Effective internal communication methods and media for knowledge transfer in the manufacturing industry

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Abstract

This study was designed to determine the effective internal communication methods and media for knowledge transfer in the manufacturing industry.

The research involved the collection of quantitative data through non-probability, convenience sampling. The data was collected using survey questionnaires at three companies in the manufacturing industry namely; Exxaro FerroAlloys, Tubatse Chrome and Amalgamated Beverage Industries. The data was analysed using descriptive and univariate statistical techniques.

The study showed that push communication methods and high-media rich communication is preferred for transferring information/explicit knowledge in the manufacturing industry. The most preferred communication methods (top three) for information/explicit knowledge transfer were email followed by newsletters and compulsory meetings. The importance of media richness in transferring tacit knowledge was shown. The study found that High-media rich communication, especially face-to-face, was preferred to transfer and share tacit knowledge. These findings were discussed in the context of existing literature and a number of recommendations were made.

Keywords: knowledge transfer, communication methods, media richness, manufacturing industry

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree of examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

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Chapter 1: Introduction to Research Problem

1.1   Research Title

Effective internal communication methods and media for knowledge transfer in the manufacturing industry.

1.2   Introduction

The purpose of this chapter is to motivate the need for the research and what the research objectives are.

The research motivation will highlight the following:

- The importance of communication and knowledge transfer in organisations.
- The dependence of knowledge transfer on communication.
- The role and importance of internal communication methods and media to the knowledge transfer process.
- Justification for conducting the research in the manufacturing industry.

Essentially the research problem is: What are the effective internal communication methods and media for knowledge transfer in the manufacturing industry?

1.3   Motivation for Research

Communication is an organisational asset which has a big impact on the success of the business. Communication serves a number of important functions in an organisation such as sharing and clarifying goals, identifying how goals are to be achieved, exerting control, motivating others, developing a sense of community and commitment, sharing information and creating common understanding. "Communication involves more than just the dissemination of information; it also provides an organisation with purpose, structure, and direction while it strengthens the cohesion of the enterprise" (Carr, Folliard, Huang, Kenney & MacGregor, 1999, p.172).

It is estimated that employees spend about four fifth of their working life communicating (Ferreira, 2006). Communication in the organisation is central to the success of the business and must be taken into consideration in a quest to increase organisational competitive advantage. According to a study conducted in the U.S. by Watson Wyatt, a human resources consulting firm, companies that communicate more effectively with their employees have a lower turnover rate (on average 33.3 percent) than those that communicate less effectively (average 51.6 percent) (Ewing, 2005).

Despite its importance, few organisations devote enough time and resources to ensure that effective communication systems and processes are in place (Ferreira, 2006). Sanchez (1999) reported in the study conducted by Watson Wyatt Worldwide in cooperation with IABC Research Foundation that only 40 percent of 913 organisations which participated in the study, mainly from the manufacturing industry had formal communication strategies. It is evident that communication touches all aspects of the business and this research will strive to find ways of ensuring effective communication in organisations.

Knowledge is important, not only between organisations, but also within the organisation. About 90 percent of the knowledge in any organization is embedded and synthesized in peoples' heads (Smith, 2001). The transfer of knowledge is thus important in ensuring that organisational members learn from one another and also create new knowledge. As more organisations begin to incorporate knowledge management into their overall business strategy, they are showing interest in implementing knowledge management processes and technologies (Zack, 1999).

"Success does not necessarily go to the firms that know the most, but to the firms that can make the best use of what they know" (Bierly, Kessler & Christensen, 2000, p.596). Hence, for knowledge to give competitive advantage, it must be effectively transferred within the organisation (Murray & Peyrefitte, 2007; Spender & Grant, 1996; Stenmark, 2001; Watson & Hewett, 2006; Zack, 1999).

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Communication plays a vital role in the knowledge transfer process within the organisation (Du Plessis & Boshoff, 2008; Roberts, 2000).

One way of managing the knowledge - transfer process is to select appropriate communication media for the property or type of knowledge to be transferred (Murray & Peyrefitte, 2007). Information about the employee's preferred communication methods and technologies is important in ensuring positive and effective communication (Du Plessis & Boshoff, 2008; Ferreira, 2006).Most of the studies have concentrated on "top-down" transfer of knowledge to the employees in the organisations. Forman and Argenti (2005) recommended that a 'bottom up' study of the recipients of information be conducted in order to determine the effectiveness of communication. This research will focus on finding appropriate communication methods and media required for knowledge transfer purposes. A bottom up approach will be adopted, where employees will be included in the study.

Spender & Grant (1996) argued that mechanisms of communicating knowledge are different and the knowledge transfer is depended upon the industry characteristics. Knowledge management in the manufacturing industries has thus far received little attention in comparison to service-related industries (Riege & Zulpo, 2007). "There is little empirical evidence on ground level knowledge discovery and bottom-up knowledge transfers in a manufacturing environment" (Riege & Zulpo, 2007, p.293). The author has worked in the manufacturing industry for more than ten

years and has experienced the challenges of transferring knowledge, especially tacit knowledge, between employees. This research will thus focus on the manufacturing industry.

1.4   Research objective

The objective of the research was to determine the effective internal communication methods and media for knowledge transfer in the manufacturing industry.

1.5   Structure of the report

The following chapters are included in the report:

Chapter 2: Literature Review

Chapter 3: Research Hypothesis

Chapter 4: Research Methodology

Chapter 5: Results

Chapter 6: Discussion of Results

Chapter 7: Conclusion

Chapter 2: Literature Review

2.1   Introduction

The purpose of the literature review is to present an argument within the current, relevant academic literature for the support of the research. The literature review sheds light and shows the need for the research topic. The figure below shows the graphical presentation of the structure of the literature review. The structure shows the approach and logical flow of the literature review.

Figure 2.1: Structure of the literature review
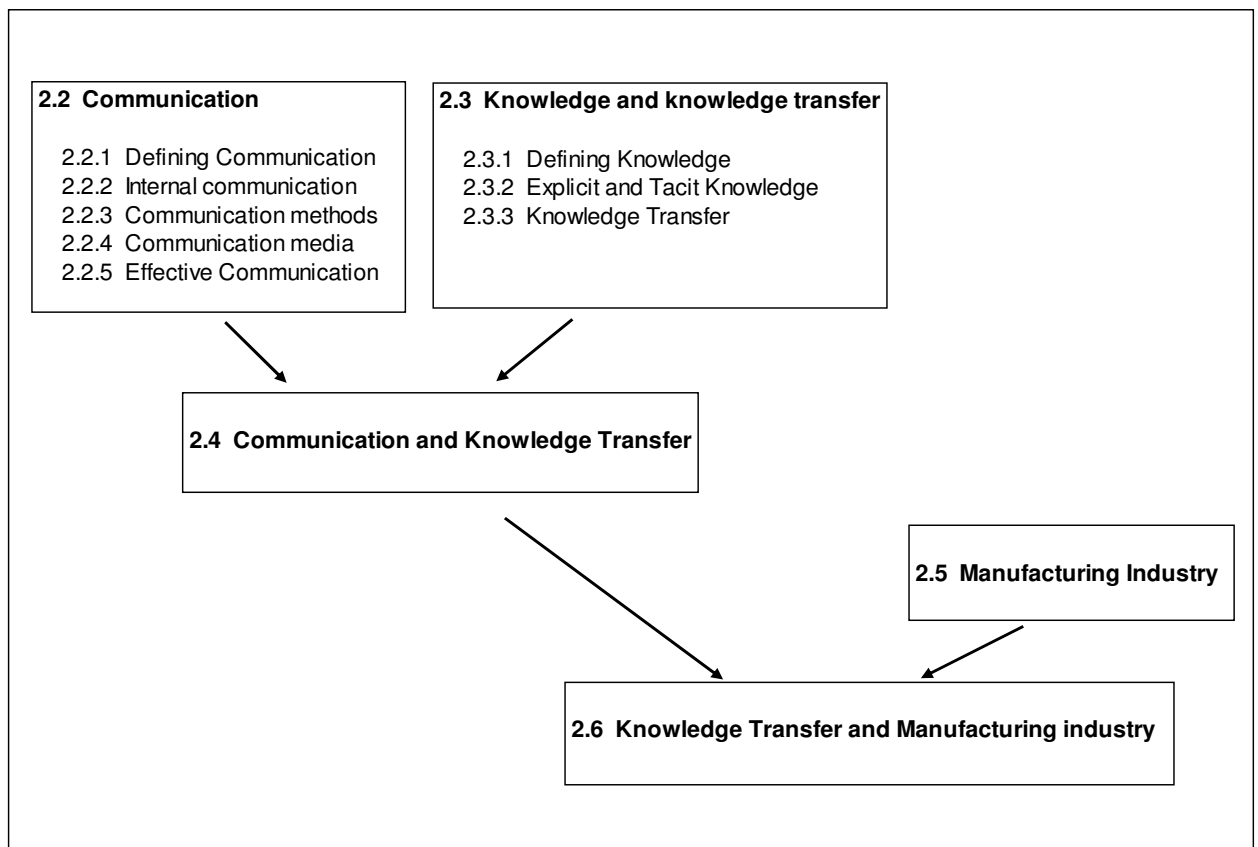
The literature is divided into five sections. Three sections review literature on the main topics of communication, knowledge transfer and the manufacturing industry. The other two sections cover the relationship between the main topics. The first section reviews literature on communication and starts with the definition of communication. The two types of communication, which includes external and internal communication is presented. Internal communication, which is the focus of the research, is explored further. This is followed by the literature on communication methods and media and the choices to be made by organisations. The concept of effective communication is defined at the end of the first section. The second section reviews literature on knowledge and knowledge transfer. The definition of knowledge by different authors is presented. The difference between explicit and tacit knowledge is explained and how both knowledge types relate to organisational knowledge. Theory covering the concept of knowledge transfer and its importance to the organisations is also reviewed. The third section reviews the literature about the relationship between communication and knowledge transfer. The focus is on how both concepts influence the organisations. A definition of the manufacturing industry is presented in the fourth section. Theory about the employees in the manufacturing industry is covered in order to highlight the reason for focussing on this industry. In the last section, the literature from the four sections is reviewed to show the relevance and importance of transferring knowledge in the manufacturing industry.

2.2 Communication

2.2.1 Defining Communication

Du Plessis and Boshoff (2008, p.3) defined communication as "The use of a medium to convey a message between individuals or groups and it is a means of relating to each other". According to Ferreira (2006), communication is a transaction where participants together create meaning through the exchange of symbols. The symbols may be verbal, non verbal and graphic. The communication process proceeds through the following steps:

- The message is conceived and encoded by the sender via a particular chosen route/channel to the receiver.
- The receiver then decodes and interprets the message

Van der Walt, Du Plessis and Barker (2006) argued that in the scientific study of communication, there are two general views about communication. The first view is concerned with how accurately and efficiently can messages be transferred from one person to another. This view attempts to identify ways of increasing clarity and accuracy of the message and concentrates on improving the tools and techniques that promote efficient communication. This view also implies that the process of communication can be reduced to its essential parts (e.g. sender, message, channel, and receiver). The second view maintains that in addition to the transmission of messages, communication is involved in the interpretation of

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messages. This view regards communication as complex, dynamic, never-ending and ever-changing. The central assumption to this perspective is that people actively interpret their experience by assigning meaning to the information they are exposed to. Communication in the organisations can be classified as internal or external.

2.2.2 Internal communication

Du Plessis and Boshoff (2008, p.3) defined internal communication as "The communication between people working together to achieve individual or collective organisational goals". Internal communication, also referred to as 'organisational communication', is the process of communication between the people within the organisation (Scheffer & Crystal, 2008). Internal communication process is used to maintain good relationships, describe tasks, give instructions and communicate the goals and philosophy of the organisation (Ferreira, 2006). Effective internal communication is a major contributor to the success of change initiatives in organisations. In particular, at the individual level, appropriate internal communication helps employees to understand both the need for change, and the personal effects of the proposed change (Goodman & Truss, 2004). The focus of this research will be on internal communication.

2.2.3 Communication methods

Carr et al. (1999) distinguished two separate communication methods; push and pull communication:

- *Push communication* drive information into the organisation without any employee-initiated action or request. It is effective for dissemination of information needed and/or wanted by a large number of people. Examples:
    - Electronic: Email
    - Written: Reports and distributed newsletters
    - Verbal: Voice mail and compulsory meetings

- *Pull communication* mechanisms require employees to seek information. Examples:
    - Electronic: Web, shared files, databases, and information system
    - Written: Libraries and reference books
    - Verbal: Voluntary meetings

The difference between push and pull communication methods are shown in table 2.1:

Table 2. 1   Comparison between push and pull communication

Push communication	Pull communication
Strengths • Ensures message delivery • Ensures message consistency	**Strengths** • Optimises message effectiveness • Offers timeliness
Weaknesses • Information may inundate recipient • Information may not be applicable • Information may not be usable, appropriate or applied	**Weaknesses** • Information may not be retrieved • Updates may not be communicated

Source: Carr et al. (1999)

A blend of push and pull communication is required for alignment in the organisation. Pull communication can be used to extract information about status of various initiatives, projects and daily performance measurements. Push communication is effective in outlining the strategic direction of a business (Carr et al., 1999).

Du Plessis and Boshoff (2008) categorised communication methods and technologies into the following categories and sub-categories:

- Voice communication – includes face to face communication, cell phone and telephone

- Written communication – includes paper by mail, paper by hand, email

- Other communication – includes fax, IM, SMS, Skype, blogging, VoIP, Web conferencing and white boards, discussion boards, wikiing, internet forums and other

The categories and sub-categories are shown in figure 2.2 (Du Plessis & Boshoff, 2008)

Figure 2.2: Communication methods and technologies
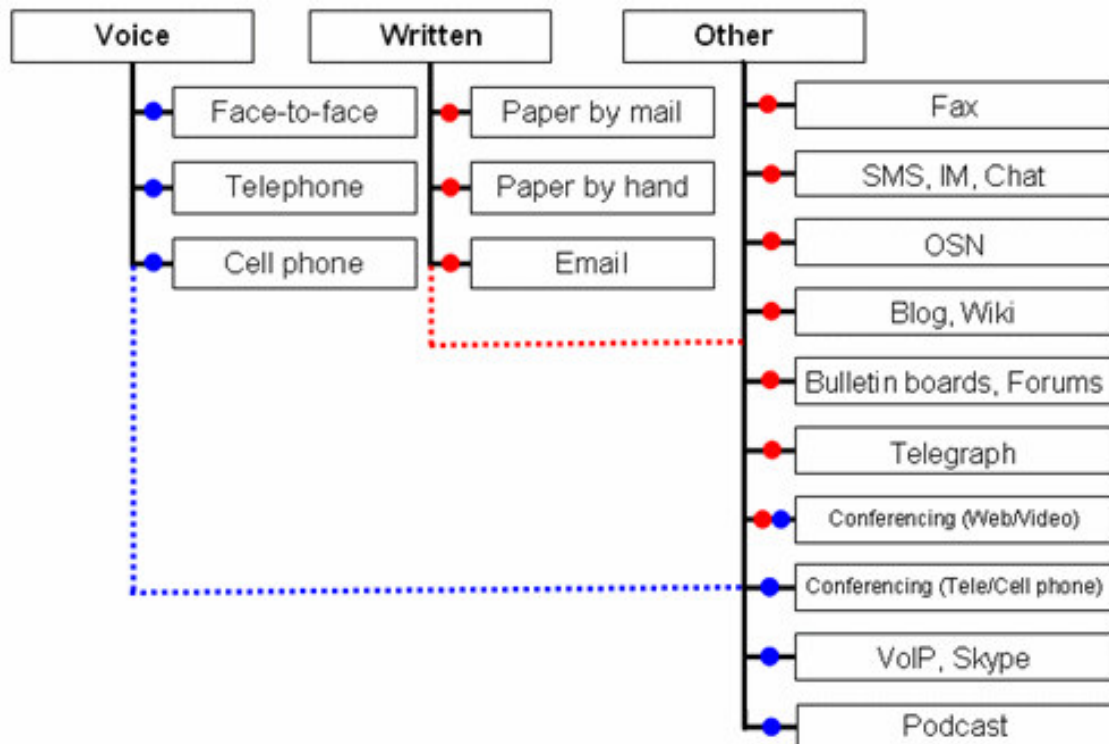
The communication methods and technologies can be used independently or in conjunction with others. Roberts (2000, p.429) stated that "Information and Communication Technologies (ICT's) have a central role in the emerging knowledge – based economy in which the generation and exploitation of knowledge are seen to play a predominant part in the creation of wealth". ICT's facilitate the collection, collation, storage and dissemination of data, thereby assisting the knowledge creation and transfer process.

The preferred communication methods and technologies within the organisation can be different (Du Plessis & Boshoff, 2008; Khan, 2000). Despite the wide choice of methods and technologies, organisations must use elements common to all audiences, not the fine lines that separate them (Arnold, 2001). This research will determine the preferred communication methods for application in the knowledge transfer process.

2.2.4 Communication media

Communication can be conducted through a variety of media such as face- to-face, telephone, fax, e-mail, paper-based messages and video conferencing. The communication media selection is critical in the knowledge transfer process. "Media differ in their level of richness, or the extent to which they possess the following qualities: inherent capacity for immediate feedback, number of cues and channels, personalisation and language variety" (Schenkel, 2004, p.49). High-

media rich communication is personal and involves face to face contact, while low-media rich communication rely on the forms, rules, procedures and databases Murray and Peyrefitte (2007) argued that the messages should be communicated on channels with sufficient and appropriate media richness, otherwise they run the risk of being ineffective.

Murray and Peyrefitte (2007) classified communication media, when it is used as key knowledge sharing activities, into three categories: technology-assisted communication, meetings, and training methods. For each of these categories there are elements that are high in media richness and that are low in media richness. Murray and Peyrefitte (2007) further distinguished high - media rich, technology – assisted communication (videoconferencing) and high - media rich communication (face to face). It was found in several studies that high-media rich communication enhances tacit knowledge sharing (Charlot & Duranton, 2006; Du Plessis & Boshoff, 2008; Murray & Peyrefitte, 2007).

2.2.5 Effective Communication

Effective communication occurs when the message communicated by the sender is interpreted as having the same meaning that the sender intended (Ferreira, 2006). Ferreira (2006) identified a number of factors which can determine the effectiveness and outcome of the communicated message. The following factors were included:

- *Stereotyping* which occurs when certain characteristics are attributed to an individual because of the group that he or she belongs to.

- The *halo effect* which is experienced when a person is categorised because of the characteristics of the group or institution represented by that particular person.

- *Selective interpretations or perceptions* which includes absorbing only those characteristics that are obvious based on interests, experience and attitude of the person receiving the message.

- *Projection* which occurs when the person receiving the message assumes that the other party shares the same beliefs, attitudes and opinions as he or she does.

Effective employee communication must start with the research of the preferred methods of communication (Ewing, 2005; Rayburn, 2007). Khan (2000) stated that "The first rule of communication is to understand your audience. Research helps put a face on that audience. Your employees are people first, then audiences". Hence, the employee's communication preferences will be sought in this research.

2.3 Knowledge and knowledge transfer

2.3.1 Defining Knowledge

Davenport and Prusak (2000, p.56) defined knowledge as "A fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organisations, it often becomes embedded not only in documents or repositories but also in organisational routines, processes, practices, and norms". Another definition by Murray and Peyrefitte (2007, p.112) stated that "Knowledge is information whose validity has been established through test of proof and can therefore be distinguished from opinion, speculation, beliefs, or other types of unproven information". Knowledge should be distinguished from data and information and should be valued on the basis of organised accumulation of information through experience, communication or inference (Bhatt, 2000; Zack, 1999).

Tobin (2006) identified three particular aspects of knowledge, namely:

- The distinction between data, information and knowledge and the reliance of knowledge upon the existence of data and information.
- The extent to which knowledge is held by one person, groups or an organisation as a whole.
- The extent to which knowledge is explicit or tacit.

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Roberts (2000, p.430) defined data as "a series of observations, measurements, or facts in a form of numbers, words, sound and/or image" whereas information is "data that have been arranged into meaningful pattern". Bierly et al. (2000) presented a framework which explains and shows the distinction between data, information, knowledge and wisdom. The framework is shown in figure 2.3:

Figure 2.3: Data, information, knowledge and wisdom framework

Use Knowledge to
Establish and
Achieve Goals

Wisdom

Analyze and Synthesize
Derived Information

Knowledge

Give Meaning
to Obtained Data

Information

Obtain
Raw Facts

Data
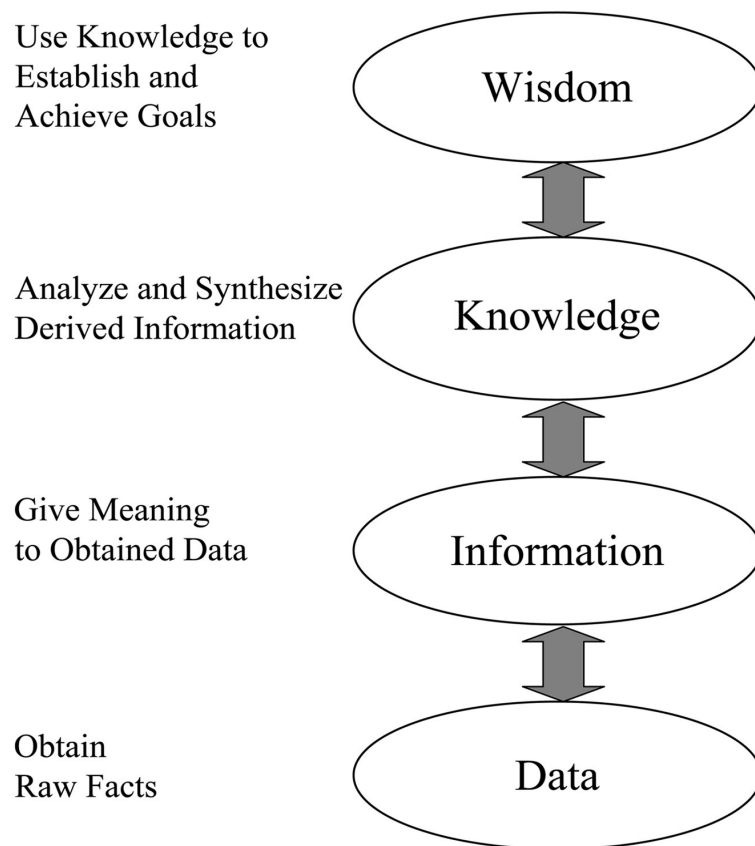
Source: (Bierly et al, 2000, p.602)

2.3.2 Explicit and Tacit Knowledge

Knowledge consists of two classifications: information (explicit knowledge) and know-how (tacit knowledge) (Bhatt, 2000; Stenmark, 2001; Murray & Peyrefitte, 2007). Both tacit and explicit knowledge form the basis of organisational knowledge as shown in figure 2.4.

Figure 2.4: Organisational knowledge


```
                    Organisational knowledge

                    Individual Knowledge
                    Group Knowledge


        Tacit Knowledge                    Explicit Knowledge


      Heuristic Knowledge


  Cognitive        Technical          Procedural        Declarative
  Elements         Elements           Knowledge         Knowledge

  - Mental models  - Skills
  - Viewpoints     - Know-how
  - Concepts
```
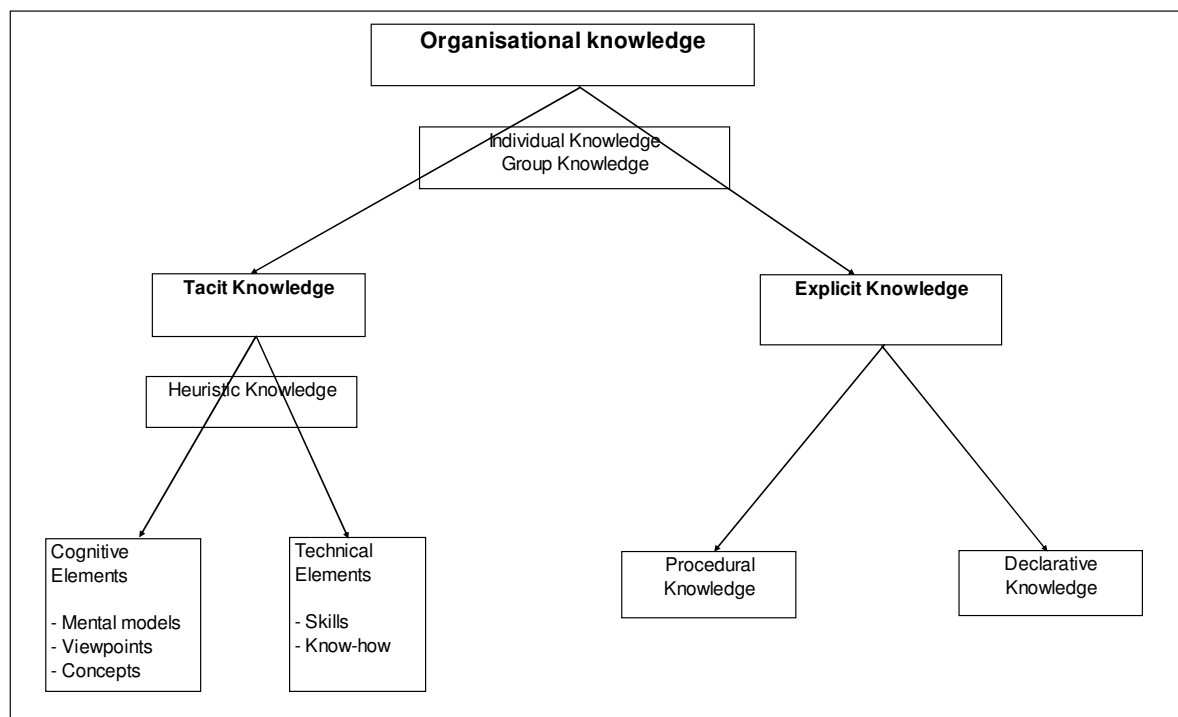
Source: Kothuri (2002, p.26)

Zack (1999, p.46) explained the difference between the two knowledge types by stating that " Tacit knowledge is subconsciously understood and applied, difficult to articulate, developed from direct experience and action, and usually shared

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through highly interactive conversation, storytelling, and shared experience. In contrast, explicit knowledge is more precisely and formally articulated, although removed from the original context of creation or use". Explicit knowledge may be easier to transfer as it can be written down whereas tacit knowledge is difficult to share mainly because it is individual specific and requires appropriate communication in order to flow (Cummings & Teng, 2003; Du Plessis & Boshoff, 2008; Leonard & Sensiper, 1998; Riege & Zulpo, 2007; Roberts, 2000; Stenmark, 2001).

Smith (2001) compared and summarised the different ways that explicit and tacit knowledge can be used in the workplace, see table 2.2:

Table 2. 2   Use of explicit and tacit knowledge in the workplace

Explicit Knowledge	Tacit Knowledge
Work process*: organized tasks, routine, orchestrated, assumes a predictable environment, linear, reuse codified knowledge, create knowledge objects	Work practice*: spontaneous, improvised, web-like, responds to a changing, unpredictable environment, channels individual expertise, creates knowledge
Learn: on the job, trial-and-error, self-directed in areas of greatest expertise, meet work goals and objectives set by organization	Learn*: supervisor or team leader facilitates and reinforces openness and trust to increase sharing of knowledge and business judgment
Teach*: trainer designed using syllabus, uses formats selected by organization,	Teach*: one-on-one, mentor, internships, coach, on-the-job training,

based on goals and needs of the organization, may be outsourced	apprenticeships, competency based, brainstorm, people to people
Type of thinking: logical, based on facts, use proven methods, primarily convergent thinking	Type of thinking: creative, flexible, unchartered, leads to divergent thinking, develop insights
Share knowledge: extract knowledge from person, code, store and reuse as needed for customers, e-mail, electronic discussions, forums	Share knowledge: altruistic sharing, networking, face-to-face contact, videoconferencing, chatting, storytelling, personalize knowledge
Motivation: often based on need to perform to meet specific goals	Motivation: inspire through leadership, vision and frequent personal contact with employees
Reward: tied to business goals, competitive within workplace, compete for scarce rewards, may not be rewarded for information sharing	Reward: incorporate intrinsic or non-monetary motivators and rewards for sharing information directly, recognize creativity and innovation
Relationships; may be top-down from supervisor to subordinate or team leader to team members	Relationships: open, friendly, unstructured, based on open, spontaneous sharing of knowledge
Technology: related to job, based on availability and cost, invest heavily in IT to develop professional library with hierarchy of databases using existing knowledge	Technology: tool to select personalized information, facilitate conversations, exchange tacit knowledge, invest moderately in the framework of IT, enable people to find one another
Evaluation: based on tangible work accomplishments, not necessarily on creativity and knowledge sharing	Evaluation: based on demonstrated performance, ongoing, spontaneous evaluation

2.3.3 Knowledge Transfer

Knowledge transfer is described as the conveyance of knowledge from one place, person or ownership to another (Major & Cordey-Hayes, 2000). Knowledge transfer involves the recreation of a knowledge package of a source in the recipient (Cummings & Teng, 2003). Lin, Geng and Whinston (2005) introduced the market view of knowledge transfer, where knowledge is treated as a good that moves in a knowledge market. A knowledge market exists within organisations and there are two groups of participants in a knowledge transfer process: knowledge senders and knowledge receivers (Lin, Geng, & Whinston, 2005). The knowledge sender as well as the knowledge receiver can be an individual, a team or an organisation. Researchers have argued that the ability to leverage valuable knowledge within the organisation is critical to building competitive advantage. Knowledge in itself is not the desired end-state, but part of a creation or transfer process (Bou-Llusar & Segarra-Cipres, 2006). One way of leveraging the knowledge is through the transfer between individuals or teams within the organisation (Spender & Grant, 1996; Watson & Hewett, 2006).

Figure 2.5 shows an integrated framework of various issues within an organisation that will influence the transfer of knowledge (Goh, 2002). This research will concentrate on the types of knowledge (tacit and/or explicit) and the transfer mechanisms, with a focus on communication.

Figure 2.5: Integrative framework of factors influencing knowledge transfer
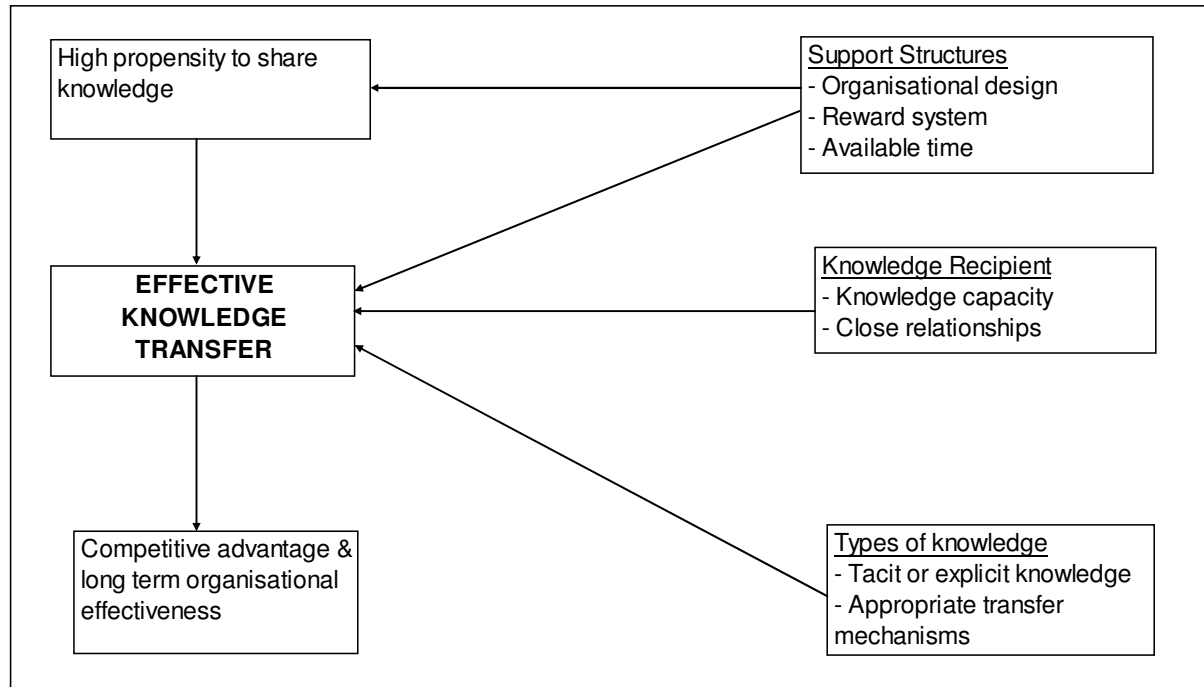
Source: Goh (2002, p.28)

2.4   Communication and Knowledge Transfer

Communication is required in order to share and transfer knowledge in the organisations (Moss & Warnaby, 1998). Communication plays a critical role in the knowledge transfer process because for knowledge to flow, written, oral or other forms of communication are required, including ICT-supported communication (Du Plessis & Boshoff, 2008, Spender & Grant, 1996).The nature of knowledge, explicit or tacit, has implications for the communication methods and media by which it may be transferred (Cummings & Teng, 2003; Roberts, 2000).

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Knowledge transfer is affected by all things that encourages or inhibits communication (Roberts, 2000; Leonard & Sensiper, 1998). Ko, Kirsch and King (2005, p.62) recognised the important role of communication in the knowledge transfer process when they defined knowledge transfer as "the communication of knowledge from a source so that it is learned and applied by a recipient". Riege (2005) emphasised the importance of identifying the barriers of knowledge sharing and included the following:

- Differences in educational levels

- Lack of trust in people

- Low awareness of the value of possessed knowledge to others

- Use of hierarchy and status

- The fear that sharing may jeopardise job security

- Differences in culture or ethnic background

- Poor communication

This research will focus on the last point, where Riege (2005) advocates the importance of effective communication in ensuring the success of knowledge transfer.

2.5   Manufacturing Industry

The manufacturing industry makes products from raw materials using manual labour and/or machines. The work is usually carried out systematically with a division of labour. The manufacturing industries produce tangible products and are generally highly process based, with employees requiring specific knowledge to create products central to the manufacturing firm's business. Manufacturing environments are driven by a need to continuously improve on the coordination of workflows, control of production activities, operational and process efficiencies and manufacturing worker productivities (Riege & Zulpo, 2007).

Manufacturing accounts for about 15% of South African gross domestic (Steyn, 2010). South African manufacturing industry is generally spatially dispersed, mainly because of the dominance of natural resource processing in the industry. Manufacturing activity is concentrated in one province with more than 40% of value added being generated in Gauteng, followed by Western Cape, Kwa-Zulu Natal and Eastern Cape. One of the objectives of South Africa's manufacturing policy is a more equitable geographic spread of economic activities. A number of incentives to encourage manufacturing in other provinces have been developed (Kaplan, 2004). There have been some improvements in North-West and Limpopo provinces (Fedderke & Simbanegavi, 2008).

A person working in a manufacturing environment, whose job is to perform process based tasks to create products, is also referred to as a factory worker. The work of the factory worker is often highly physical and follows a structured process and the worker's understanding of the process and product is based on the daily encounter with the process and product (Riege & Zulpo, 2007). The factories are also referred to as plants.

2.6   Knowledge Transfer and Manufacturing industry

Knowledge plays a crucial role in the manufacturing industry (Alvi & Labib, 2008). It must be fully integrated into manufacturing planning, control, design and research to achieve the optimum results. Alvi and Labib (2008) described knowledge as being of three types in order to compete in the market environment: (a) rules of the game – making it possible to compete; (b) common body of knowledge – making it possible to manufacture; (c) confidential knowledge – required to provide a competitive edge.

There is a need to understand how the different knowledge is successfully transferred and shared by the employees (Riege & Zulpo, 2007). They also argue that firms must provide communication channels which supports and encourage interactions. "If knowledge discovered by factory workers is to be recognised as a viable and new source of knowledge, then the focus on transferring this knowledge must shift to the ability of the factory worker to indeed transfer that knowledge to

someone in the firm who can codify it into a format that can be distributed to people it would most benefit" (Riege & Zulpo, 2007, p.299).

The working environment of factory workers and their undertaking of specific production tasks usually do not involve the use of computers to share knowledge; hence it seems unlikely for a computer network to support knowledge transfer within their community. The factory workers perform physical tasks and they gain knowledge through self discovery and ongoing learning of processes, hence it can be assumed that their scope of knowledge discovery lies within the realm of physical processes and know-how. They also prefer to share knowledge within their work environment in informal discussions rather than formalised idea - sharing forums (Riege & Zulpo, 2007). The challenge for manufacturing companies is how to ensure that the know-how is transferred between employees, and which communication methods and media are appropriate to facilitating the knowledge transfer process.

2.7   Chapter Summary

The objective of the literature review was to present an argument, supported by academic literature, that knowledge is an asset which must be transferred in an organisation. An argument about the important role of effective communication in the knowledge transfer process was presented. The literature review also covered the manufacturing industry, especially the environment and people, and the need to research how to communicate effectively and ensure that knowledge transfer takes place in the manufacturing environment.

The literature review was divided into five sections, namely: communication (2.2), knowledge and knowledge transfer (2.3), communication and knowledge transfer (2.4), manufacturing industry (2.5) and knowledge transfer and Manufacturing industry (2.6).

Communication was defined as the means of relating to each other by using a medium to convey a message between individuals or group. A differentiation was made between external and internal communication. The research focus was on internal communication which was defined as the process of communication between the people within the organisation. The different communication methods and technologies were presented and divided into three categories namely; voice communication, written communication and other communication. The comparison between push and pull methods of communication was presented.

The literature about communication media was presented and the importance of using the appropriate media in the knowledge transfer process. The concept of media richness in communication was introduced. High-media rich communication is personal and involves face to face contact, while low-media rich communication rely on the forms, rules, procedures and databases. An argument was made that the messages should be communicated on channels with sufficient and appropriate media richness, otherwise they run the risk of being ineffective.

The literature review about knowledge and its definition was presented from different authors. The difference between data, information and knowledge was explained and the reliance of knowledge upon the existence of data and information. Knowledge was classified into two types: information (explicit knowledge) and know-how (tacit knowledge). Explicit knowledge was found to be easier to transfer as it can be written down whereas tacit knowledge is difficult to share because it is individual specific. The type of knowledge, explicit or tacit, has implications for the communication methods and media by which it may be transferred. It was argued that effective employee communication must start with the research of the preferred methods of communication. This will be covered in this research.

The manufacturing industry was defined as an industry that makes products from raw materials by the use of manual labour or machines and that is usually carried

out systematically with a division of labour. The working environment of manufacturing workers is physical and process oriented and they gain knowledge through self discovery and ongoing learning of processes. The workers undertake specific production tasks and usually do not involve the use of computers to share knowledge. There is a diverse workforce with different languages, which can affect the knowledge transfer process. It is unlikely for a computer network to support knowledge transfer in the manufacturing environment.

The challenge for manufacturing companies is how to transfer knowledge in the organisation, and which communication methods and media are effective for the knowledge transfer process. This will be the main objective of this research. The next chapter presents the research hypothesis based on the findings from the literature review.

Chapter 3: Research Hypotheses

3.1 Introduction

In order to determine the effective internal communication methods and media for knowledge transfer in the manufacturing industry, the following research hypotheses are proposed:

3.2 Hypothesis 1

The null hypothesis states that push communication methods (pushcom) are preferred for internal information/explicit knowledge transfer purposes than pull communication methods (pullcom). The alternative hypothesis states that push communication methods (pushcom) are not preferred for internal information/explicit knowledge transfer purposes than pull communication methods (pullcom).

$H1_0$: pushcom – pullcom < 0

Diffpushpull < 0

$H1_a$: pushcom – pullcom ≥ 0

Diffpushpull ≥ 0

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3.3   Hypothesis 2

The null hypothesis states that high-media rich communication (HMR) is preferred for internal information/explicit knowledge (EXP) transfer than low-media rich communication (LMR). The alternative hypothesis states that high-media rich communication (HMR) is not preferred for internal information/explicit knowledge (EXP) transfer than low-media rich communication (LMR).

$H2_0$: $LMR(EXP) - HMR(EXP) > 0$

DiffLMRHMR(EXP) > 0

$H2_a$: $LMR(EXP) - HMR(EXP) \leq 0$

DiffLMRHMR(EXP) ≤ 0

3.4   Hypothesis 3

The null hypothesis states that knowledge senders do prefer low-media rich communication (LMR) for tacit knowledge (TAC) transfer than high-media rich communication (HMR). The alternative hypothesis states that knowledge senders do not prefer low-media rich communication (LMC) for tacit knowledge (TAC) transfer than high-media rich communication (HMR).

H3$_0$:   HMR(TAC) – LMR(TAC) > 0

DiffHMRLMR(TAC) > 0

H3$_a$:   HMR(TAC) – LMR(TAC) ≤ 0

DiffHMRLMR(TAC) ≤ 0

3.5   Hypothesis 4

The null hypothesis states that knowledge senders do prefer to transfer tacit knowledge (TAC) by high-media rich, technology - assisted communication (HMRTA) than high-media rich communication (HMR). The alternative hypothesis states that knowledge senders do not prefer to transfer tacit knowledge (TAC) by high-media rich, technology - assisted communication (HMRTA) than high-media rich communication (HMR).

$H4_o$:   HMR(TAC) – HMRTA(TAC) > 0

DiffHMRHMRTA (TAC) > 0

$H4_a$:   HMR(TAC) – HMRTA(TAC) ≤ 0

DiffHMRHMRTA (TAC) ≤ 0

3.6   Chapter Summary

The four hypotheses are proposed in order to determine the effective internal communication methods and media for knowledge transfer in the manufacturing industry. It is clear from the hypothesis that the nature of knowledge, explicit or tacit, has implications for the communication methods and media by which it may be transferred (Roberts, 2000). Hence, in each of the four hypotheses, the communication methods and/or media are linked to a particular type of knowledge. The next chapter presents the methodology which was used in the research.

Chapter 4: Research Methodology

4.1 Introduction

This chapter provides details on the methodology used to conduct this research. There are seven main sections to this chapter. These are the research approach (4.2), unit of analysis (4.3), research population (4.4), sampling method and size (4.5), data gathering (4.6), data analysis and presentation (4.7) and research limitations (4.8)

4.2 Research Approach

Tobin (2006) identified three dimensions which can be used to evaluate the research approach, namely;

- Qualitative / Quantitative
- Deductive / Inductive
- Subjective / Objective

The three dimensions do not represent a simple either/or choice, but should rather be seen as the extent to which the elements of the approach apply. The dimensions will be explored further.

4.2.1 Qualitative / Quantitative approach

A choice was whether to adopt a qualitative or quantitative approach, or a combination of both. Table 4.1 provides a comparison between the two approaches.

Table 4. 1 Comparison between Quantitative and Qualitative Research

Quantitative	Qualitative
1. The reality is objective, and usually one dimensional.	1. Reality is more subjective, and is multi-dimensional in nature.
2. The researcher is independent from being researched.	2. The researcher interacts with the subject being researched.
3. Values do not play a role, and as such is unbiased.	3. Research data obtained is value-laden, and is hence biased.
4. The language is formal, where set definitions are used, and is impersonal in terms of delivery.	4. The language is more informal, where concepts and decisions continually evolve. The experience is personal.
5. In terms of the research process: • It is a deductive process. • Cause and effect relationships are proved. • The design is static, where concepts are usually determined prior to	5. In terms of the research process: • It is an inductive process. • There is a mutual shaping of factors. • There is an emerging design, where concepts are identified often during the research.

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research.	• Research is context-bound.
• Research is context- free.	• Patterns and theories are developed for understanding.
• Generalisations are made to explain, understand and predict	• Accuracy and reliability obtained through verification.
• It obtains its accuracy and reliability through validity.	

Source: Hussey & Hussey (1997, p.48)

The aim of the research was to use the known concepts of communication (methods and media) and knowledge transfer and apply them to the manufacturing industry, rather than identifying new concepts in the research. Hence it was deemed appropriate to use the quantitative approach in this research.

Descriptive research is designed to describe the characteristics of a population or phenomenon (Zikmund, 2003). Zikmund (2003) further explained that descriptive research is based on some previous understanding of the nature of the problem, which was the case in this research. The research approach was thus quantitative and descriptive in nature.

4.2.2 Deductive / Inductive

Hussey and Hussey (1997, p.19) defined deductive research as "a study in which a conceptual and theoretical structure is developed which is then tested by empirical observation; thus particular instances are deducted from general influences." The deductive method is referred to as moving from the general to the particular. Inductive research is "a study in which theory is developed from the observation of empirical reality; thus general inferences are induced from particular instances, which is the reverse of the deductive method since it involves moving from individual observation to statements of general patterns or laws," (Hussey & Hussey, 1997, p.13). A deductive approach was used in this research.

4.2.3 Subjective / Objective

Another choice in the research approach was the extent to which the researcher is subjective (involved in or has an influence on the research outcome) or objective (distanced from or independent) in the execution of the fieldwork (empirical work) (Tobin, 2006). An objective approach was used in this research. This is consistent with the characteristics of quantitative approach which were shown in table 4.1.

4.3   Research Population

Zikmund (2003) defined a population as any complete group of people, companies or other entities sharing some common set of characteristics. The population of relevance to the research comprised of people who are working in the manufacturing industry in South Africa.

4.4   Unit of Analysis

The unit of analysis relevant to this research was individuals working in the manufacturing industry.

4.5   Sampling method and Size

The sampling methods can be divided into two broad categories: probability and non-probability sampling. In probability sampling, every element in the population has a known non-zero probability of being selected. In non-probability sampling, the probability of any member of the population being chosen is unknown (Zikmund, 2003).

Non probability sampling, more specifically convenience sampling was used in the research. Convenience sampling involved using units of people who were most

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conveniently available. The benefits of this sampling method included the ability to obtain a large number of completed questionnaires quickly and economically (Zikmund, 2003). The main disadvantage of convenience sampling is that projecting the data beyond the sample is inappropriate (Zikmund, 2003).

The choice of the sampling method and size was influenced by the following constraints:

- The time available to complete the research.
- The financial resources available to conduct the research.
- Access to manufacturing companies for sampling.

Given the constraints, the research was conducted at three different manufacturing companies. Access to the companies was organised through network from the MBA class at the Gordon Institute of Business Science (GIBS).

4.6   Data gathering

The primary data for the research was collected using the survey method. According to Zikmund (2003) surveys are useful in identifying characteristics of a particular group, to measure attitudes and describe behaviour patterns. The benefits of surveys are the quick, efficient, cost effective and accurate means of assessing information about the population (Zikmund, 2003).

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Face to face personal interviews were conducted using structured 'questionnaires'. The advantages of personal interviews include the high response and the likelihood that the respondent will answer all items on the questionnaire (Zikmund, 2003). The disadvantages of personal interviews include the reluctance of respondents to provide confidential information because they are not guaranteed anonymity and also the differential interviewer techniques which may introduce interviewer bias. The choice of method was also influenced by the fact that most of the people in the manufacturing companies did not have access to computers.

4.7   Data Analysis and Presentation

The collected data was categorised in terms of the survey questions and specific research hypotheses they related to. Descriptive analysis was used to summarise the data and make it easy to understand and interpret. Descriptive statistics such as frequencies, means and standard deviations were conducted. The data was further analysed using univariate statistical analysis in order to assess the statistical significance of the hypotheses. Zikmund (2003) stated that univariate data analysis should be used when researchers want to generalise from a sample about one variable at a time, which was the case in this research. The data was presented in tables.

4.8   Research limitations

The following aspects are limitations to this research:-

- The sample does not represent the entire manufacturing industry.

- The choice of non probability, convenience sampling method prohibits the projection of the data beyond the sample.

4.9   Chapter Summary

The following methodology was used to conduct this research.

- The research approach was quantitative, deductive and objective in nature.

- The population of relevance to the research comprised of people who are working in the manufacturing industry in South Africa.

- Non probability sampling, more specifically convenience sampling was used in the research.

- The research was conducted at three different manufacturing companies.

- Data analysis was conducted using the descriptive statistics and univariate statistical analysis.

The next chapter presents the research results.

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Chapter 5: Results

5.1   Introduction

The purpose of this chapter is to present the results obtained in the study. The results are presented according to the questions asked in the survey questionnaire and the four hypotheses that underpin this study.

There are three main sections in this chapter. The first section describes the sample (5.2). The second section presents the results from the survey questionnaire (5.3) and the last section presents the results of the research hypotheses (5.4).

5.2   Sample Description

The questionnaires were administered at three different manufacturing companies, namely; Exxaro FerroAlloys (EFA), Amalgamated Beverage Industries (ABI) and Tubatse Chrome (TC). The EFA plant is situated in Pretoria, Gauteng province. EFA plant produces atomised ferrosilicon powder. The ABI plant is situated in Johannesburg, Gauteng province. ABI produces soft drinks. The TC plant is situated in Steelpoort, Mpumalanga province. TC plant produces ferrochrome. The

total number of employees working in the manufacturing plants is 50, 182 and 200 for EFA, ABI and TC respectively.

5.3   Results from survey questionnaire

The results are reported from the two sections of the questionnaire; section 1: demographic information (5.3.1) and section 2: communication methods and media (5.3.2).

5.3.1 Section 1: Demographic Information

The demographic information relevant to the study included the names of the companies and the number of respondents. The demographic data is shown in table 5.1.

Table 5. 1   Demographic Information

Company	Respondents	Percent (%)
EFA	42	39
ABI	35	32
TC	32	29
Total	**109**	**100**

5.3.2   Section 2: Communication Methods and Media

This section presents the results from the four main questions in the questionnaire. The respondents were asked to select their preferred methods and media for the type of knowledge to be transferred. The respondents were further asked to rate their choices on a scale of 1 to 3, with 1 indicating that it is the most preferred method or media of communication and a 3 indicating that it is the least preferred.

The results for questions 1, 2, 3 and 4 are in 5.3.2.1, 5.3.2.2, 5.3.2.3 and 5.3.2.4 respectively. The results include the frequencies, means and standard deviations.

5.3.2.1   Question 1

Question: I prefer the following communication methods to receive information/explicit knowledge in the company:

Email [   ] Written Reports [   ] Newsletters [   ] Compulsory [   ] Voluntary [   ]
                                                                     Meetings   Meetings

Intranet [   ] Libraries [   ]   Shared files [   ]   Other:
                                                                      Please specify _____

Table 5. 2   Email (communication method)

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	57	78.08	57	78.08
2	9	12.33	66	90.41
3	7	9.59	73	100.00

Frequency Missing = 36

N	Mean	Std Dev	Minimum	Maximum
73	1.32	0.64	1.00	3.00

Table 5. 3   Written Reports (communication method)

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	19	35.85	19	35.85
2	19	35.85	38	71.70
3	15	28.30	53	100.00

Frequency Missing = 56

N	Mean	Std Dev	Minimum	Maximum
53	1.92	0.81	1.00	3.00

Table 5. 4   Newsletters (communication method)

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	3	4.11	3	4.11
2	43	58.90	46	63.01
3	27	36.99	73	100.00

Frequency Missing = 36

N	Mean	Std Dev	Minimum	Maximum
73	2.33	0.55	1.00	3.00

Table 5. 5   Compulsory meetings (communication method)

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	35	53.03	35	53.03
2	14	21.21	49	74.24
3	17	25.76	66	100.00

Frequency Missing = 43

N	Mean	Std Dev	Minimum	Maximum
66	1.73	0.85	1.00	3.00

Table 5. 6   Voluntary meetings (communication method)

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	6.25	1	6.25
2	7	43.75	8	50.00
3	8	50.00	16	100.00

Frequency Missing = 93

N	Mean	Std Dev	Minimum	Maximum
16	2.44	0.63	1.00	3.00

Table 5. 7   Intranet (communication method)

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	6.67	1	6.67
2	7	46.67	8	53.33
3	7	46.67	15	100.00

Frequency Missing = 94

N	Mean	Std Dev	Minimum	Maximum
15	2.40	0.63	1.00	3.00

Table 5. 8   Libraries (communication method)

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	20.00	1	20.00
2	1	20.00	2	40.00
3	3	60.00	5	100.00

Frequency Missing = 104

N	Mean	Std Dev	Minimum	Maximum
5	2.40	0.89	1.00	3.00

Table 5. 9   Shared Files (communication method)

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	4	44.44	4	44.44
3	5	55.56	9	100.00

Frequency Missing = 100

N	Mean	Std Dev	Minimum	Maximum
9	2.56	0.53	2.00	3.00

5.3.2.2 Question 2

Question: I prefer that the company use the following media to communicate and transfer information to employees:

Face -to-face ☐ Phone ☐ Newsletters ☐ Email ☐

Intranet ☐ Notice boards ☐ Video conferencing ☐ Other: Please specify _____

Table 5. 10 Face-to-face (communication media)

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	62	80.52	62	80.52
2	9	11.69	71	92.21
3	6	7.79	77	100.00

Frequency Missing = 32

N	Mean	Std Dev	Minimum	Maximum
77	1.27	0.60	1.00	3.00

Table 5. 11   Phone (communication media)

v4_2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	6	24.00	6	24.00
2	10	40.00	16	64.00
3	9	36.00	25	100.00

Frequency Missing = 84

N	Mean	Std Dev	Minimum	Maximum
25	2.12	0.78	1.00	3.00

Table 5. 12   Newsletter (communication media)

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	11	18.03	11	18.03
2	20	32.79	31	50.82
3	30	49.18	61	100.00

Frequency Missing = 48

N	Mean	Std Dev	Minimum	Maximum
61	2.31	0.76	1.00	3.00

Table 5. 13   Email (communication media)

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	27	43.55	27	43.55
2	25	40.32	52	83.87
3	10	16.13	62	100.00

Frequency Missing = 47

N	Mean	Std Dev	Minimum	Maximum
62	1.73	0.73	1.00	3.00

Table 5. 14   Intranet (communication media)

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	7	41.18	7	41.18
3	10	58.82	17	100.00

Frequency Missing = 92

N	Mean	Std Dev	Minimum	Maximum
17	2.59	0.51	2.00	3.00

Table 5. 15   Notice boards (communication media)

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	11	15.71	11	15.71
2	34	48.57	45	64.29
3	25	35.71	70	100.00

Frequency Missing = 39

N	Mean	Std Dev	Minimum	Maximum
70	2.20	0.69	1.00	3.00

Table 5. 16   Video conferencing (communication media)

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	16.67	1	16.67
2	1	16.67	2	33.33
3	4	66.67	6	100.00

Frequency Missing = 103

N	Mean	Std Dev	Minimum	Maximum
6	2.50	0.84	1.00	3.00

5.3.2.3 Question 3

Question: I prefer to transfer my work knowledge (know how) to others using the following media:

Face -to-face [   ] Phone [   ] Newsletters [   ] Email [   ]

Intranet [   ] Notice boards [   ] Video conferencing [   ] Other:
Please specify _____

Table 5. 17   Face-to-face (communication media)

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	80	88.89	80	88.89
2	5	5.56	85	94.44
3	5	5.56	90	100.00

Frequency Missing = 19

N	Mean	Std Dev	Minimum	Maximum
90	1.17	0.50	1.00	3.00

Table 5. 18   Phone (communication media)

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	4	13.33	4	13.33
2	15	50.00	19	63.33
3	11	36.67	30	100.00

Frequency Missing = 79

N	Mean	Std Dev	Minimum	Maximum
30	2.23	0.68	1.00	3.00

Table 5. 19   Newsletter (communication media)

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	13	28.89	13	28.89
2	13	28.89	26	57.78
3	19	42.22	45	100.00

Frequency Missing = 64

N	Mean	Std Dev	Minimum	Maximum
45	2.13	0.84	1.00	3.00

Table 5. 20   Email (communication media)

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	17	28.81	17	28.81
2	27	45.76	44	74.58
3	14	23.73	58	98.31
4	1	1.69	59	100.00

Frequency Missing = 50

N	Mean	Std Dev	Minimum	Maximum
59	1.98	0.78	1.00	3.00

Table 5. 21   Intranet (communication media)

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	9.09	1	9.09
2	6	54.55	7	63.64
3	4	36.36	11	100.00

Frequency Missing = 98

N	Mean	Std Dev	Minimum	Maximum
11	2.27	0.65	1.00	3.00

Table 5. 22   Notice boards (communication media)

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	4	8.89	4	8.89
2	19	42.22	23	51.11
3	22	48.89	45	100.00

Frequency Missing = 64

N	Mean	Std Dev	Minimum	Maximum
45	2.40	0.65	1.00	3.00

Table 5. 23   Video Conferencing (communication media)

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	3	30.00	3	30.00
2	3	30.00	6	60.00
3	4	40.00	10	100.00

N	Mean	Std Dev	Minimum	Maximum
10	2.10	0.88	1.00	3.00

5.3.2.4   Question 4

Question: Which one of the two media will you prefer to transfer your work knowledge (know how) to others?

Face -to-face   ☐   Video conferencing   ☐

Table 5. 24   Face-to-face or Videoconferencing

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Face-to-face	92	84.40	92	84.40
Videoconferencing	17	15.60	109	100.00

5.4 Survey results by research hypothesis

The results are presented according to the four hypotheses.

5.4.1 Hypothesis 1

When testing the first null hypothesis which stated that push communication methods are preferred for internal information/explicit knowledge transfer purposes, the difference between the push communication score and pull communication score (diffpushpull) was calculated for every individual and the difference between the two scores was tested using a paired t-test procedure.

Results from the T-test procedure are in table 5.25.

Table 5. 25   Hypothesis 1

Variable: Diffpushpull

N	Mean	Std Dev	Std Err	Minimum	Maximum
109	-0.9266	1.3892	0.1331	-2.0000	2.0000

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
-0.9266	-1.1903	-0.6629	1.3892	1.2260	1.6027

DF	T-value	p-value
108	-6.96	<.0001

In order to prove that push communication methods are more preferred compared to pull communication methods, the difference between push and pull communication scores (Diffpushpull) must be significantly less than 0. By examining the test results, the two tailed p-value is less than 0.0001, therefore a 1 tailed p-value would be less than 0.00005. When testing at a 5% level of significance the null hypothesis will not be rejected. It can therefore be concluded that the difference between push and pull communication scores is significantly less than zero, which shows that there is enough statistical evidence to suggest that push communication methods are the more preferred communication methods for internal information / explicit knowledge transfer purposes.

5.4.2 Hypothesis 2

When testing the second null hypothesis which stated that high-media rich communication is preferred for internal information/explicit knowledge transfer, the difference between the low-media rich communication score and high-media rich (diffLMRHMR(EXP)) communication score was calculated for every individual and the difference between the two scores was tested using a paired t-test procedure.

Results from the T-test procedure are in table 5.26.

Table 5. 26   Hypothesis 2

Variable: diffLMRHMR(EXP)

N	Mean	Std Dev	Std Err	Minimum	Maximum
109	1.1476	0.9886	0.0947	-1.5000	2.5000

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
1.1476	0.9599	1.3352	0.9886	0.8725	1.1406

DF	T-value	p-value
108	12.12	<.0001

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In order to prove that low-media rich communication is more preferred compared to high-media rich communication, the difference between low-media rich and high-media rich communication scores must be significantly less than zero. However, the test results showed that the difference is more than zero. By examining the test results, the two tailed p-value is less than 0.0001, therefore a 1 tailed p-value would be less than 0.00005. When testing at a 5% level of significance the null hypothesis will not be rejected. It can therefore be concluded that the difference between low-media rich and high-media rich communication scores is significantly more than zero, which shows that there is enough statistical evidence to suggest that high-media rich communication is the more preferred communication media for internal information / explicit knowledge transfer purposes.

5.4.3 Hypothesis 3

When testing the third null hypothesis which stated that knowledge senders do prefer low-media rich communication for tacit knowledge transfer, the difference between the high-media rich communication score and low-media rich communication score (diffHMRLMR(TAC)) was calculated for every individual and the difference between the two scores was tested using a paired t-test procedure.

Results from the T-test procedure are in table 5.27.

Table 5. 27   Hypothesis 3

Variable: diffHMRLMR(TAC)

N	Mean	Std Dev	Std Err	Minimum	Maximum
109	-0.7951	1.1760	0.1126	-2.5000	1.5000

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
-0.7951	-1.0184	-0.5718	1.1760	1.0379	1.3568

DF	T-value	p-value
108	-7.06	<.0001

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In order to prove that knowledge senders prefer high-media rich communication more than low-media rich communication to transfer tacit knowledge, the difference between high-media rich and low-media rich communication scores must be significantly less than 0. By examining the test results, the two tailed p-value is less than 0.0001, therefore a 1 tailed p-value would be less than 0.00005. When testing at a 5% level of significance the null hypothesis will be rejected. It can therefore be concluded that the difference between high-media rich and low-media rich communication scores is significantly less than zero, which suggests that there is enough statistical evidence to suggest that knowledge senders do prefer high-media rich communication more than low-media rich communication for tacit knowledge transfer purposes.

5.4.4 Hypothesis 4

The null hypothesis stated that knowledge senders do prefer to transfer tacit knowledge (TAC) by high-media rich, technology - assisted communication (HMRTA) than high-media rich communication (HMR).

In order to test the fourth null hypothesis, the frequency procedure was conducted and the results are in table 5.28.

Table 5. 28   Hypothesis 4

	Number	Percentage
Face-to-Face	92	84.4
Video Conferencing	17	15.6
Total	109	100

The results showed that the majority of respondents (84.4%) prefer face-to-face transfer of tacit knowledge where only 15.6% of all respondents prefer video conferencing as a method of tacit knowledge transfer. The null hypothesis will be rejected. It can thus be concluded that knowledge senders do prefer to transfer tacit knowledge by high-media rich communication (face-to-face) than high-media rich, technology - assisted communication (Videoconferencing).

5.5   Chapter Summary

The chapter presented the results from the survey questionnaires.   Descriptive statistics results which included the frequencies, means and standard deviations were presented for each of the survey questions. Results of the four hypotheses that underpin this study are shown below:

Hypothesis 1: The null hypothesis stated that push communication methods are preferred for internal information/explicit knowledge transfer purposes than pull communication methods.

Results: Do not reject (Accept) null hypothesis

Hypothesis 2: The null hypothesis stated that high-media rich communication is preferred for internal information/explicit knowledge transfer than low-media rich communication.

Results: Do not reject (Accept) null hypothesis

Hypothesis 3: The null hypothesis states that knowledge senders do prefer low-media rich communication for tacit knowledge transfer than high-media rich communication.

Results: Reject null hypothesis

Hypothesis 4: The null hypothesis stated that knowledge senders do prefer to transfer tacit knowledge by high-media rich, technology - assisted communication than high-media rich communication.

Results: Reject null hypothesis

The next chapter presents the discussion of results.

Chapter 6: Discussion of Results

6.1   Introduction

The purpose of this chapter is to discuss the results presented in chapter five. The relationship between this chapter and chapter one (where the research objective was discussed); chapter two (where the relevant literature was reviewed) and chapter three (where the research hypotheses were presented) will be established.

There are two main sections in this chapter. The first section revisits the research objective (6.2). The second section discusses the results according to the research hypotheses (6.3).

6.2   Research objective revisited

The objective of this research was to determine the effective internal communication methods and media which are preferred for knowledge transfer in the manufacturing industry. Effective employee communication can only be achieved with the research of the preferred methods of communication (Ewing, 2005; Rayburn, 2007). This objective was achieved in the research and the results are discussed next.

6.3   Discussion of results according to hypotheses

The type of knowledge (know-how/tacit or information/explicit) has implications for the communication methods and media by which it may be transferred (Cummings & Teng, 2003; Roberts, 2000). Hence, in each of the four hypotheses, the communication methods and/or media were linked to a particular type of knowledge.

6.3.1   Hypothesis 1

The first hypothesis was proposed in order to determine which communication methods (push or pull) are preferred for information/explicit knowledge transfer.

The first null hypothesis ($H1_0$) stated that push communication methods are preferred for internal information/explicit knowledge transfer purposes than pull communication methods. The first alternative hypothesis ($H1_a$) stated that push communication methods are not preferred for internal information/explicit knowledge transfer purposes than pull communication methods.

Based on the results presented in chapter five, the first null hypothesis ($H1_0$) was not rejected. The alternative hypothesis ($H1_a$) was rejected. The results thus indicate that push communication methods are preferred for transferring information/explicit knowledge in the manufacturing industry. The most preferred

communication methods (top three) for information/explicit knowledge transfer were found to be email followed by newsletters and compulsory meetings (table 5.2 to table 5.9).

Email was the most preferred choice, with 67% of respondents indicating that it is their preferred communication method for information transfer. The outcome was also similar to the prior study undertaken in the retail industry by Du Plessis and Boshoff (2008), where email was also found to be the most preferred method for internal/organisational communication. The preference for email was not expected in the manufacturing industry mainly because of employee's limited interaction with computers when they perform their tasks. However, this is positive for the industry because it shows the willingness of employees to embrace technology. On the contrary, only 14 percent of respondents preferred to use the intranet. This shows that technology did not necessarily influence the choice for employees, but rather the communication method (push or pull).

The advantage of using push communication for information transfer is that it ensures message delivery and consistency (Carr et al., 1999). Push communication is effective for the dissemination of information needed and/or wanted by a large number of people. The preference for push communication methods in manufacturing was probably influenced by the nature of the industry, where there are structured processes and procedures which have to be followed

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by everyone (Riege & Zulpo, 2007). The consistency of the message is also very important in this environment.

6.3.2 Hypothesis 2

The second hypothesis was proposed in order to determine the type of communication media (high-media rich or low-media rich) which is preferred for information/explicit knowledge transfer.

The second null hypothesis ($H2_0$) stated that high-media rich communication is preferred for internal information/explicit knowledge transfer than low-media rich communication. The second alternative hypothesis ($H2_a$) stated that high-media rich communication is not preferred for internal information/explicit knowledge transfer than low-media rich communication.

Based on the results presented in chapter five, the second null hypothesis ($H2_0$) was not rejected. The alternative hypothesis ($H2_a$) was rejected. The results thus indicate that high-media rich communication is preferred for transferring information/explicit knowledge in the manufacturing industry. The most preferred communication media (top three) for information/explicit knowledge transfer were found to be face-to-face followed by notice boards and email (table 5.10 to table 5.16).

According to Murray and Peyrefitte (2007), messages should be communicated on channels with sufficient and appropriate media richness, otherwise they run the risk of being ineffective. The choice for high-media rich communication could have been motivated by its inherent capacity for immediate feedback (Schenkel, 2009). The factory workers prefer to transfer and share information within their work environment (Riege & Zulpo, 2007). Hence, it is appropriate for media-rich communication especially face-to-face to be preferred for transferring information in their environment because it is personal and also allows for immediate feedback.

6.3.3 Hypothesis 3

The third hypothesis was proposed in order to determine the type of communication media (high-media rich or low-media rich) which is preferred by knowledge senders for know-how/tacit knowledge transfer.

The third null hypothesis (H3$_0$) stated that knowledge senders do prefer low-media rich communication for tacit knowledge transfer than high-media rich communication. The third alternative hypothesis (H3$_a$) stated that knowledge senders do not prefer low-media rich communication for tacit knowledge transfer than high-media rich communication.

Based on the results presented in chapter five, the third null hypothesis (H3$_0$) was rejected. The alternative hypothesis (H3$_a$) was not rejected.

The results thus indicate that the knowledge senders in the manufacturing industry prefer to transfer their tacit knowledge by high-media rich communication. The most preferred communication media (top three) for tacit knowledge/know-how transfer were face-to-face followed by email and newsletters (table 5.17 to table 5.23). Face-to-face was by far the most preferred method (83% of respondents).

This outcome was consistent with the literature, where it was found that in several studies that high-media rich communication enhances tacit knowledge transfer and sharing (Charlot & Duranton, 2006; Du Plessis & Boshoff, 2008; Murray & Peyrefitte, 2007). Tacit knowledge is individual specific and requires appropriate communication in order to flow. Zack (1999) wrote that tacit knowledge is developed from direct experience and action, which is the case for the manufacturing environment, and usually shared in highly interactive conversations. Face- to-face will thus be appropriate for transferring and sharing of tacit knowledge mainly because it is highly interactive and also allows for immediate feedback. The challenge with using face-to-face to transfer tacit knowledge is how to ensure that the knowledge is coded and made accessible to other employees. One of the ways of achieving this is to encourage employees to participate in knowledge sharing forums and ensure that face-to-face communication is utilised. Employees should also be incentivised to contribute their tacit knowledge for the benefit of everyone in the organisation.

6.3.4 Hypothesis 4

The fourth hypothesis was proposed in order to determine if technology is preferred to assist the transfer of tacit knowledge. Specifically, the hypothesis was aimed at determining if the knowledge senders prefer high-media rich communication (face-to-face) or high-media rich, technology - assisted communication (video-conferencing) for know-how/tacit knowledge transfer.

The fourth null hypothesis (H4$_0$) stated that knowledge senders do prefer to transfer tacit knowledge by high-media rich, technology - assisted communication than high-media rich communication. The fourth alternative hypothesis (H4$_a$) stated that knowledge senders do not prefer to transfer tacit knowledge by high-media rich, technology - assisted communication than high-media rich communication.

Based on the results presented in chapter five, the fourth null hypothesis (H4$_0$) was rejected. The alternative hypothesis (H4$_a$) was not rejected. The results thus indicate that the knowledge senders in the manufacturing industry prefer to transfer their tacit knowledge by high media rich communication (face-to-face).

The outcome of this study was also supported by literature where Riege and Zulpo (2007, p.299) stated that "In examining the working environment, the performance of factory workers in undertaking their specific production tasks usually does not involve the frequent use of computers to share knowledge. Hence, it seems

unlikely for a computer network to support knowledge transfers within their community or to another". They further mentioned that factory workers prefer to share knowledge within their work environment in informal discussions rather than formalised idea-sharing forums. This explains why 84% of respondents prefer face-to-face for tacit knowledge transfer.

6.4   Chapter Summary

The chapter presented the discussion of results. There was support from the data and the literature for the research hypotheses. The push method of communication was found to be preferred for information/explicit knowledge transfer because of its ability to ensure message delivery and consistency. This is important in the manufacturing industry because of the strict work processes and procedures. High-media rich communication was preferred for information transfer mainly because of its inherent capacity for immediate feedback. High-media rich communication, especially face-to-face, was found to be the preferred media for transferring tacit knowledge in the manufacturing industry.   The next chapter presents the conclusion and recommendations from the research.

Chapter 7: Conclusion

7.1 Introduction

This chapter highlights the findings and recommendations from the research. The chapter contains four main sections namely; review of research background and objectives (7.2), research findings (7.3), recommendations for the manufacturing industry (7.4) and recommendations for future research (7.5).

7.2 Review of research background and objectives

The literature highlighted the importance of communication and a vital role it plays in the knowledge transfer process (Du Plessis & Boshoff, 2008; Roberts, 2000). It was argued that for knowledge to give competitive advantage, it must be effectively transferred within the organisation (Murray & Peyrefitte, 2007; Spender & Grant, 1996; Stenmark, 2001; Watson & Hewett, 2006; Zack, 1999). In order to ensure effective employee communication, the research of the preferred methods of communication must be undertaken (Ewing, 2005; Rayburn, 2007).

The objective of this research was to determine the effective internal communication methods and media which are preferred for knowledge transfer in the manufacturing industry.

7.3   Research findings

The type of knowledge (know-how/tacit or information/explicit) has implications for the communication methods and media by which it may be transferred (Cummings & Teng, 2003; Roberts, 2000). The main findings of the research were:

- Push communication methods were preferred for information/explicit knowledge transfer in the manufacturing industry. The most preferred communication methods (top three) for information/explicit knowledge transfer were email followed by newsletters and compulsory meetings.

- High-media rich communication was preferred for transferring information/explicit knowledge in the manufacturing industry. The most preferred communication media (top three) for information/explicit knowledge transfer was face-to-face followed by notice boards and email.

- Knowledge senders in the manufacturing industry preferred to transfer their tacit knowledge by high-media rich communication. The most preferred communication media (top three) for tacit knowledge/know-how transfer were face-to-face followed by email and newsletters.

- Knowledge senders in the manufacturing industry preferred to transfer their tacit knowledge by high media rich communication (face-to-face).

7.4 Recommendations for the manufacturing industry

The following recommendations are made for companies in the manufacturing industry:

- The findings from the research (7.3 above) should be implemented in order to ensure that appropriate and effective communication methods and media are used for knowledge transfer purposes.

- The preferences of employees must be reflected in the Information and Communication Technology (ICT) architecture in order to promote an environment which supports effective internal/organisational communication.

- The communication and knowledge management practitioners must work together in order to ensure successful transfer and sharing of knowledge.

- The preferred communication methods and media must be considered in the design and implementation of knowledge management strategies.

- Regular bottom-up communication audits must be carried out to ensure that appropriate communication methods and media are used for knowledge transfer purposes. The audits must form part of performance measures for managers, communication and knowledge management practitioners.

- A project based approach should be followed to ensure successful implementation of the findings. It is crucial that financial and human resources are made available for the project.

7.5 Recommendations for future research

It is recommended that future research be conducted in order to find ways of introducing and encouraging the adoption of new communication technologies for knowledge transfer purposes. The role of communication methods and media on knowledge management strategy should also be investigated. A study should also be conducted to find ways of encouraging the employees to transfer and share tacit knowledge. A similar study must also be conducted in other industries in order to determine if similar results will be obtained.

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Appendix

<u>Survey Questionnaire</u>

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RESEARCH QUESTIONNAIRE

Thank you for taking the time to respond to this research questionnaire. This questionnaire will be used as part of research on effective internal communication methods and media for knowledge transfer in the manufacturing industry. By taking part in completing this questionnaire, you indicate that you voluntarily participate in this research.

Please be assured that your responses will be strictly confidential and is only being used for this research.

If you have any concerns, please contact me:

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<u>Section 1: Demographic Information</u>

1. Name of Company _____

2. Date _____

<u>Section 2: Communication methods and media</u>

This section covers the communication methods and media which are preferred to transfer information(explicit knowledge) and work knowledge/ know how (tacit knowledge)

<u>Instructions for answering questions 3, 4 and 5</u>

A. Please respond to the questions by making a tick √ on the applicable boxes **(atleast 3 choices per question)**
B. Then rank your **top 3** (from you choices in A) and mark each of them as 1,2 or 3, with 1 being the most preffered followed by 2 then 3

3. I prefer the following communication methods to receive information/explicit knowledge in the company

Email ☐	Written Reports ☐	Newsletters ☐	Compulsory Meetings ☐	Voluntary Meetings ☐
Intranet ☐	Libraries ☐	Shared files ☐	Other: Please specify _____	

4. I prefer that the company use the following media to communicate and transfer information to employees

Face -to-face ☐	Phone ☐	Newsletters ☐	Email ☐
Intranet ☐	Notice boards ☐	Video conferencing ☐	Other: Please specify _____

5. I prefer to transfer my work knowledge (know how) to others using the following media:

Face -to-face ☐	Phone ☐	Newsletters ☐	Email ☐
Intranet ☐	Notice boards ☐	Video conferencing ☐	Other: Please specify _____

6. Which one of the two media will you prefer to transfer your work knowledge (know how) to others? (Please choose one)

Face -to-face ☐	Video conferencing ☐