Knowledge flow elements within a context – a model

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Contents

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1 Introduction

Academics and business managers (Dixon 2000; Henczel 2000; Abell and Oxbrow 2001; Stacey 2001;

Blackburn, Khoza and Tate 2003; Snowden 2003) from all over the world are in agreement that knowledge is currently one of the most valuable assets in an organization. Proper knowledge management initiatives can make a substantial contribution towards extracting maximum benefit from knowledge. One of the most significant aspects knowledge managers should keep in mind is how knowledge is shared and used, since knowledge is one of the few assets – if not the only one – of which the value increases with use (Bonaventura 1997:85; Probst, Raub and Romhardt 2000:vii).

Borghoff and Pareschi (1998:7) stress that '[k]nowledge that doesn't flow doesn't grow and eventually ages and becomes obsolete and useless…. By contrast, knowledge that flows, by being shared, acquired, and exchanged, generates new knowledge.' In other words, if the flow of knowledge is hindered or congested, it cannot contribute towards making informed decisions and executing sensible actions. As a consequence, it is of the essence to determine how knowledge flows in the organization for 'the flow of knowledge [is] the fundamental goal of knowledge management' (Borghoff and Pareschi 1998:8).

McAdam and McCreedy (1999), Shin and Holden (2000) and Nissen (2002:251–266) are some of the authors who developed knowledge flow models to classify and visualize knowledge flow patterns. These models are of significant and practical value in their respective situations. However, an aspect absent from them is the representation of the knowledge flow elements within the context wherein knowledge exchanges transpire. It is the authors' belief that knowledge flow events cannot be separated from the context wherein they take place. A model was therefore developed to address this shortcoming.

This article takes a closer look at what knowledge flow entails and introduces a model that visualizes all relevant and applicable basic elements present in knowledge flow.

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2 Methodology

Information obtained from a literature review was analysed to distinguish the main concepts, approaches and theories applicable to knowledge flow. Existing knowledge flow models were carefully examined, compared and analysed in order to identify essential components in addition to shortcomings.

The content analysis of the literature, combined with the analysis of the existing models, led to the development of a new model. The new model is an attempt to isolate the most basic elements involved in knowledge flow, the relationships between them as well as the impact they have on each other.

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3 Nature of knowledge flow

To have a better comprehension of knowledge flow an understanding of the characteristics of knowledge and knowledge flow, the elements of knowledge flow and types of knowledge flow is necessary.

3.1 Characteristics of knowledge

Fahey and Prusak (1998:265–276); Coleman (1999:12-1–12-15); Breedt (2000:91); Carver (2001:1–8); Tarnopolsky (2002:1–35); Wenger, McDermott and Snyder (2002:8–12); Zhuge (2002:23–30); Newman (2003:301–316); Steyn (2003:206–225) and Peschl (2004:3–27) provide useful information, which can be summarized as follows to provide a brief overview of these characteristics:

The most important characteristic is that knowledge cannot be separated from humans because it is only through the human act of knowing and human cognitive processes that it can exist. Peschl (2004:7) explains: 'It is the cognitive system that knows, applies, understands and constructs knowledge.' Therefore, knowledge can only be created and assimilated inside humans and as a result it is highly

subjective and context-sensitive.

Knowledge is very dynamic and evolves continually. It is also cyclic and self-generating and therefore in constant flux and change. This characteristic highlights the perishable nature of knowledge, because knowledge that does not evolve becomes stale and outdated.

Another important aspect is the social and collective nature of knowledge. Most of what we know is an accumulation of knowledge that has been created, developed and transferred over centuries. This is especially true in the scientific community, where the established scientific body of knowledge continues to be refined and adjusted based on the verification and validation of theories (Wenger *et al.* 2002:10). This kind of knowledge is also created through the interaction and collaboration of individuals and teams whose knowledge and expertise complements each other to form the collective knowledge of the community.

Knowledge can exist in a variety of formats ranging from tacit to explicit manifestations. According to Holsapple and Joshi (1999:7–3; 2003:95), knowledge in an organization can broadly be classified in two groupings. Content resources – which include individuals' knowledge and artefacts – can exist independently from the organization. Schematic resources – which include infrastructure, culture, purpose and strategy – depend on the organization for their existence. Both are indispensable parts of the organization's knowledge.

Knowledge is therefore a complex entity that can be held by individuals and collectively by groups. Its creation most often relies on the collaboration, discussion and exchange of ideas between individuals. It is therefore clear that healthy knowledge flow is needed to generate new knowledge and enhance existing knowledge.

3.2 Knowledge flow characteristics

The characteristics of knowledge flow are strongly influenced by and linked to the attributes of knowledge. The overview provided in the previous section should therefore be kept in mind when considering knowledge flow characteristics. Carver (2001:1–8), Tarnopolsky (2002:1–35), Zhuge (2002:23–30) and Newman (2003:301–316) discuss some of these characteristics, which can be outlined as follows:

Knowledge flow is invisible, non-standardized, non-linear and hard to measure. In addition it is often nested and multi-layered. In other words, one knowledge flow event is often part of a bigger knowledge flow event, and at the same time smaller flows might also be taking place within it.

Consequently, knowledge flows are interrelated, interconnected and difficult to isolate. Like knowledge, knowledge flow cannot be separated from humans. Knowledge flow connects and binds individuals, and provides the means through which knowledge is transferred from those who have it to those who need it.

As a result of its nebulous nature, knowledge flow cannot easily be traced and studied. It is only through breaking it down to its most fundamental components that better insight can be gained into knowledge flow. Although each instance of knowledge flow differs from another, some basic elements must be present when knowledge flow occurs.

3.3 Elements of knowledge flow

3.3.1 Knowledge

The central element is knowledge in its pure form – prior to being translated and transformed to facilitate easy transfer and exchange – as it exists within the knowledge source or creator. Knowledge is cyclic, evolves and changes when it is subjected to the processes or activities mentioned below. Different authors use different labels to identify these processes, activities or events, but they usually consist of the following (Bouthillier and Shearer 2002:online; Breedt 2000:53; Probst *et al.* 2000:29–33; Reinhardt 2002:9; Tarnopolsky 2002:4–17):

- Knowledge creation, identification or discovery: in this process new knowledge is created or existing knowledge is identified as having potential value.
- Knowledge acquisition, collection or capture: the knowledge identified in the previous phase is obtained.
- Knowledge processing, filtering or adaptation: after knowledge is obtained, it is transformed or converted according to the recipient's need for it.
- Knowledge utilization or application: for knowledge to be of any value it must be used.
- Knowledge storage or retention: when knowledge is applied it becomes part of the user's knowledge base and expertise.

3.3.2 Agents, activities and artefacts

Newman's outline (Newman and Conrad 1999:online; Newman 2003:301–316) serve as a basis for the discussion of these elements with relevant references to other applicable sources.

Newman (Newman and Conrad 1999:online; Newman 2003:301–316) identifies three main elements: **agents**, **activities** and **artefacts**. Each element has a second layer that further describes the element. The knowledge source, owner or creator is grouped together with the recipient to form the first element, namely **agents**. These agents perform all the actions and can be individuals, automated or organizational.

Individual agents are at the centre of every knowledge flow. They are capable of performing all knowledge activities alone, but sometimes help from automated or organizational agents can improve or ease knowledge flow.

Automated agents can be any human construct capable of retaining, transmitting or transforming knowledge artefacts. Automated agents are not necessarily computers, for other equipment such as a conventional camera or an audio recorder can also capture and transfer knowledge.

Organizational or **collective** agents can be a grouping or combination of any of the other two types of agents. It can therefore be a group of individuals or a mixture of automated and individual agents. Organizational agents present the interesting situation where knowledge can only reside in the relationships between the members of the collective. This knowledge can be difficult to codify or isolate, because its very existence is dependent on the grouping of the specific members.

Agents perform **activities** or transformations on knowledge artefacts. These activities include all processes, tasks, events and behaviours associated with the creation, transfer, application and preservation of knowledge artefacts.

It is important to note that knowledge itself is not transferred. It is only its representation that can be exchanged (Holsapple 2003:166; Shin and Holden 2000:1346). These **representations** or knowledge **artefacts** can be explicit, tacit or implicit. An explicit knowledge artefact is codified knowledge (e.g. a document) that can be transferred directly and completely from one agent to another. Tacit knowledge artefacts are more difficult to codify and many times defy expression, while implicit knowledge's meaning can be deduced from previously obtained knowledge.

3.3.3 Context

Newman does not isolate the context wherein knowledge flow takes place as a separate element, but discusses it more generally. In the authors' opinion, the importance of a shared environment warrants **context** to be acknowledged as a main knowledge flow element. According to Fahey and Prusak (1998:266), Newman and Conrad (1999:online) and Shin and Holden (2000:1345) knowledge flow cannot take place without a common frame of reference or a shared context. It is required that both the source and recipient must share a mutual understanding of the knowledge so as to make successful knowledge flow possible. Without such a common ground, ambiguous knowledge can be misinterpreted and wrongly applied.

3.3.4 Direction

As indicated by Nissen (2002:253) and Zhuge (2002:24) the **direction** of knowledge flow must also be considered. Holsapple and Joshi (1999:7-7–7-11) indicate that knowledge can be pushed or pulled. In other words, knowledge flow can be the result of a knowledge source's initiative (push strategy) to exchange knowledge with the recipient. Conversely, knowledge flow can be prompted by a request (pull strategy) from the recipient for knowledge. Direction is closely related to the types of knowledge flow that can take place.

3.4 Types of knowledge flow

Knowledge flow is not necessarily bound to the organization's formal structure. When investigating knowledge flow, one also has to look at all the other ways and means through which knowledge can flow. An understanding of the types of knowledge flow possible in an organization can provide very useful information about knowledge usage in the organization, and can be applied to improve knowledge flow. Knowledge can flow in the following ways (Bontis, Fearon and Hishon 2003:6–19; Carver 2001:1–8; Den Hertog and Huizenga 2000:95–98):

3.4.1 Longitudinal knowledge flow

Longitudinal, **vertical** or **hierarchical** flow echoes the organizational chart, for knowledge is transferred up and down the management reporting lines and along linear processes. This kind of knowledge flow can be hampered by the amount of knowledge that must be transferred, for too much knowledge can congest the free flow. In addition, knowledge is strongly linked to power, and this might persuade senior management to withhold knowledge from some employees.

3.4.2 Circular knowledge flow

Circular knowledge flow happens around an iterative planning process or cycle and usually involves a specific group of people. It is an intense and mainly tacit process, which results in the generation of collective knowledge.

3.4.3 Centre to periphery knowledge flow

Centre to periphery flow refers to the flow between agents who are separated by either distance or time. Knowledge usually flows from the core to remote offices or to less central business units. The transfer of knowledge can be greatly facilitated by information technology, but due to the tacit features of some knowledge, the actual depth and complexity of knowledge are difficult to communicate by means of information technology.

3.4.4 Lateral knowledge flow

Lateral or **horizontal** flow takes place between staff or units that perform similar or complementary functions. A community of practice is a relevant example of this kind of knowledge flow.

3.4.5 Viral knowledge flow

Viral flow refers to the spread of knowledge through the grapevine. Knowledge moves rapidly along trust relationships between individuals and depends on the social fabric of the organization. Frequently, the hierarchical structure is completely disregarded.

3.4.6 Networked knowledge flow

Networked flow transpires when people use their personal networks within the organization to refer contacts to each other. Often the same trust relationships as in viral flow are involved, but it differs from viral flow, for interaction is one-to-one and mostly serendipitous.

3.4.7 External knowledge flow

Knowledge can also flow **externally** from and to others, such as clients, customers, suppliers and rivals.

The specific characteristics of knowledge, as well as the disposition of the elements engaged, give rise to the type of knowledge flow that transpires. The type of transfer can be affected by a diversity of factors. These factors are attended to in the model.
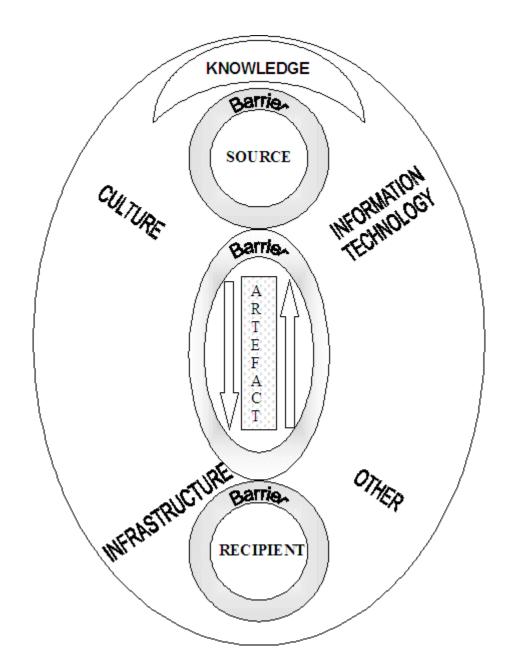
4 **Knowledge flow model – elements within a context**

During the research it was established that specific elements are always present and involved when knowledge flows. As far as could be determined, there is not a knowledge flow model that exclusively focuses on these elements framed within the context of enabling and inhibiting factors. The model shown in Figure 1 was developed to fill this gap. In the rest of this section, the individual parts of the model are explained in more detail. In addition, their role as factors that can influence the flow of knowledge is also explored.

These influences can have either a beneficial or detrimental effect on the ease, speed and success of knowledge flow. Some issues cannot be clearly classified as enablers or inhibitors, for their impact can be positive or negative depending on the specific situation. Based on this, the following issues identified in the literature are grouped under certain categories, and within these groupings a distinction is made between enablers, inhibitors and general factors that can have an impact on knowledge flow.

The subsequent exposition is an amalgamation of relevant information from the following sources: Abell and Oxbrow (2001:39–42); Armbrecht, Chapas, Chappelow, Farris, Friga, Hartz, Mellvaine, Postle, and Whitwell (2001:28–48); Bahra (2001:208–211); Bennet (2001:297); Breedt (2000:45, 50, 89); Chase (1998:16–17, 51–83, 90–91); Davenport and Prusak (2000:97); Disterer (2002:516–517); Dixon (2000:46–50, 73–74, 93–95, 139–140); Dunford (2000:297–299); Fabris (1999:online); Gladstone (2000:110); Guptara (1999:26–29); Holsapple and Joshi (1999:7-1 – 7-17); Knapp and Yu (1999:16–21); Liebowitz (2000:26); Liebowitz and Beckman (1998:64); Lindsay Chadee Mattson Johnston and Millett (2003:12, 14–15); Newman (2003:301–316); Probst et al. (2000:133–135, 172–173, 192–195, 204–207, 304–309); Rolland and Chauvel (2000:228–233); Sivan (2000:12); Stanford (2000:online); Stevens (2000:online); Sydänmaanlakka (2002:26–28); Tarnopolsky (2002:1–34); Wang and Ahmed (2003:51–62); Wenger *et al.* (2002:83, 118–119); Wiig (1999:3–36, 3–41); Wiig (2000:11–12); Yuva (2002:8).

Figure 1 Knowledge flow model

4.1 Knowledge

At the top of the model is the principle element, namely knowledge. This is knowledge as it exists in the thoughts and cognition of the source. Alternatively, it might also be codified in a physical format, such as a document. The features of this knowledge will significantly impact the success or failure of knowledge flow.

4.1.1 Knowledge as enabler of knowledge flow

If knowledge is easily available and accessible, it will flow smoothly. It must also be appropriate and relevant for the recipient's needs, and recognized and understood as such. Furthermore, if it is perceived as being credible, valuable and current, flow can further be enhanced.

The content of knowledge can be a critical enabler of knowledge flow. Knowledge in the appropriate language (including the spoken language as well as its technical level) will flow with ease. If the content can be readily codified and articulated, knowledge will be communicated better and faster.

Knowledge in an appropriate format, which can be easily transmitted and received, could also assist knowledge flow.

4.1.2 Knowledge as an inhibitor of knowledge flow

Just as content can be an enabler, it can also be a critical inhibitor of knowledge flow. If the language is

foreign to the receiver, or too technical, knowledge flow cannot take place. Even if an agent possesses the necessary prowess in a language, he/she might not be aware of the finer nuances and connotations of certain words. Hence, the full meaning of the knowledge might not be conveyed. Much also depends on the level of tacitness and abstraction of the knowledge. Some tacit knowledge (e.g. non-verbal knowledge) is very difficult to codify, which might delay transfer. Also, when non-essential knowledge is embedded, it might hamper transfer.

Duplicated, contradicting, conflicting, ambiguous or inconsistent knowledge will also negatively impact knowledge flow. Therefore, knowledge that is perceived as being of inferior quality will not flow. Furthermore, knowledge that is too voluminous will not flow properly. The same applies to knowledge in an incorrect or incompatible format.

4.1.3 General knowledge issues that can impact knowledge flow

The viscosity, density, richness and complexity of the knowledge can either speed up or slow down knowledge flow. On the one hand, the knowledge might be too dense to be easily transferred. On the other hand, the recipient might require the knowledge to be rich and complex based on his or her specific needs.

4.2 Source

The knowledge sender, source, author or creator is another prominent factor, which can either enhance or impede knowledge flow. As the reader might recall, the agent can be an individual, group or automated entity. The source element in the model can be any one of these agents.

In the model (Figure 1), it will be noticed that a barrier exists between the knowledge and the source. This aspect shows that the meaning of the knowledge might be affected by the translation and codification processes that the source applies when preparing to transfer the knowledge. The source's understanding of the knowledge is affected by its volume, complexity, abstraction, language and level of tacitness. The source might also have personal barriers like reluctance to share knowledge for fear that he or she will lose power and control.

4.2.1 Source as enabler of knowledge flow

If a source is enthusiastic and motivated to share knowledge with others, knowledge can flow without difficulty. His or her attitude can be altruistic, unselfish, friendly and approachable. Ardichvili, Page and Wentling (2003:69) identify the following reasons why people might be willing to share their knowledge:

- They view their knowledge as a public good, which does not belong to them individually.
- Some might feel a moral obligation to share their knowledge.
- Others might crave recognition and credit.
- They might feel the need to establish themselves as experts.
- They might view it as an opportunity to give something back to the community.

Some sources might commit themselves to share owing to their reputation and role as experts and mentors. They might feel pride and satisfaction in being able to contribute to their community.

4.2.2 Source as inhibitor of knowledge flow

While a source's attitude can serve as an enabler of knowledge flow, it can also be a significant hindrance. Potential sources can hoard knowledge for a multitude of reasons. The source might fear the loss of power, loss of control, ridicule, criticism or misuse of knowledge. The source might feel uncertain and withhold knowledge because he or she is unsure of its accuracy. A strong sense of privacy as well as an attitude of 'what's in it for me?' might further impose a form of self-censorship.

The source might feel that certain knowledge is confidential and should not be communicated. A related reason is that the source might be intimidated into keeping the knowledge concealed by others, such as

his or her superiors.

4.2.3 General source issues that can impact knowledge flow

The source's understanding of his or her knowledge might have a positive or negative influence. He or she might be unable to communicate the knowledge because it is still being refined. Then again, an expert and authoritative person might be better equipped to communicate the knowledge because he or she has a wealth of erudition, experience and expertise to draw on.

The source's memory can also influence flow favourably or adversely. The ability to translate and process the knowledge into a suitable form is also of importance.

Much depends on the source's personality and attitude. These can be shaped by the person's ego, pride, level of jealousy and sense of territorial protection.

4.3 Recipient

Tarnopolsky (2002:15) observes that 'if knowledge is not absorbed, it has not been transferred'. Therefore, the recipient is a critical element in successful knowledge flow. In the model (Figure 1), the recipient is encircled by a barrier. This shows that many factors can influence the success or failure of flow when knowledge reaches the recipient.

4.3.1 Recipient as enabler of knowledge flow

A great deal depends on the absorptive capacity of the receiver of knowledge. A recipient with an enthusiastic and interested attitude coupled with the desire to learn can ensure the success of flow. Along with motivation, the recipient's education, experience and existing knowledge are further decisive factors.

The recipient should not only possess a receptive disposition, but should also hold the minimum intellectual level needed to grasp the knowledge.

4.3.2 Recipient as inhibitor of knowledge flow

Several of the greatest hindrances to knowledge flow are linked to psychological factors, such as a recipient's morale and negative attitude. A recipient's pride, ego, jealousy, prejudice, stubbornness and resistance to change can all affect flow negatively. In addition, ignorance, negligence and unawareness of the available knowledge can also have an adverse affect.

Sometimes the recipient is distrustful of the quality of knowledge, which might further retard knowledge flow. The recipient might also experience an overload if the volume and complexity of knowledge are too much to digest.

For others, the fear of being perceived as ignorant might prevent them from requesting knowledge.

4.3.3 General recipient issues that can impact knowledge flow

The cognitive and knowledge processing abilities, as well as existing knowledge of the recipient, are additional factors that can influence knowledge flow positively or negatively. The cognitive capabilities depend on the recipient's level of attention, memory, innovation, creativity, knowledge processing competencies, sense- and decision-making styles, and familiarity with the topic. The recipient's general behaviour, skills and competencies might be further influences.

4.4 Knowledge artefact

A knowledge artefact 'is an object that conveys or holds usable representations of knowledge (e.g. file cabinet contents, memos, videos, manuals, patents, products), but has no ability to process those

representations' (Holsapple and Joshi 1999:7–3).

The oval in the middle of the model (Figure 1) that surrounds the artefact represents the barrier between the source and the artefact, as well as between the artefact and the recipient. This barrier can influence the completeness, accuracy and format of the artefact.

Seiler (2004:51) points out that knowledge needs to be objectified and conventionalized before it can be communicated. Without this process, no exchange or understanding is possible. Therefore, the tacit knowledge needs to be converted to an explicit format that is acceptable and usable by both the source and recipient. Depending on the content of the tacit knowledge, this might be difficult to achieve because formalization increases the distance between the knowledge and its meaning (Seiler 2004:54–55). A great deal therefore depends on the source to translate the tacit knowledge to an appropriate and user-friendly format that allows easy transfer without sacrificing substance.

4.4.1 General knowledge artefact issues that can impact knowledge flow

Almost all the factors can either be helpful or harmful to the flow of knowledge. When the knowledge artefact is in the correct format, without need of specific technology to be transferred and used, knowledge can flow smoothly and without a hitch. In contrast, if the format is indecipherable, knowledge flow will be prevented.

The location, format, number, volume, size and age of the knowledge artefacts can all assist or restrain the flow of knowledge. Much depends on the situation, context as well as the preferences of the recipient, whether the artefact will be useful. In one instance, knowledge held in a static database might be sufficient to the needs of the recipient, while in another instance that same knowledge might be amiss due to the artefacts' attributes.

4.5 Direction

The **direction** of the flow is indicated by the arrows in the model (Figure 1). The arrows indicate the two-way flow of exchanges as well as ancillary messages. Ancillary messages might include the initial request from the recipient, which does not qualify as knowledge, but is nonetheless important for it can put the whole flow in motion. The final responsibility lies with a knowledge seeker to ensure that he or she gets the needed knowledge.

4.5.1 General direction issues that can impact knowledge flow

Direction is one of the main elements of knowledge flow, which also holds a strong relation to the different types of knowledge flow that can occur. The type of knowledge flow directly influences the direction of the exchange as well as the need for ancillary messages. For example, circular knowledge flow is usually characterized by an assortment of give-and-take exchanges, because it involves a group of people working together on a problem. Knowledge flows in both directions, and a specific agent might be a sender and recipient at the same time.

The direction might be an obstacle when knowledge flows in the wrong direction. For instance, when knowledge usually flows from the top to the bottom along the hierarchy, an attempted knowledge exchange from the bottom to the top might be discouraged or ignored.

4.6 Context

The knowledge, source, recipient and artefact are surrounded by the **context**. No knowledge flow can occur outside a shared context, which is why the elements are all embedded in the context. If the context is misinterpreted, the meaning understood and the intended meaning might differ significantly. The context is formed by the **culture**, **infrastructure** and **information technology**.

4.7 Culture

As indicated by Knapp and Yu (1999:16), culture serves as the lens through which employees make

sense of their environment and their experiences in it. It also acts 'as a collective prescription for acceptable interactions' (Knapp and Yu 1999:16). It is therefore understandable that their norms, values and principles can impinge on the flow of knowledge.

4.7.1 Culture as an enabler of knowledge flow

Possibly one of the most important aspects of a knowledge-enabling culture is trust. If any doubts exist that knowledge might be misused, people would be reluctant to share it. Therefore, a culture that values, encourages and enables knowledge sharing and creation must be built upon the foundation of trust and honesty.

Culture forms the needed common frame of reference for knowledge exchanges to take place. A shared culture advances solidarity, which in turn enhances a joint purpose. A knowledge-friendly culture empowers people to interact, cooperate and collaborate.

An open culture promotes commitment, understanding, creativity, ingenuity, innovation, curiosity and courage to take risks. Such a culture tolerates mistakes and creative errors. Knowledge flow is further stimulated by a culture that endorses a service attitude and transparency. By instilling a positive outlook on knowledge sharing and use, knowledge flow can be greatly increased.

4.7.2 Culture as an inhibitor of knowledge flow

Whereas a positive culture can significantly augment knowledge flow, a negative culture can severely debilitate flow. Distrust is probably one of the most powerful deterrents of knowledge sharing. Firstly, distrust creates fear in the sender that knowledge might be exploited. Conversely, the receiver might have reservations about the quality and reliability of the source's knowledge.

A culture that does not create a shared milieu or perspective will also thwart knowledge flow. Such a culture is embodied in the destructive behaviour, approaches and activities of employees. This harmful conduct is usually characterized by intolerance of mistakes, resistance to change, complacency, arrogance and unhealthy competition between business units. An additional negative influence is the so-called 'not invented here syndrome'. This behaviour is marked by 'the tendency to neglect, ignore or, worse still, disparage knowledge that is not created within your own department' (Kluge, Stein and Licht 2001:33).

4.7.3 General culture issues that can impact knowledge flow

Relationships are very important where culture is concerned. As pointed out earlier, knowledge flows along relationships. For this reason, people are prone to share knowledge with those with whom they have pleasant working interaction. These dealings are often reciprocal in nature, whereby both parties are on the receiving end at one time or another. On the contrary, people are not inclined to share knowledge with those with whom they have unfriendly relations.

The style of interaction is closely associated with these relationships. Some knowledge exchanges might call for an informal style of transfer, while a formal style might be more appropriate in other circumstances. Certain situations demand clear boundaries and ethical guidelines, which is prescribed by the culture.

Diversity in the workplace is one of those aspects that can either be helpful or obstructive to knowledge flow. It might lead to improved innovation and creativity, when it takes place in a supporting culture. In contrast, diversity could also lead to the formation of cliques that frustrate free knowledge flow.

Reward and incentive programmes can also have an ambivalent effect on flow. It is understandable that people might be encouraged to share knowledge if they receive compensation for doing so. The danger exists that contributors are rewarded for the wrong things, which in turn might provoke unconstructive behaviour, such as the sharing of inferior quality knowledge. Rewards and incentives should rather be awarded selectively, for worthy conduct such as the creative utilization and application of existing knowledge. Abell and Oxbrow (2001:59) remark that rewards must be selected that encourage culture

to change from an 'information is power' culture to a 'knowledge sharing builds power' culture.

How things are usually done in an organization, together with what is deemed acceptable, will definitely have a bearing on the flow of knowledge.

4.8 Infrastructure

The infrastructure is formed by both physical and intangible constructs, such as the office building, organizational structures, reporting lines and management layers. It also includes physical structures such as the office layout and size. A strong infrastructure is a vital ingredient for smooth knowledge flow.

4.8.1 Infrastructure as an enabler of knowledge flow

A supporting infrastructure can considerably enrich the flow of knowledge. This can be accomplished by supplying vital resources. These resources include clear management direction and backing, practical systems and dedicated staff. Together with a fitting, formal and central knowledge management programme, these resources will not only enable the flow of knowledge, but also boost it. The knowledge management initiative can establish infrastructure such as knowledge inventories, knowledge maps and knowledge navigation tools that will certainly add to knowledge flow.

The infrastructure should also provide for appropriate business policies, procedures, practices and activities. Depending on the organization, seemingly restrictive measures such as standard procedures and processes might ease knowledge flow in one organization, while in another it might have a stifling affect.

4.8.2 Infrastructure as an inhibitor of knowledge flow

Infrastructure might encumber flow by the lack of dedicated resources. The absence of necessary resources might be an immense setback. Likewise, insufficient or sub-standard resources or a biased distribution of resources might further slow down knowledge flow.

High staff turnover is also a factor that must be attended to. It takes time to build trust relationships in an organization. Besides, whenever an employee leaves the organization, his or her unique combination of skills, knowledge and expertise is difficult to replace.

Boundaries, reporting lines and management control that are too rigid also disable knowledge flow. These can be caused by fixed management layers, a strong hierarchy and the existence of functional silos, whereby units are isolated from the rest of the organization.

4.8.3 General infrastructure issues that can impact knowledge flow

The physical location, layout, size and types of offices may affect knowledge flow positively or negatively. The design of the building, offices, meeting rooms and other collaboration spaces can encourage employees to share knowledge, especially if these fixtures are flexible and easy to rearrange as the need arises. Knowledge flow can be meaningfully advanced through common areas where people can visualize knowledge with the help of wall charts, posters and white boards. A disagreeable work environment might have quite the opposite effect.

4.9 Information technology

Information technology is a matter that has been focused on a lot during the last decade. Although a strong infrastructure of information technology can support a healthy knowledge flow, too much emphasis on IT might divert attention away from other deserving factors, such as culture and infrastructure. Nevertheless, sophisticated information technology can greatly enhance and speed up the transfer and exchange of knowledge.

4.9.1 Information technology as an enabler of knowledge flow

Information technology – which includes hardware and software – is a major role-player in making information and knowledge accessible. It enables fast communication and fosters innovation through e-mail, intranets, groupware, portals and databases. When information technology supplies a common platform that can be used by all to produce, manipulate, store, communicate and disseminate knowledge, it can cultivate an environment where knowledge flows rapidly and without trouble.

Information technology can also help reduce the disabling effect of some of the other factors mentioned in this section. For instance, information technology can help to combat negative infrastructural issues such as functional silos and the physical separation of employees. It is therefore of great assistance to enable collaboration and cooperation, both of which is needed to let knowledge flow.

4.9.2 Information technology as an inhibitor of knowledge flow

Information technology might be a barrier when one of the agents (receiver or sender) insists on using information technology, even though an alternative course of action might have been more appropriate. Some knowledge is difficult to translate to a codified format, and therefore a quick face-to-face meeting might be more beneficial in certain situations.

When selecting information technology one should also be careful not to reinforce existing social and cultural boundaries in the organization (Swan 2003:278). Some employees might not be proficient in using information technology. This might keep them from using information technology to its full extent, which might prevent knowledge from flowing.

4.9.3 General information technology issues that can impact knowledge flow

It is evident that information technology can be one of the biggest knowledge flow enablers. A strong information technology infrastructure can greatly alleviate knowledge flow difficulties. Then again, information technology might become one of the biggest impediments of knowledge flow, if organizations focus too much of their energy and resources on building information technology systems.

4.10 Other factors that can influence knowledge flow

A number of additional factors can impact the flow of knowledge. Among these, is time. In many organizations people are so busy that they do not have time available to share and collaborate. Knowledge is time-sensitive and loses value quickly. A shortage of time is therefore a serious burden on the unrestricted flow of knowledge. Coupled with this factor, the nature of work might also be a stumbling block. In some companies, employees are out of office a lot – for example salespersons or consultants – which means that they have fewer occasions to interact with colleagues. Together with the scarcity of time, the absence of co-location might further prevent people to share their knowledge.

A big obstacle that the majority of people experience is information overload. If people become inundated with information and messages from all over, they will start to ignore the surplus information and knowledge just to make do. It is possible that potentially vital knowledge might be included in those messages that are blocked.

In addition, other factors such as the size of the organization will also have an impact. Generally people have more contact and interaction – and therefore better collaboration – in organizations that are small in size.

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5 Conclusion

The aim of this article was to explore a topic that is often overlooked. Davenport and Prusak (2000:89) observe: 'Knowledge abounds in our organisations, but its existence does not guarantee its use.' Unused

knowledge points to knowledge flow problems. For that reason, if organizations want to make the most of their knowledge they cannot afford to neglect to investigate knowledge flow.

Knowledge managers should therefore not only concentrate on building knowledge repositories, but should also facilitate the means to gain access to that knowledge. Frappaola and Toms (1999:382) reckon that '[i]t is the role of knowledge management … to connect two nodes, knowledge owners and knowledge seekers'. It is therefore evident that the way knowledge is shared and how it is channelled are much more important than how much of it is stored.

Knowledge managers have a big responsibility to ensure that access to knowledge is balanced, because in most organizations knowledge is not distributed evenly. These imbalances can be caused by a variety of factors and should be addressed through proper knowledge management practices by means of adjusting the organizational culture, knowledge management policies and processes, as well as implementing a robust infrastructure. Hence, the importance of knowledge flow cannot be disregarded and therefore it should be central to all knowledge management initiatives and programmes.

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