities across systems, boundaries and people.

All the virtual teams depicted in Table 2 were involved in extensive boundary spanning across functional departments and/or organisational affiliations and had to deal with team members from diverse languages and cultures. All four of these teams reported organisationally related cultural misunderstanding as a barrier to virtual teamwork. When virtual teams are therefore being implemented in an organisation, the extent to which virtual teams will be involved with cross-boundary collaboration within or between organisations needs to be determined. On the basis of the type of collaboration required, team members' cross-functional capabilities and cross-cultural skill training needs should be considered.

The implementation of virtual teams involves significant organisational changes as well as technological-, work- and social adaptation especially when an organisational strategy is aimed at transforming co-located teams into high performing virtual teams. Employees are also likely to develop negative attitudes and beliefs about virtual work (Hodgson, 2002) especially if no mechanism is in place to address employees' need for social and/or physical contact. Organisational support for virtual teamwork should therefore be in place either in the form of a facilitator who has worked in a virtual environment before or a mentoring and/or coaching system for new entrants into virtual teams. Hodgson (2002) accentuates the importance of mentoring and role models to facilitate effective knowledge sharing between more and less experienced virtual team workers. Virtual team members therefore need to be oriented towards developing what Kimble et al. (2000) terms "communities of practice", which refers to a form of learning in which team members openly share and build upon information and knowledge through dialogue.

VIRTUAL TEAM IMPLEMENTATION MODELS

Implementation models of virtual teams therefore needs to reflect multiple factors that are related to enabling conditions for virtual team effectiveness in terms of organisational context, team and task characteristics, technology use, team member and leader competencies, as well as work and team processes.

Several models on virtual teams exist in the literature focusing on different aspects relating to virtual team viability, such as the performance and/or development of virtual teams. Lipnack and Stamps (2000) for example, propose a three-part model of virtual team principles that relate to the development of virtual teams in three basic dimensions, namely: behavioural requirements of the people and leaders working in a virtual team context, the shared purpose of the team and aspects relating to communication links, and/or the technological infrastructure that supports and enables collaboration between virtual team members. The implementation of virtual teams is therefore approached from a normative systems model of inputs, processes and produced outputs.

- Inputs refer to knowledge, skills and abilities of team members, the composition of the team, and aspects of organisational context such as the tasks and associated objectives, reward systems, information systems and training resources.
- Process refers to the interaction among group members, for example information exchange, patterns of participation in decision making and social support.
- Outputs refer to the results of the team's performance such as higher levels of productivity, quality, customer satisfaction, innovation, safety, job satisfaction and organisational commitment.

The above mentioned approach seems to be based on traditional team effectiveness models and does not account for the critical structural and process changes involved with the implementation of virtual teams. Other models on the implementation of virtual teams such as Haywood's (1998) alignment model, Fisher and Fisher's (1998) model on the integration of virtual knowledge teams and Lines (1997) strategy for the implementation of virtual project teams are experienced based, and lack a theoretical basis. Bal and Gundry's (1999) model of virtual team implementation seems to be the most relevant theory-based model applicable to complex business environments. Their model describes the three interrelated structural

requirements for the implementation of virtual teams, namely: people, process and technology.

The aforementioned model was specifically developed to address the barriers to effective virtual teamwork in an automotive supply chain utilising concurrent engineering but could also be applied to other organisational contexts making use of cross functional and - organisational virtual teams in which collaboration requires a high level of multifunctional interaction for problem solving. Bal and Gundry (1999) identified critical aspects relating to people, process and technology dimensions to the implementation of virtual teams as a long-term strategic process (see Figure 1).

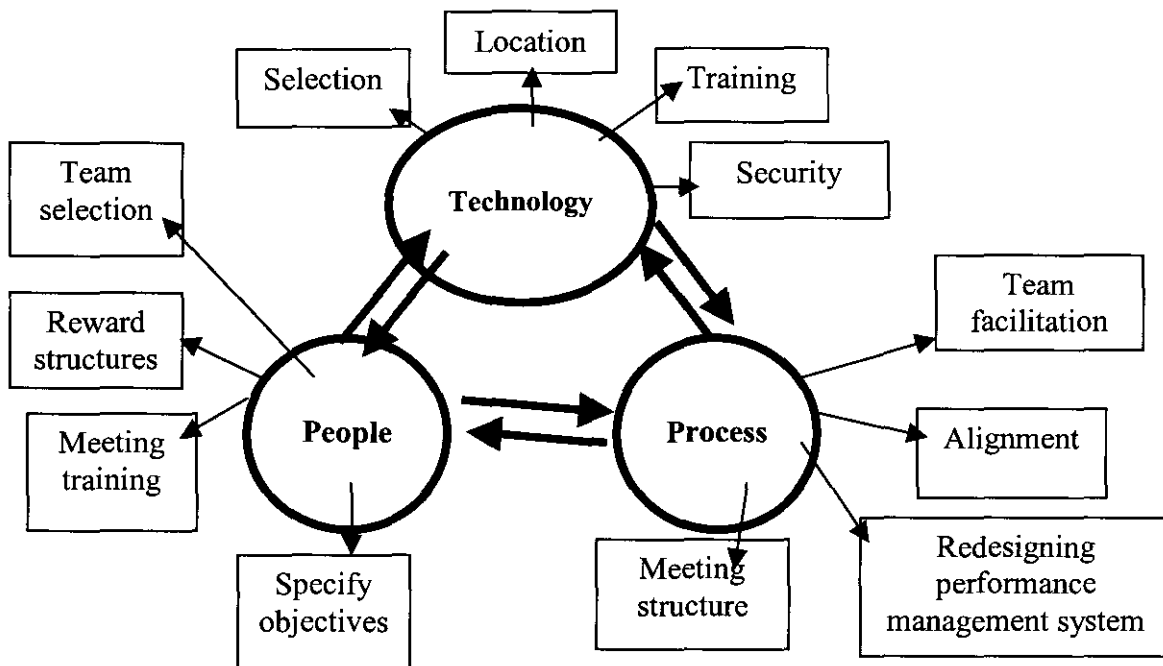


Figure 2. Important factors for the implementation of virtual teams (Bal & Gundry, 1999)

Technology Factors

Electronic collaboration and communication technology must support the business needs, the strategy and mission of the team (Duarte & Snyder, 1999). Different types of virtual teams therefore need different support technologies. O'Hara-Devereaux and Johansen (1994) present a taxonomy of the support technologies within the different types of virtual teams.

Table 3

Types of Support Technologies for Different Virtual Team Types

Virtual team type	Type of support technologies
Same time, different place	Synchronous technologies such as telephone, video conferencing, chat/meeting rooms;
Different time, same place teams	Workstations, bulletin boards, team work rooms;
Different time, different place teams	Asynchronous technologies such as e-mail, voice mail, Web discussion forums or bulletin boards, computer conferencing, shared databases and personal, mobile learning sites.

A global virtual team that communicates and works collaboratively across different time zones at different places would for example, need a minimum set of standards for technology. For communication, this includes touch tone telephones, audio conferencing equipment, voice mail, fax capability, and access to a common e-mail system that allows people to send messages and exchange files. Video conferencing, scheduling, real-time data conferencing, electronic meeting systems, collaborative writing tools, and whiteboards would be essential if the team's strategy stipulates intensive collaborative work (Duarte & Snyder, 1999).

Appropriate technology must also fit specific virtual team tasks. The selection of appropriate technology is determined by the virtual team's task, organisational capability and user skills (Bal & Gundry, 1999). Duarte and Snyder (1999) formulated a task-communication matrix in which different modes of information technologies fit different types of virtual team tasks (see Table 4). Using an e-mail system is for example appropriate when a virtual team needs to generate ideas or collect information, but is not an appropriate mode to use when virtual team members are involved in interpersonal conflicts. Organisations therefore need to take into account that technology developers bundle specific design features into their information technologies that have intended effects on the way people should use the technology (DeSanctis & Poole, 1997).

Virtual team technology can also be linked to or isolated from an internal corporate system. The former could pose security risks especially when inter-organisational collaboration is required and/or when a virtual team is involved with the transfer, exchange, or real time

browsing or editing of sensitive business information. Isolating virtual team technology from an internal corporate system, on the other hand, could increase the workload of the virtual team since virtual team members would need to manually transfer data between systems (Bal & Foster, 2002).

Duarte and Snyder (1999) as well as Bal and Foster (2002) regard formal training in using technology as an essential factor for virtual teams to be successful. In addition to formal training, team members should also have access to continual on-line training for software upgrades and technical support. Systems can be implemented for sharing knowledge across functions, projects, and organisations by using databases, knowledge repositories and chat rooms. Virtual teams require extensive training in the operation of virtual team tools, to be able to execute virtual team tasks, communicate effectively and prevent information overload.

Table 4

Task-communication Matrix (Duarte & Snyder, 1999, p.28)

Information technologies modes	Type of task			
	Generating ideas and plans and collecting data	Problems with answers	Problems without answers	Negotiating technical or interpersonal conflicts
Audio only	Marginal fit	Good fit	Good fit	Poor fit
Video only	Poor fit	Good fit	Good fit	Marginal fit
Data only (e-mails and bulletin boards)	Good fit	Marginal fit	Poor fit	Poor fit

People Factors

The transformation from a traditional team to a virtual team has several implications for the people that need to work in a virtual environment. According to Arnison and Miller (2002), virtual working predominantly facilitates work to be performed independently by team members. This requires a great degree of autonomy, self-management and cultural sensitivity as team members generally work in isolation from their organisation's support structures and need to collaborate with and trust other team members from different organisational cultures.

Arnison and Miller (2002) as well as Duarte and Snyder (1999) state that virtual team members need to take the initiative in collaborating with their team as well as with others in the organisation, and with external partners. Compared to conventional teams, virtual teams need higher levels of interdependence among teams' roles (Lipnack & Stamps, 2000). Duarte and Snyder (1999) reiterate the importance of team members' ability to play multiple roles and classify roles required in virtual teams as co-ordination, collaboration and autonomy roles. Virtual team members are therefore faced with the challenge of differentiating their individuality while at the same time trying to integrate their roles into the team they belong to. This integration consequently results in each member being individually and mutually accountable for the team's collective performance.

The following people factors are therefore important when virtual teams are being implemented:

- virtual team objectives, purpose and tasks need to be clear to provide the team with direction. Protocols or team charters are therefore necessary to establish team norms, depict conflict-resolution procedures and communication standards
- reward structure should be structured around collective performance. Interdependent members of a team can accomplish certain aspects of their jobs on their own, but are dependent on other units in the organisation to deliver certain outputs. According to Lipnack and Stamps (2000) the interdependency between tasks creates a need for employees to co-operate and collaborate to achieve the team goals. The social interdependence theory therefore suggests that competitive rewards should only be allocated when task interdependence is low and that cooperative rewards be allocated to virtual teams based on their high task interdependence (Deustsch, 1949).
- team members and leaders need to be selected based on specific competencies that relate to the mission and strategy of the team as well as competencies that relate specifically to virtual teamwork. Compared to traditional teams, virtual teams are presented with a different set of challenges to both team leaders and team members, which require a different set of competencies. Duarte and Snyder (1999) identified a set of critical competencies that the team-leader and team-members need to demonstrate. The former refers to competencies such as coaching and managing performance without traditional forms of feedback; leading in a cross-cultural environment; building and maintaining trust and networking across hierarchical and organisational boundaries, while team member competencies relate to project management techniques; using electronic communication

and collaboration technologies effectively and working across cultural and functional boundaries. Although these competencies will vary, depending on the type of virtual team and its specific mission and strategy, the above competencies do provide a useful guideline for selecting and developing individuals for virtual teamwork.

- Virtual team members need to receive training in conducting different types of virtual team meetings such as:
 - Information-sharing meetings which can range from one-way presentation to multiple path exchanges of information. Examples are regular progress reviews and updates
 - Discussion meetings during which information is exchanged to promote dialogue, the generation of ideas or opinions, and discussion of different technical approaches to problems, system issues, plans and policies
 - Decision-making meetings in which final decision are made collaboratively about a project schedule, technical approach, or policy
 - Product-producing meetings during which tangible products are produced, such as the analysis of data or work on a document or engineering design.

Process factors

Since most organisational processes are designed around the need for face-to-face meetings Bal and Gundry (1999) suggest that organisational processes be redesigned to align them with the capabilities of virtual teams. The following need to be addressed prior to establishing a virtual team, namely:

- Redesigning appropriate business processes to re-align the organisation's processes with the virtual team's processes. According to Crowe and Rolfes (1998) a business process cuts across departmental boundaries and groups a set of diverse functional level work activities to produce a desired output. Organisations planning to implement virtual teams need to evaluate the current performance of their business processes to identify appropriate business processes for reengineering. Crowe and Rolfes (1998) identified processes that have both a high impact on customer value and a high importance in developing competitive capabilities such as priority processes for reengineering. It is also important that an organisation determine a process' impact on its strategic objectives. Several methods are being used in reengineering projects which range from clustering individuals with specific core competencies to estimating the value of business processes

and determining the return on investment for reengineering each process. The most likely methodology to be used with the implementation of virtual teams would be to align employees who have obtained specific skills with core competencies required within the organisation. Bal and Foster (2000) do however, caution that if the people in the organisation do not adopt a process and customer focus, reengineered processes could have limited success.

- Redesigning security measures; meeting structure towards more structured communication which encourages participation from all team members and reward strategies which relate directly to the virtual team's performance and virtual team objectives.

All the above factors do not need to be in place when virtual teams are initially being implemented in an organisation. Duarte and Snyder (1999) argue that the existence of the initial virtual teams will, over time, create the infrastructure and conditions necessary for virtual team effectiveness.

A METHODOLOGY FOR THE IMPLEMENTATION OF VIRTUAL TEAMS

Bal and Teo (2001) define a methodology as a collection of procedures, techniques, tools, and documentation aids, which can be used to provide guidelines when an organisation for instance implements virtual teams. The principle of the methodology is to emphasise that virtual implementation should be considered as a work transformation process and not merely the implementation of new information technologies or the automation of existing business processes. Figure 1 depicts the work transformation process proposed by Robertson (2000) and will be discussed in the specific context of virtual team implementation.

The first phase involves the key corporate service groups from human resources, information technology and facilities management, who need to develop a basic work transformation strategy geared towards virtual team implementation. The facilities management group typically supplies corporate real estate and is also responsible for the co-ordination and design of office spaces. Although the facilities management function is often outsourced, Robertson (2000) recommends that they be integrated with human resource and information technology functions to enable a strategic driven process. Facilities management groups, for example, play a key role in designing and introducing team spaces to organisations where

team members can easily communicate with each other to enhance the effectiveness of the team.

Robertson (2000) recommends that the transformational strategy be based on continuous research on virtual teams, executive input and a shared vision for work transformation. A communication plan then needs to be developed to address employees' fears and initial confusion when the change initiative is announced (Reiss, von Rosenstiel & Lanz, 1997; Robertson, 1999). Brück (2002) regards communication as an ongoing process during the change process. He also identifies coaching during the change process as an important characteristic of successfully implementing change initiatives. Coaching is therefore an important mechanism to facilitate learning of skills that employees will need, to adapt successfully to a new "virtual" environment.

Although strong senior management involvement and commitment are required for employees to accept the new working practice, an executive champion from the line areas of the organisation should lead the work transformation charge within the organisation (Bal & Teo, 2001; Robertson, 1999). By using an executive champion from the line areas a "bottom-up" approach is used to initiate and implement change.

The second phase includes a readiness assessment for the implementation of virtual teams within the organisation. This includes the evaluation and redesign of existing business processes to fully exploit the advantages of virtual teamwork. The virtual team's performance therefore needs to be aligned with the organisation's strategic objectives (Robertson, 2000). Appropriate business processes might need to be redesigned to re-align organisational processes with the virtual team's processes. This includes the redesign of security measures, meeting structures, reward strategy and performance measure principles as well as the implementation of new performance monitoring and management schemes. Bal and Foster (2002) suggest that clear performance expectations be established as well as guidelines, procedures and goals for virtual teamwork. The other members of the organisation including customers and other important stakeholders also need to know the benefits of virtual teamwork, how virtual teams operate and how their goals are aligned with organisational objectives to support the change to virtual teamwork.

The assessment includes an exploration of the current use of electronic communication technologies and their appropriateness for specific virtual team tasks, user skills, and employees' capabilities to work as independent team members. Robertson (2000) also emphasises the importance of developing an organisational culture that will support virtual teamwork and defines organisation's culture as the norms and values that guide individual behaviour. Duarte and Snyder (1999) identified teamwork, learning, collaboration, diversity, trust as well as sharing information and power as important values that support the implementation of virtual teams.

Based on this readiness assessment a business case can be developed which incorporates the costs and benefits to the implementation of virtual teams in relation to direct costs of traditional cross-organisational teamwork (Bal & Teo, 2001). Organisations also need to consider alternative space arrangements when locating virtual team technology. Single or group facilities need to be developed in the form of open-plan offices or separate virtual team rooms. All team members should have equal ability to access shared resources (Bal & Foster, 2002). Implementation of virtual teams can then proceed either as part of a large organisation-wide change process or in several incremental steps.

The establishment of a virtual team includes the clarification of specific objectives for virtual teamwork, the assessment of available human resources for virtual teamwork both inside and outside the organisation, the identification of virtual team members based on specific competencies, the identification of the tasks, expected outputs and associated deadlines for each virtual team member. The training of virtual team members is also important during this phase and should be aimed at self-managing skills, communication and meeting training, project management skills and technology training. A virtual team facilitator could be appointed to ensure that team members have equal access to resource allocation, training, and technical support within their host organisations (Bal & Foster, 2002).

The resource allocation involves training virtual team members in areas such as cross-cultural work, project management and technology as well as acquiring and maintaining the technology needed to facilitate virtual teamwork. Team leaders might need to travel for face-to-face meetings with team members at the beginning phase of implementation. It is important that virtual leaders model the desired behaviours they expect from virtual team members such as demonstrating trust in team members' judgement and flexibility when

business conditions change (Holton, 2001). Leaders themselves need to be open to change to establish a culture that promotes and supports virtual teamwork. Duarte and Snyder (1999) identified four leadership behaviours that encourage virtual team performance, namely: communicating throughout the organisation that working across time and distance and with organisational partners is a new way of doing business that leverages organisational knowledge and skills and capitalises on diversity. Brück (2002) suggests that virtual teams be assigned to highly visible tasks and projects and their results be reported in an organisation-wide attempt to institutionalise virtual team behaviour and reward virtual team successes.

For organisations to adapt to changing environmental conditions and circumstances, continuous improvement practices need to be in place and adjustments might also be required after initial implementation (Reiss et al., 1997). During this phase performance losses can be expected since virtual teams are adapting to a new virtual work environment and require time to develop into high performing teams (Lipnack & Stamps, 2000). Haywood (1998) supports this notion and identified the following effectiveness outcomes when virtual teams are being implemented:

Implementation is effective, and use of virtual teams enables an organisation to achieve its strategic objectives. A culture of virtuality emerges in which aspects relating to virtual work is valued and employees share a customer orientation and value learning, technology, team work, collaboration, diversity, trust and information sharing. Virtual teams operate on a standardised level and/or optimising level, where the former is characterised by teams overcoming the barriers of virtual work and derive benefits from operating as a virtual team. Virtual teams that operate on an optimising level are able to work efficiently any time from any place, and new members can be easily integrated into the team and released in the life-cycle of the team. Managers' and supervisors' support for virtual team implementation increases, yielding likely improvements in implementation policies and practices.

Implementation is effective, but the use of virtual teams does not reach the strategic objectives of the organisation and the organisation's climate for implementation declines. Virtual teams operate on a basic level, which is characterised by teams achieving a performance level similar to their co-located counterparts. Virtual team members begin to derive some of the benefits of being virtual, but are faced with time and efficiency problems due to their infrastructure.

Implementation fails, the implementation climate is weak and employees have strong resistance to work in a virtual team environment. Teams could operate on an *ad hoc* level, which is characterised by significant under-performance compared to co-located teams. The organisational context, people, process and technology aspects need to be reviewed to determine virtual team viability

The aforementioned methodology for the implementation of virtual teams depicts several guidelines, processes and tools that organisations can use to enhance organisational resources through the strategic positioning of information technology that allows for virtual teamwork. The methodology also incorporates important people, process and technology based factors identified by Bal and Gundry (1999), as well as broader contextual factors such as organisational culture, the change approach and tools to determine the viability of implementing virtual teams. Mechanisms to facilitate organisational learning are also suggested. The methodology strongly supports the notion that change is a process of learning and not just a method of changing organisational structures.

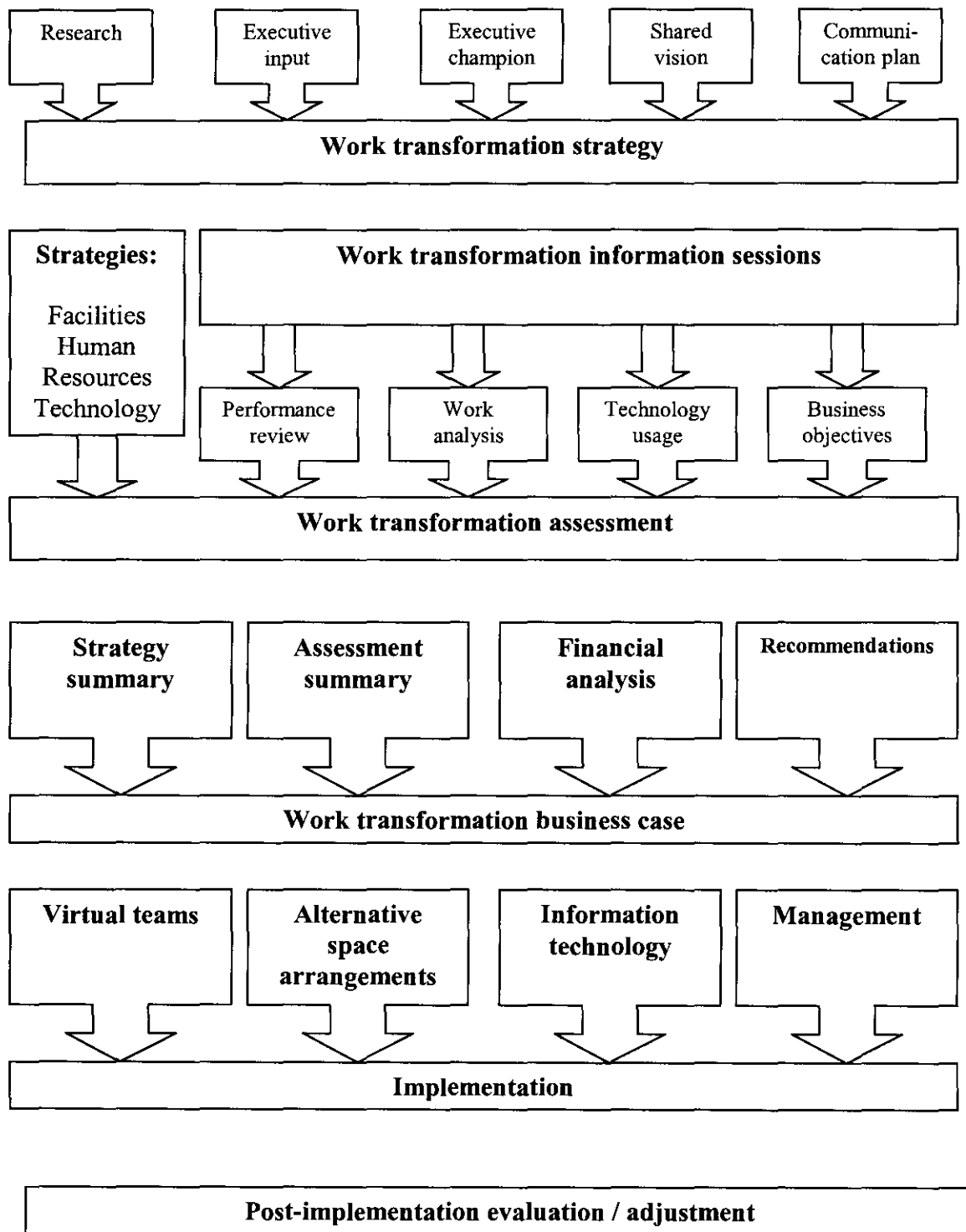


Figure 2. Work transformation process (Adapted from Robertson, 2000)

DISCUSSION

Rapid advances in information technology, e-engineering, deregulation, globalisation and the emergence of the internet and e-commerce are contributing to rapid and unpredictable

changes in the business environment requiring different set of practices in managing organisational and people performance. This article specifically relates to advancements in information and communication technologies as a significant environmental force that impacts on organisations and requires transformational changes from conventional team interaction and behaviour. From the literature study it is evident that information technology can strategically be used to improve organisational efficiency in complex and fast changing business environments.

Virtual teams enable an organisation to pool employees with specialised knowledge and skills regardless of their geographical location by using information technology. This characteristic of virtual teams therefore enables organisations to focus on their core competence as product complexity, for example, increases. Prasad and Akhilesh (2002) relate the diversity of skills and competencies as a dimension of a team's virtuality. Since outsourcing and/or co-located cross-functional teams are also characterised by the diversity of their skills and competencies (Robertson, 2000) this dimension of virtuality can not be used as a criterion to distinguish virtual from traditional co-located teams.

Another criterion used in the literature to differentiate conventional teams from virtual teams is the extent to which teams are involved in cross-boundary collaboration within or between organisations. On a global scale cross-boundary collaboration between organisations make it possible for organisations to share the costs and the risks of doing business and also facilitates learning and knowledge sharing (Hale & Whitlam, 1997). Virtual teams are therefore continuously involved with boundary management to create and maintain boundaries. Shachaf and Hara (2002) support this notion and state that team boundaries in conventional teams are pre-defined and do not require the level of integration necessary in virtual teams. Within a virtual team context integration needs to exist between the virtual team, its immediate organisational environment and to other teams to prevent virtual teams operating in isolation.

Unlike conventional teams, virtual teams not only cross organisational boundaries but also boundaries of space and time by using information technology to collaborate. Although Attaran and Attaran (2002) asserts that information technology can facilitates significant co-operative efforts across distance, several studies (Duarte & Snyder, 1999; O'Hara-Devereaux

& Johansen, 1994) indicate that this is dependent on the correct fit between the types of information technology used, virtual teams and virtual team tasks.

The most significant criteria that differentiates a virtual team from traditional co-located teams seems to be virtual team members' reliance on collaborative technology for teamwork. In conventional co-located teams, information technology can be used as an additional form of communication, but not to replace face-to-face interactions and other existing communication channels. Information technology is also not specifically used by conventional teams for cross-boundary collaboration. The extent and purpose of using information and communication technology within teams seem to be important factors that determine the degree of virtuality that a team presents.

A criterion of virtuality that is often cited in literature is the geographical dispersion of team members where employees work together from different geographical locations (Duarte & Snyders, 1999; Gibson & Cohen, 2003; Lipnack & Stamps, 2000). This criterion alone does not seem to include all virtual team types since co-located cross-organisational virtual teams come together in the same place to work on a specific project within a set timeframe. These teams are therefore regarded as virtual, based on the temporary context in which they function as well as extensive cross-boundary collaboration. Arnison and Miller (2002) and Jennings (1997) support this notion and state that team members do not need to be geographically separated to be considered virtual and emphasise the use of information technology as a criterion for virtuality. Virtual team members can therefore be all located in one office-building but use information technology extensively for cross-boundary collaboration.

The virtual team's dependence on collaborative or information and communication technology also seems to distinguish the concept of virtual teams from other forms of virtual work such as telework arrangements. Although both forms represent remote work, telework is usually limited to relatively independent job categories and involves low levels of collaboration between teleworkers, whereas a virtual team requires interdependent employees to work in highly collaborative teams (Townsend, DeMarie & Hendrickson, 1998).

Unlike telework arrangements and/or outsourcing, the objective of implementing virtual teams is not merely to increase operational efficiencies, but is specifically related to strategic

objectives and opportunities aimed at improving organisational functioning. Within the knowledge and service industries virtual teams are often used to extend their service areas, to reduce cycle times and to create a faster time-to-market for new products and services (Lines, 1997). According to Davenport and Pearlson (1998) telework arrangements such as mobile work is the result of reengineered processes aimed at automating existing processes and is not driven by a strategic positioning of information technologies to improve organisational functioning. In the service industry for example, order-management processes are often redesigned to enable a salesperson to make a commitment to a product configuration, a price, and a delivery schedule while having face-to-face contact with the customer. This procedure reduces the need for physical contact between the salesperson and employees from other divisions such as manufacturing, finance, or logistics.

Through the effective use and positioning of advanced information technology, teams can be optimised to increase an organisation's performance gains, quality of products or services and overall productivity while at the same time reduce time and operating costs by working virtually. The implementation of virtual teams therefore offers organisations with a strategic approach to increase their orientation to change, to remain competitive in dynamic and complex business environments by using technology to facilitate work changes, that allows for greater organisational flexibility and learning.

Different types of virtual teams can be designed based on the nature of tasks required such as information processing (i.e. process information by planning, creating and deciding), the production of goods or the delivery of services. Virtual teams can therefore be involved with both knowledge and/or skilled work. Okkonen (2002) defines knowledge workers as “white-collar workers” who process and utilise information knowledge mainly in service/production related work or professional group such as lawyers and engineers. Okkonen (2002) distinguishes knowledge from skilled work, where the former requires an individual to actively seek new solutions to problems while skilled workers are not expected to develop new methods to do the work. Virtual teams involved with knowledge work (i.e. processing of information such as software development teams) are more exposed to a temporary context since they are often created on a temporary basis to solve a particular problem, after which they disband (Lipnack & Stamps, 2000). Skilled work such as the production of goods and services may be virtual across the space dimension but consist of permanent team structures within an organisation.

From the literature it is evident that virtual teams are associated with a greater level of complexity than traditional co-located teams. Virtual teams perform a combination of serial and parallel tasks, where the former refers to tasks that are highly dependent on other tasks and need to be performed in a specific sequence (serial), while other task sequences are independent (parallel) and result in a combined outcome (Lipnack & Stamps, 2000). Some tasks are therefore simple and lead directly to results while others are more complex. Apart from tasks the complexity is also due to multiple interdependencies that need to be managed across time, space and organisations. The virtual team concept therefore does not represent individuals who are merely brought together through technology but involves a greater level of complexity in team membership, task design, environmental demands and team processes. There are therefore several factors that organisations need to take into account when considering work transformation towards virtual teams.

Since a high failure rate is often associated with virtual teams (Bal & Foster, 2002; Bal & Gundry, 1999) a comparative analysis of the most salient barriers to actual virtual teamwork in complex business environments were conducted to serve as a guideline and starting point for the development of a transformational strategy towards virtual teamwork. The broader organisational context in which these virtual teams function such as the organisational culture as well as specific virtual team objectives, virtual team effectiveness criteria and the extent to which these teams were familiar with virtual teamwork were not explored. The rationale for selecting these specific research studies was explorative in nature to identify broad areas of barriers and/or constraints to actual virtual teamwork.

Organisationally related cultural misunderstandings were listed as a challenge to effective virtual teamwork in all four of the explorative research studies in which virtual teams crossed functional- and/or organisational boundaries. In three of the four research studies virtual team members reported, electronic communication such as phone, fax, data tapes, mobile phones, net-meetings, e-mail and audio- and video-conferencing as being inadequate for teamwork, whilst Hodgson's (2002) study indicated that virtual team members used regular cycles of communication and used electronic communication appropriately for different tasks. These studies also indicated that distributed cross-organisational virtual teams that worked in the same time-zone experienced leadership problems, a lack of clarity in team objectives and a loss of social contact.

Global virtual teams that worked across different time-zones experienced it difficult to establish trust, to work together as a team and identified intra-team conflict as a major barrier to effective virtual teamwork. According to Panteli and Sockalingam (2002), trust is positively related to constructive conflict resolution necessary inter- and intra-organisational teamwork. When conflict is poorly managed and trust is lacking, morale and motivation are threatened, communication is impaired and knowledge sharing is limited compromising effective virtual teamwork and collaboration.

The establishment of trust is central to knowledge sharing and therefore an important factor when virtual teams are globally dispersed. Jarvenpaa and Shaw (1998) found that high-trust teams do not really need "high trust" and that "swift trust" takes place, which is very much task-oriented but emphatic enough in order to achieve good performance. Both virtual teams that worked in the same time-zones reported a lack of clarity in team objectives but did not indicate the establishment of trust as a potential barrier to effective virtual teamwork which could indicate their task-orientation and the possibility that "swift trust" took place. This deduction is however speculative in nature and further empirical investigation is needed to confirm a causal relationship between the degree of virtuality across time zones and the establishment of trust required for effective virtual teamwork.

The comparative analysis of potential barriers to virtual teamwork indicated the importance of people-based factors related to leadership- and team development, the need for electronic communication training and organisational mechanisms for social and cultural integration. Bal and Gundry's (1999) model of virtual team implementation accommodates the integration between specific people-, technological and process based factors to ensure virtual team effectiveness. Although they argue that their model is based on a long-term strategic process it does not seem to reflect a specific methodology for work transformation to assist organisations in moving towards the transformational stage of technology adoption in which individual, team and organisational benefits can be realised. Katzy, Evaristo and Zigurs (2000) for example, indicate a transformational change in teams from traditional, to distributed, to interorganisational, and finally to virtual teams as organisations develop their technological infrastructure for increasingly more complex team-based tasks.

The methodology for the implementation of virtual teams is based on an emergent approach to organisational change and work transformation. According to Burnes (1996) an emergent

approach views change as a continuous process of adaptation to external influences which is also supported by Hale and Whitlam's (1997) model of high organisational change orientation for virtual work. The methodology of a transformational process to virtual team implementation proposed in the literature study incorporates a bottom-up approach to change and continuous improvement of practices. Menkhoff, Wah and Loh (2002) recommend that change be driven from the bottom up rather than from the top down, and argue that a planned model of change is inappropriate when organisations operate in a turbulent, dynamic and unpredictable environment. Lewin's (1958) planned model of change for example is based on the assumption that organisations operate under stable conditions and can move from one stable state to another; for example, unfreezing the present level, moving to the new level and refreezing the new level. The emergent based approach to work transformation therefore implies a shift towards inter- and/or intra- collaborative organisational activities that are mediated through the strategic positioning of information technology.

Virtual teams are therefore a mechanism that can be used to increase an organisation's orientation to change through enhancing and integrating key organisational resources such as people, space and information technology to deliver greater business value and operate more effectively in a turbulent, dynamic and unpredictable business environments.

An inductive approach was followed to provide a better understanding of virtual teams, the factors that need to be considered with the implementation of virtual teams as well as approaches, processes and tools to build, design and implement strategies to ensure effective virtual team work. The major limitations of this research is that it is essentially descriptive and interpretative and lacks the scientific rigour of a positivist approach in which the deductions, theories and frameworks proposed in this study can be tested.

Three models were used as a basis from which the implementation of virtual teams were approached, namely: the work transformation process (Robertson, 2000), the virtual organisation model (Hale & Whitlam, 1997) and virtual team implementation (Bal & Gundry, 1999). Bal and Gundry's (1999) model of virtual team implementation and the comparative analysis between four explorative research studies into the barriers to effective virtual teamwork were specific to highly virtual teams operating in a temporary project environment. Overall the study did not differentiate between temporary or permanent virtual teams and/or different types of virtual teams based on different models of virtual inter-organisational

arrangements such as virtual alliances, virtual partnerships and/or the permanent virtual organisation. Virtual teams were also explored within knowledge-intensive industries but not in relation to different types of industries that require a high change orientation. Although the emphasis of this research study was not the barriers to virtual teamwork, an in-depth exploration into the barriers for effective virtual teamwork across different types of virtual teams could provide valuable information to the implementation process, such as mechanisms that address the challenges related to a team-member's re-entry into new virtual teams and virtual team members belonging to multiple virtual teams at the same time.

This study also emphasised the role of information technology in work transformation, but did not specifically relate the reciprocal influence between the use of existing and emerging workgroup technologies and virtual group structures and processes.

Although the study included elements of knowledge management, organisational development, change management, business process engineering, leadership and virtual team development these concepts need to be explored more in-depth in relation to virtual teamwork.

RECOMMENDATIONS

The implementation of virtual teams provides organisations with a strategic approach in order to increase their orientation to change. Information technology should therefore be used to facilitate work changes, for faster paced workflow as well as greater organisational flexibility and learning. The extent to which technology is used and integrated into the organisational design will in part be indicative of the type of transformational change required when virtual teams are considered within an organisation. The strategic use of information technology does seem to play an important role in work transformation and enables organisations to replace fixed jobs with interdependent tasks performed by virtual teams that are not restricted by time, space and organisational boundaries.

The leading driver of virtual work arrangements and the implementation of virtual teams in organisations would most likely be cost reduction if the basic information technology infrastructure is in place. The technological requirements for implementing virtual teams are:

- specific workgroup technologies that support different time/space configurations of teams' boundary-crossing (interorganisational or intraorganisational) interactions with each other;
- virtual team training in electronic communication and the appropriate use of specific information technologies to fit specific types of virtual team tasks; and
- access to continual on-line training and technical support in the use of technology and software updates.

In South Africa, where available bandwidth is related to cost, a cost benefit analysis needs to be conducted to identify the potential direct cost saving and to delineate the advantages using virtual teamwork. It is therefore important that managers do a cost-benefit analysis to be able to justify the initial costs in relation to the expected outputs of the virtual team (such as an increase in productivity, quality, customer satisfaction, innovation, safety, job satisfaction and organisational commitment as well as cost savings in time and travel expenses).

It is recommended that a holistic approach to the implementation of virtual teams be followed to align the people, processes, structures and culture with the strategic objectives for implementing virtual teamwork. An organisation's culture and climate, the technological infrastructure and current businesses processes therefore need to be analysed to identify areas in which virtual teams can be used to add business value through: the acquisition and dissemination of competence; reducing cycle times; extending products and/or service areas to different geographical areas; increasing the organisation's capacity to take on larger and/or concurrent projects; and enhancing organisational resources to foster cross-boundary collaboration within or between organisations.

To curb the high failure rate of virtual teams it is recommended that the implementation of virtual teams be approached as a work transformation process and that an emergent instead of a planned approach to change be followed. Team selection, training, and career path planning as well as performance evaluation and reward systems will need to change to support virtual team performance. Several tools are presented in the literature review to determine virtual team viability and an organisation's readiness for virtual teamwork. Duarte and Snyder (1999) suggest that a pilot project be implemented if there are major discrepancies in this assessment. The pilot project may include the following steps:

- selecting a problem that is highly visible and difficult to solve in a traditional team, and to get management to support the pilot project
- identifying two or three teams from functional areas such as sales, telemarketing, project engineering, or consulting to collaborate remotely
- setting clear project and performance objectives and explain how results will be measured. It is also important to appoint a team leader that will assist the team in planning how team members are going to exchange information, receive feedback and support
- assigning a member of the information systems department to assist the team with new workgroup technologies and technical support, and
- evaluating the outputs of the team in relation to inputs in terms of processes that supported or limited their functioning.

From the literature study and specifically the exploration of potential barriers to virtual teamwork it is evident that different work cultures need to be aligned with an organisation's strategy for virtual team implementation. It is therefore recommended that organisations engage employees that represent different organisation and/or departmental cultures to contribute to the design and implementation of new strategic directions, and to address organisational and/or departmental cultural risks that could create barriers to inter- and/or intra-organisational collaboration and strategy execution. The combination of cultural resource and risk management could therefore facilitate a culture of virtuality and buy-in into the change which could lead to greater horizontal and vertical alignment of diverse enterprise cultures and their integration around strategic goals.

Strategic integration is one important mechanism that aligns virtual teams to a commonly shared definition of mission and goals. It is therefore recommended that standard team processes be developed, especially for project teams that follow a common standard process. Protocols or team charters are also necessary to clarify team objectives and for the establishment of team norms, conflict-resolution procedures and communication standards.

Because there are numerous barriers to effective virtual teamwork it is also recommended:

- that teambuilding be started with initial face-to-face contact sessions during which leader and team responsibilities and team objectives be clarified and conflict-resolution procedures be discussed to establish a common understanding that facilitates

communication and coordination for virtual teamwork. A second goal with initially co-locating virtual team members is to build the social network of team members, so that team identity and commitment can be sustained despite the loss of frequent face-to-face contact, once team members are again dispersed.

- that the organisation introduce informal support networks as well as a coaching and/or mentoring system for virtual team members.
- that information technology operations and support be located close to operational centres or customer bases, to enhance local relationships, establish local presence, and to take advantage of localised areas of expertise.

It is also recommended that future research be conducted in the behavioural sciences which focuses on: different approaches to change management to determine the most suitable approach to work transformation that enables effective virtual teamwork; the effectiveness of different leadership practices in leading change as well as the type of leadership required for effective virtual teamwork; the role of information technology in virtual team development and virtual team effectiveness; the potential barriers to effective virtual teamwork in different types of virtual team designs; different mechanisms for cultural integration in virtual teams that cross organisational and departmental boundaries; social adaptation in virtual teamwork is to be able to identify strategies that prevent virtual teams from experiencing social isolation which could impact negatively on the viability of virtual teams in the future; the development of trust and specifically the phenomenon of "swift" trust in relation to different types of virtual team designs; the extent to which virtual team implementation contributes to increasing an organisation's orientation to change and the extent to which virtual teams are replacing or forming new forms of bureaucratic hierarchies.

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CHAPTER 3

CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

Chapter 3 includes the conclusions reached that are based on the findings and results of the literature review. In addition, limitations of this research are discussed and recommendations are made for future related research.

3.1 CONCLUSIONS

The following conclusions have been reached based on the literature review and in relation to the specific objectives set in Chapter 1.

The first specific objective of this study was to explain the impact of globalisation and advanced information technology on South African organisations

From the literature review it is evident that globalisation has forced many South African organisations to improve their efficiency and remain competitive in a fast paced business environment that is increasingly becoming borderless and boundary-free. The traditional model of a hierarchical organisational structure is preventing the free flow of information and knowledge and reduces their overall effectiveness in "new" dynamic and complex business environments. Organisational designs are therefore changing as flatter team-based structures are being implemented and organisational boundaries are expanding to leverage distinctive capabilities, competencies and shared resources to gain greater organisational efficiency.

Fierce international and national competition, faster-paced workflow and the increasing demand for better quality products and specialisation characterise the current business environment. In addition, rapid advances in information technology, e-engineering and the emergence of the internet and e-commerce contribute to rapid and unpredictable changes in the business environment requiring different set of practices in managing organisational and people performance. Rapidly changing marketplaces and the increase of complexity demands, therefore require a different organisational model that is based on a high change orientation. This article specifically relates to the strategic role that advancements in

information and communication technologies can play in work transformation towards virtual teamwork as a mechanism to increase an organisation's orientation to change.

When an organisation's basis is the division of labour, departments such as human resources, information technology, manufacturing, product design and/or facilities management often work independently. The result is often a consideration of outsourcing, which is driven towards operational efficiencies and not strategic opportunities. Individually these groups are not as effective as they could be if they were integrated (Robertson, 2000). Globalisation and increased outsourcing, however, require not only intraorganisational but also inter-organisational teamwork and collaboration.

The role of information technology in organisational functioning therefore seems to shift from playing a supportive role to a core strategic role in an attempt to improve organisational efficiency in complex and fast changing business environments. South African organisations' competitive positioning seems to be dependent on both the strength of technology and whether it plays a core or supportive role in their business operations. With outsourcing, technology requirements are weak and play a supportive role to the competitive positioning of the organisation (Veldsman, 2002). The prerequisite for virtual teams, on the other hand, is the existence of a technological infrastructure to support computer-mediated communication and collaboration. Information technology requirements are considered advanced and play a core role when it is used to enhance the productivity of existing teams or when teams are used to exploit new market opportunities on a global scale.

Through the effective use and positioning of advanced information technology, teams can be optimised to increase an organisation's performance gains, quality of products or services and overall productivity, while at the same time reduce time and operating costs by working virtually.

The second specific objective of this study was to distinguish virtual from conventional teams and other virtual work designs based on the use of information technology

Three distinct virtual organisational designs such as the virtual organisation, telework arrangements and virtual teams reflect the different ways in which technology can be strategically deployed to gain a competitive position in today's business environment. The

term "virtual" is used on a macro-level to refer to an organisation's ability to restructure and change to remain competitive in the business environment (Mowshovitz, 1997; Hale & Whitlam, 1997).

Virtual teams enable an organisation to pool employees with specialised knowledge and skills regardless of their geographical location by using information technology. This characteristic of virtual teams therefore enables organisations to focus on their core competence as product complexity, for example, increase. Prasad and Akhilesh (2002) relate the diversity of skills and competencies as a dimension of a team's virtuality. Since outsourcing and/or co-located cross-functional teams are also characterised by the diversity of their skills and competencies (Robertson, 2000) this dimension of virtuality cannot be used as a criterion to distinguish virtual from traditional co-located teams.

Another criterion used in the literature to differentiate conventional teams from virtual teams is the extent to which teams are involved with cross-boundary collaboration within or between organisations. On a global scale cross-boundary collaboration between organisations makes it possible for organisations to share the costs and the risks of doing business and also facilitates learning and knowledge sharing (Hale & Whitlam, 1997). Virtual teams are therefore continuously involved with boundary management to create and maintain boundaries. Shachaf and Hara (2002) support this notion and state that team boundaries in conventional teams are pre-defined and do not require the level of integration necessary in virtual teams. Within a virtual team context integration needs to exist between the virtual team, its immediate organisational environment and to other teams to prevent virtual teams operating in isolation. Unlike conventional teams, virtual teams not only cross organisational boundaries but also boundaries of space and time by using information technology to collaborate. Although Attaran and Attaran (2002) asserts that information technology can facilitate significant co-operative efforts across distance, several studies (Duarte & Snyder, 1999; O'Hara-Devereaux & Johansen, 1994) indicate that this is dependent on the correct fit between the types of information technology used, -virtual teams and -virtual team tasks.

The most significant criterion that differentiates virtual from traditional co-located teams seems to be virtual team members' reliance on collaborative technology for teamwork. In conventional co-located teams, information technology can be used as an additional form of communication, but not to replace face-to-face interactions and other existing communication

channels. Information technology is also not specifically used by conventional teams for cross-boundary collaboration. The extent and purpose of using information and communication technology within teams seem to be important factors that determine the degree of virtuality that a team presents.

A criterion of virtuality that is often cited in literature is the geographical dispersion of team members where employees work together from different geographical locations (Gibson & Cohen, 2003; Duarte & Snyders, 1999; Lipnack & Stamps, 2000). This criterion alone does not seem to include all virtual team types since co-located cross-organisational virtual teams come together in the same place to work on a specific project within a set timeframe. These teams are therefore regarded as virtual, based on the temporary context in which they function as well as extensive cross-boundary collaboration. Arnison and Miller (2002) and Jennings (1997) support this notion and state that team members do not need to be geographically separated to be considered virtual and emphasise the use of information technology as a criterion for virtuality. Virtual team members can therefore all be located in one office-building but use information technology extensively for cross-boundary collaboration.

The virtual team's dependence on collaborative or information and communication technology also seems to distinguish the concept of virtual teams from other forms of virtual work such as telework arrangements. Telework, mobile or home based workers refer to work arrangements where employees perform independent tasks at different times from remote locations away from the office. Two dimensions of virtuality are implied in telework, namely space and time. Individuals therefore work virtually from different places at different times and technology is mainly used to establish contact between the organisation and the remote worker (Kurland & Bailey, 1999). Although both forms represent remote work, telework is usually limited to relatively independent job categories and involves low levels of collaboration between teleworkers, whereas a virtual team requires interdependent employees to work in highly collaborative teams.

Unlike telework arrangements and/or outsourcing the objective of implementing virtual teams is not merely to increase operational efficiencies, but is specifically related to strategic objectives and opportunities aimed at improving organisational functioning. Within the knowledge and service industries virtual teams are often used to extend their service areas, to

reduce cycle times and to create a faster time-to-market for new products and services (Lines, 1997). According to Davenport and Pearlson (1998), telework arrangements such as mobile work is the result of reengineered processes aimed at automating existing processes and is not driven by a strategic positioning of information technologies to improve organisational functioning. In the service industry for example, order-management processes are often redesigned to enable a salesperson to make a commitment to a product configuration, a price, and a delivery schedule while having face-to-face contact with the customer. This procedure reduces the need for physical contact between the salesperson and employees from other divisions such as manufacturing, finance, or logistics.

The third specific objective of this study was to identify the type of task design and complexity involved with virtual teamwork.

The implementation of either co-located cross-organisational, distributed- or distributed cross-organisational virtual teams is therefore dependent on the strategic direction of the organisation and the competitive positioning of technology.

Different types of virtual teams can be designed based on the nature of tasks required such as information processing (i.e. process information by planning, creating and deciding), the production of goods or the delivery of services. Virtual teams can therefore be involved with both knowledge and/or skilled work. Okkonen (2002) defines knowledge workers as “white-collar workers” who process and utilise information knowledge mainly in service/production related work or professional groups such as lawyers and engineers. Okkonen (2002) distinguishes knowledge from skilled work, where the former requires an individual to actively seek new solutions to problems while skilled workers are not expected to develop new methods to do the work. Virtual teams involved with knowledge work (i.e. processing of information such as software development teams) are more exposed to a temporary context since they are often created on a temporary basis to solve a particular problem after which they disband (Lipnack & Stamps, 2000), while skilled work such as the production of goods and services may be virtual across the space dimension but consist of permanent team structures within an organisation.

From the literature it is evident that virtual teams are associated with a greater level of complexity than traditional co-located teams. Virtual teams perform a combination of serial

and parallel tasks, where the former refers to tasks that are highly dependent on other tasks and need to be performed in a specific sequence (serial), while other task sequences are independent (parallel) and result in a combined outcome (Lipnack & Stamps, 2000). Some tasks are therefore simple and lead directly to results while others are more complex. Apart from tasks the complexity is also due to multiple interdependencies that need to be managed across time, space and organisations. The virtual team concept therefore does not represent individuals who are merely brought together through technology but involve a greater level of complexity in team membership, task design, environmental demands and team processes.

The fourth specific objective of this study was to determine the potential barriers to actual virtual teamwork.

Since a high failure rate is often associated with virtual teams (Bal & Foster, 2002; Bal & Gundry, 1999) a comparative analysis of the most salient barriers to actual virtual teamwork in complex business environment were conducted to serve as a guideline and starting point for the development of a transformational strategy towards virtual teamwork. The broader organisational context in which these virtual teams function such as the organisational culture as well as specific virtual team objectives, virtual team effectiveness criteria and the extent to which these teams were familiar with virtual teamwork were not explored. The rationale for selecting these specific research studies was explorative in nature to identify broad areas of barriers and/or constraints to actual virtual teamwork.

Organisationally related cultural misunderstandings were listed as a challenge to effective virtual teamwork in all four of the explorative research studies in which virtual teams crossed functional- and/or organisational boundaries. In three of the four research studies virtual team members reported electronic communication such as phone, fax, data tapes, mobile phones, net-meetings, e-mail and audio- and video-conferencing as being inadequate for teamwork, while Hodgson's (2002) study indicated that virtual team members used regular cycles of communication and used electronic communication appropriately for different tasks. These studies also indicated that distributed cross-organisational virtual teams that worked in the same time-zone experienced leadership problems, a lack of clarity in team objectives and a loss of social contact. Global virtual teams that worked across different time-zones found it difficult to establish trust, to work together as a team and identified intra-team conflict as a major barrier to effective virtual teamwork. According to Panteli and Sockalingam (2002)

trust is positively related to constructive conflict resolution necessary for inter- and intra-organisational teamwork. When conflict is poorly managed and trust is lacking, morale and motivation are threatened, communication is impaired and knowledge sharing is limited, compromising effective virtual teamwork and collaboration.

The establishment of trust is central to knowledge sharing and therefore an important factor when virtual teams are globally dispersed (Bodensteiner & Stecklein, 2002). Jarvenpaa & Shaw (1998) found that high-trust teams do not really need "high trust" and that "swift trust" takes place, which is very much task-oriented but emphatic enough in order to achieve good performance. Both virtual teams that worked in the same time-zones reported a lack of clarity in team objectives but did not indicate the establishment of trust as a potential barrier to effective virtual teamwork which could indicate their task-orientation and the possibility that "swift trust" took place. This deduction is however speculative in nature and further empirical investigation is needed to confirm a causal relationship between the degree of virtuality across time zones and the establishment of trust required for effective virtual teamwork.

The comparative analysis of potential barriers to virtual teamwork indicated the importance of people-based factors related to leadership- and team development, the need for electronic communication training and organisational mechanisms for social and cultural integration when organisations implement virtual teams.

The fifth specific objective of this study was to develop a methodology for work transformation based on a sound theoretical model for virtual team implementation.

Based on the literature review the methodology for the successful implementation of virtual teams within South African based organisations is highly dependent on their orientation towards change which will determine how readily technology is adopted and used to enable virtual team formations. Virtual team working therefore needs to be introduced in an appropriate organisational context:

- with a high degree of interdependence between tasks. Interdependent members of a team can accomplish certain aspects of their jobs on their own, but are dependent on other units in the organisation to deliver certain outputs; and
- where the organisational structure supports teamwork and cultural values such as learning, collaboration, diversity and sharing information and power.

The implementation of virtual teams could provide organisations with a strategic approach to increase their orientation to change in order to remain competitive in dynamic and complex business environments by using technology to facilitate work changes that allow for greater organisational flexibility and learning.

Bal and Gundry's (1999) model of virtual team implementation accommodates the integration between specific people-, technological- and process-based factors to ensure virtual team effectiveness. Although they argue that their model is based on a long-term strategic process it does not seem to reflect a specific methodology for work transformation to assist organisations in moving towards the transformational stage of technology adoption in which individual, team and organisational benefits can be realised. Katzy et al. (2000), for example, indicate a transformational change in teams from traditional, to distributed, to interorganisational, and finally to virtual teams as organisations develop their technological infrastructure for increasingly more complex team-based tasks.

The methodology, proposed in the literature review, include the following four phases:

- The involvement of key corporate service groups from human resources, information technology and facilities management, who present different departmental and/or organisational cultures to develop a work transformation strategy geared towards virtual team implementation.
- A readiness assessment for the implementation of virtual teams, based on existing business processes, the current use of electronic communication and information technologies and an organisational culture analysis to determine cultural risk factors that could impede the development of a culture of "virtuality".
- The development of a business case which incorporates the costs and benefits with the implementation of virtual teams in relation to direct costs of traditional cross-organisational teamwork.
- Resource allocation for virtual teamwork, the selection and training of virtual team members and the establishment of virtual teams.
- Continuous improvement practices and adjustments after initial implementation.

The methodology for the implementation of virtual teams is based on an emergent approach to organisational change and work transformation. According to Burnes (1996) an emergent approach views change as a continuous process of adaptation to external influences which is

also supported by Hale and Whitlam's (1997) model of high organisational change orientation for virtual work. The methodology of a transformational process to virtual team implementation proposed in the literature study incorporates a bottom-up approach to change and continuous improvement of practices. Menkhoff, Wah and Loh (2002) recommend that change be driven from the bottom up rather than from the top down and argue that a planned model of change is inappropriate when organisations operate in a turbulent, dynamic and unpredictable environment. Lewin's (1958) planned model of change for example is based on the assumption that organisations operate under stable conditions and can move from one stable state to another, for example unfreezing the present level; moving to the new level and refreezing the new level.

Bal and Gundry's (1999) model of virtual team implementation provided a conceptual approach to understanding the interdependency between people, process and technology whereby change in any one factor requires compensatory changes in others. The above model of virtual team implementation does not seem to be congruent with a centrally-directed process of planned change but rather an emergent based approach to work transformation which implies a shift towards inter- and/or intra- collaborative organisational activities that are mediated through the strategic positioning of information technology.

Virtual teams are therefore a mechanism that can be used to increase an organisation's orientation to change, through enhancing and integrating key organisational resources such as people, space and information technology to deliver greater business value and operate more effectively in a turbulent, dynamic and unpredictable business environments.

3.2 LIMITATIONS OF THIS RESEARCH

An inductive approach was followed to provide a better understanding of virtual teams, the factors that need to be considered with the implementation of virtual teams as well as approaches, processes and tools to build, design and implement strategies to ensure effective virtual team work.

The most salient limitation of this research is that it is essentially descriptive and interpretative and lacks the scientific rigour of a positivist approach in which the deductions, theories and frameworks proposed in this study can be tested.

Three models were used as a basis from which the implementation of virtual teams were approached, namely: the work transformation process (Robertson, 2000), the virtual organisation model (Hale & Whitlam, 1997) and virtual team implementation (Bal & Gundry, 1999). Bal and Gundry (1999) model of virtual team implementation and the comparative analysis between four explorative research studies into the barriers to effective virtual teamwork were context specific to highly virtual teams operating in a temporary project environment. Overall the study did not differentiate between temporary or permanent virtual teams and/or different types of virtual teams based on different models of virtual inter-organisational arrangements such as virtual alliances, virtual partnerships and/or the permanent virtual organisation. Virtual teams were also explored within knowledge-intensive industries but not in relation to different types of industries that require a high change orientation.

Although the emphasis of this research study was not the barriers to virtual teamwork, an in-depth exploration into the barriers for effective virtual teamwork across different types of virtual teams could provide valuable information to the implementation process, such as mechanisms that address the challenges related to a team-member's re-entry into new virtual teams and virtual team members belonging to multiple virtual teams at the same time.

This study also emphasised the role of information technology in work transformation, but did not specifically relate the reciprocal influence between the use of existing and emerging workgroup technologies and virtual group structures and processes.

Although the study included elements of knowledge management, organisational development, change management, business process engineering, leadership and virtual team development these concepts need to be explored more in-depth in relation to virtual teamwork.

3.3 RECOMMENDATIONS

Recommendations pertaining to the practical implementation of virtual teams and related, future research are discussed below.

3.3.1 Recommendations for the implementation of virtual teams

Since virtual teams offer organisations with a strategic approach, to increase their orientation to change, information technology should be used to facilitate work changes, which allow for faster paced workflow as well as greater organisational flexibility and learning.

The extent to which technology is used and integrated into the organisational design will in part be indicative of the type of transformational change required when virtual teams are considered within an organisation. The strategic use of information technology does seem to play an important role in work transformation, and enables organisations to replace fixed jobs with interdependent tasks performed by virtual teams that are not restricted by time, space and organisational boundaries.

The leading driver of virtual work arrangements and the implementation of virtual teams in organisations would most likely be cost reduction if the basic information technologies' infrastructure is in place. The technological requirements for implementing virtual teams are:

- specific workgroup technologies that support different time/space configurations of teams' boundary-crossing (interorganisational or intraorganisational) interactions with each other;
- virtual team training in electronic communication and the appropriate use of specific information technologies to fit specific types of virtual team tasks; and
- access to continual on-line training and technical support in the use of technology and software updates.

In South Africa, where available bandwidth is related to cost, a cost benefit analysis needs to be conducted to identify the potential direct cost saving and to delineate the advantages using virtual teamwork. It is therefore important that managers do a cost-benefit analysis to be able to justify the initial costs in relation to the expected outputs of the virtual team (such as an increase in productivity, quality, customer satisfaction, innovation, safety, job satisfaction and organisational commitment as well as cost savings in time and travel expenses).

It is recommended that a holistic approach to the implementation of virtual teams be followed to align the people, processes, structures and culture with the strategic objectives for

implementing virtual teamwork. An organisation's culture and climate, the technological infrastructure and current businesses processes therefore need to be analysed to identify areas in which virtual teams can be used to add business value through: the acquisition and dissemination of competence; reducing cycle times; extending products and/or service areas; increasing the organisation's capacity to take on larger and/or concurrent projects; and - enhancing organisational resources to foster cross-boundary collaboration within or between organisations.

To curb the high failure rate of virtual teams, it is recommended that the implementation of virtual teams be approached as a work transformation process and that an emergent instead of a planned approach to change be followed. Team selection, training, and career path planning as well as performance evaluation and reward systems will need to change to support virtual team performance. Several tools are presented in the literature review to determine virtual team viability and an organisation's readiness for virtual teamwork. Duarte and Snyder (1999) suggest that a pilot project be implemented if there are major discrepancies in this assessment. The pilot project may include the following steps:

- selecting a problem that is highly visible and difficult to solve in a traditional team, and to get management to support the pilot project;
- identify two or three teams from functional areas such as sales, telemarketing, project engineering, or consulting to collaborate remotely;
- set clear project and performance objectives and explain how results will be measured. It is also important to appoint a team leader that will assist the team in planning how team members are going to exchange information, receive feedback and support;
- assign a member of the information systems department to assist the team with new workgroup technologies and technical support; and
- evaluate the outputs of the team in relation to inputs in terms of processes that supported or limited their functioning.

From the literature study and specifically the exploration of potential barriers to virtual teamwork it is evident that different work cultures need to be aligned with an organisation's strategy for virtual team implementation. It is therefore recommended that organisations engage employees that represent different organisation and/or departmental cultures to contribute to the design and implementation of new strategic directions and to address

organisational and/or departmental cultural risks that could create barriers to inter- and/or intra-organisational collaboration and strategy execution. The combination of cultural resource and risk management could therefore facilitate a culture of virtuality and buy-in into the change which could lead to greater horizontal and vertical alignment of diverse enterprise cultures and their integration around strategic goals.

Strategic integration is one important mechanism that aligns virtual teams to a commonly shared definition of mission and goals. It is therefore recommended that standard team processes be developed, especially for project teams that follow a common standard process. Protocols or team charters are also necessary to clarify team objectives and for the establishment of team norms, conflict-resolution procedures and communication standards. Because there are numerous barriers to effective virtual teamwork it is also recommended:

- that teambuilding be started with initial face-to-face contact sessions during which leader and team responsibilities and team objectives be clarified and conflict-resolution procedures be discussed to establish a common understanding that facilitates communication and coordination for virtual teamwork. A second goal with co-locating virtual team member initially is to build the social network of team members, so that team identity and commitment can be sustained despite the loss of frequent face-to-face contact, once team members are again dispersed.
- that the organisation introduce informal support networks as well as a coaching and/or mentoring system for virtual team members.
- that information technology operations and support be located close to operational centres or customer bases, to enhance local relationships, establish local presence, and to take advantage of localised areas of expertise.

3.3.2 *Recommendations for future research*

The following recommendations for further research have been identified on the basis of the research findings:

- a meta-theoretical framework is necessary to depict the process and methodology for implementing virtual teams on a local and global scale
- empirical research is necessary to validate the theoretical models on virtual teams, and
- more quantitative and qualitative research is necessary in behavioural sciences. Research should be focused on: the effectiveness of different leadership practices in leading change

as well as the type of leadership required for effective virtual teamwork, different approaches to change management to determine the most suitable approach to work transformation that enable effective virtual teamwork, the role of information technology in virtual team development and virtual team effectiveness, the potential barriers to effective virtual teamwork in different types of virtual team designs, the different mechanisms required for cultural integration in virtual teams that cross organisational and departmental boundaries, social adaptation in virtual teamwork to be able to identify strategies that prevent virtual teams from experiencing social isolation which could impact negatively on the viability of virtual teams in the future, the development of trust and specifically the phenomenon of "swift" trust in relation to different types of virtual team designs; the extent to which virtual team implementation contribute to increasing an organisation's orientation to change and the extent to which virtual teams are replacing or forming new forms of bureaucratic hierarchies.

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