

Perceptions of Continuity Management in an Irish Semi-state Organisation

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Abstract: This paper draws on an exploration of continuity management (CM) in a large Irish semi-state organisation in transition. Drawing on interviews with ten of the senior management team, findings are presented in terms of intellectual capital, replacement strategy, information sources, knowledge transfer to successors, tacit knowledge, CM systems, and barriers to CM implementation. There is a clear consensus in favour of introducing a CM system—but also clear recognition of the barriers, such barriers perceived to be mainly cultural.

Keywords: continuity management; knowledge management; culture

1. Introduction

This practitioner oriented paper draws on an exploration of continuity management (CM) within a large Irish semi-state organisation (referred to in this paper as Semstate) that is entering a period of transition. Whereas knowledge management (KM) generally refers to attempts to identify, capture and share know-how that is perceived to be valuable throughout an organisation (Edvinsson and Malone, 1997; Field, 2003), CM refers to “the efficient and effective transfer of critical operational knowledge—both explicit and tacit, both individual and institutional—from transferring, resigning, terminating or retiring employees to their successors” (Beazley *et al.*, 2002: *xiv*). The empirical component is based on ten in-depth interviews with members of Semstate’s senior management group.

Overall the main findings reported here suggest that CM does have a role to play in both KM and human resource management and development (HRM and HRD). There is a clear consensus in favour of introducing a CM system in Semstate—but also clear recognition of the barriers, such barriers perceived to be mainly cultural. The structure of the paper is as follows: in section 2 we present a very brief review of some relevant CM literature allied to a brief description of the research context and methodology; the main findings of interest are then presented and discussed; finally, we conclude that CM has an important role to play in designing, implementing and maintaining any broad KM strategy linked to the HRM/HRD strategy.

2. Context, literature and method

Semstate is set to lose almost one third of its senior management staff, and one seventh of its general workforce, over the next five years. This fact alone has the potential for major discontinuity in the “upper echelons”, but it also provides a suitable site for CM oriented research. Based on the literature reviewed a decision on semi-structured interviews (see Appendix A for interview outline) with members of the senior management team was deemed to be an appropriate research strategy in accessing the “perceived reality” (Henriksen *et al.*, 2004) of Semstate’s “upper echelons”. Ten interviews (representing almost one third of the senior management group) were conducted in early 2004, recorded and transcribed generating ~40,000 words.

The CM literature (Beazley *et al.*, 2002; Field, 2003) suggests that there are advantages to be gained from implementing a CM system but that there are also significant barriers. The advantages of CM may be listed as follows: speeds up orientation and settling in of new or newly promoted employees; facilitates knowledge creation and innovation; results in better decision making; preserves knowledge networks; places emphasis on identifying job-critical knowledge; may prevent knowledge hoarding; and, increases long term organisational effectiveness. Barriers include the attitude of knowledge workers to skill acquisition, the bargaining power of workers with transferable skills and the implications of both these aspects for reward structures. A knowledge-sharing

friendly organisational culture is deemed crucial to the success of CM but is one of the most difficult factors to achieve. Further, CM needs to be aligned with the intellectual capital (IC) of both the organisation and its employees, including the human, social, internal and external aspects of IC. This IC focus is broader than individualistic human capital theory and highlights the importance of both internal and external networks to CM, and indeed to KM (Bontis, 1998; Edvinsson and Malone, 1997; O'Donnell, 2004; Sveiby, 1997).

CM may also be viewed as a continuation of a long stream of research on succession planning, particularly CEO (chief executive officer) succession. Canella and Lubatkin (1993) note the distinction between the 'adaptive' and 'inertial' views of succession, which can also be applied to senior managerial succession. From the adaptive perspective senior management favour external recruitment when performance is poor or the organisation is in crisis as "outsiders are perceived to be more capable of changing the mission, objectives and strategy ... than are insiders (p. 764)". In contrast, the inertial perspective suggests that selection processes are likely to be relatively unadaptive due to the number of people and vested interests involved (Child, 1972). Large organisations tend to resist change (Henriksen *et al.*, 2004), cling to outdated strategies and administrative forms and resist outsider selections (Canella and Lubatkin, 1993).

3. Findings and discussion

Seven broad themes were identified in the preliminary analysis of the interview transcripts presented here: perceptions of intellectual capital; replacement strategy; information sources; knowledge transfer to successors; tacit knowledge; CM system; and finally, barriers to CM implementation.

3.1 Intellectual Capital

A short questionnaire on the dimensions of intellectual capital (following O'Donnell *et al.*, 2003) was completed by each respondent. The perceived value of organisational IC in Semstate is ~70 per cent. Respondents were also asked to distribute 100 points between Human, Internal and External dimensions of IC with reference to their perceptions of *their*

own IC. Averages are almost half (46%) human capital and an approximately even percentage on internal (28%) and external (26%) dimensions. The tentative finding here, in terms of the relevance of IC to CM, is that these senior managers perceive half their IC to be personal human capital, with the other half more or less equally divided between internal and external forms of capital—areas of Semstate IC that new external recruits would not be expected to have. This suggests that we take a broader view on CM than on merely human capital—and take both internal and external knowledge sources/networks into consideration. Knowledge and experience of the internal organisation and links to external clients, customers and other institutional connections are critical components in any CM strategy.

3.2 Replacement strategy

The age profile and impending loss of IC was well signposted in recent years but little action was taken to guard against this loss. Eight noted that managers leaving were not easily replaced from inside and that such promotions had become difficult. One stated the opposite; and another stated that it depended on the job. There have been quite a number of promotions in the recent past and this resulted in "the well being pretty dry" and a view that "we have promoted to management level as much as we can at the moment". A number of reasons were put forward to explain this including the fact that Semstate currently has a policy that all management posts are generic leading to generic job descriptions. The contention was that prospective external candidates don't really know what they are applying for—"You advertise for an assistant regional manager. What does that mean?"

Another respondent, from a very 'adaptive' perspective, stated that at least 50 per cent of new managers should be recruited externally. Two of the senior managers expressed the view that it depended on the management post—"There are some people who are super in some management functions and some who are dreadful in others". Some positions could be easily filled from inside because:

In some areas there will be a number of people who will be very close to each other in

terms of what they do and how they do it ... A lot of experience of the departing person will have been acquired. There would be other jobs, I suspect, where experience, knowledge and know-how would be more important than others. You can't package (those) and hand them to someone.

At the younger level, now that we have started all the development...(we are) more serious about the type of development that the staff are undertaking.... I think they have the where-with-all to do it now.

Semstate has a very strong culture, a culture that has grown up around historic HR policies that involved recruiting only from within for management grades. Semstate very rarely recruited externally, except for specialist posts such as IT or finance. Various agreements with the trade unions also tended to marginalise external recruitment. With regard to recruiting externally all respondents, bar one, expressed the view that this would pose some difficulties—evidence of internal 'inertia' emanating from historic institutionalised norms and practices. Most mentioned a large learning curve as a difficulty with external recruitment and that this might in turn lead to gaps in services to clients. Of greater concern was the ability of such new managers to "have credibility and fit in".

If you promote people from within you are obviously getting a certain amount of continuity but if you take people from the outside, you may lose some of your services ... but having said that ... you may get new ways of doing things and you may actually improve your services.

New talent and new blood is needed...new ways of doing things and new ideas... and the best way of getting that is to go outside and get them.

The biggest... handicap for people coming from outside. What do [they] know about Semstate? I've been here for

20 years! There is a view that Semstate is Semstate and nobody else can know anything about it except Semstate people. This is nonsense actually.

If the right people were recruited from outside they would bring new thinking and ideas and no baggage.

Another aspect concerned the competencies needed by managers to do their jobs. Five noted that Semstate had too high an emphasis on academic development, with many having availed of its generous staff development policies over the years—but much of this is perceived to be overly "academic" and not backed up by experience in external business or industry—leading to a lack of experience as one of the principal reasons for present internal promotional difficulties. This is the difference between learning "to be", being actively engaged in the practice in question (Brown and Duguid, 2000: 128), and learning "about". There is a clearly articulated need here for the "local, relevant, current, modifiable and effective" type of "hands on knowledge" (Beazley *et al.*, 2002: 211) that, apparently, has not been passed on from retiring Semstate managers to up and coming others leading to a promotional void—the type of adverse outcome that CM is supposedly designed to guard against.

3.3 Information sources

With one exception, those interviewed stated that their main information sources were internal networks of one form or another including peers and "the grapevine"—strong support for the internal capital dimension of IC or indeed social capital. Other sources were the Intranet, e-mails, policies and the internal management information systems (MIS), as well as external networks (external capital), contacts built up over years and current literature. Knowing who to contact and when, and "feedback" from the ground were regularly mentioned as key information sources.

Meeting people on the floor and talking to staff.

Being inquisitive enough to ask a lot of questions.

Talking to clients and customers.

Wear out two pairs of shoes every year. Walk the streets, driving around is no good. Talk to people.

I've been around Semstate long enough to know a lot of people so if I hear rumblings of anything happening I ring up and directly ask what's happening.

Most viewed the internal person-to-person contact as the chief means of getting the information/knowledge needed to do their jobs. The social side of organisations has a crucial role to play in KM; these experienced senior managers certainly know the value of such information and are very clear about how and where to get it. In terms of CM the location of specific organisational memories is a key point. For example, who knows about a particular issue or process? Who has been through it before? In CM terms, this is one area where new recruits to senior managerial grades, particularly if recruited externally, would be expected to require some social mentoring as their knowledge of internal capital and Semstate culture would be minimal.

3.4 Knowledge transfer to successors

Interviewees were asked for the three most important things (in knowledge terms) that they would highlight to their successors in order to help them to succeed. In general, the respondents believed that the technical knowledge required to do the job was a “given”—taken for granted. Six referred to the importance of knowing the right people to contact at the right time, which links to the previous discussion on internal and social capital, and knowing where to find information. Other suggestions centred around the areas of personal integrity and talking and listening to colleagues and peers. A number of respondents saw themselves sitting down with their successor and:

Saying right, this is where we are in relation to this.... this is what we are trying to do...these are the barriers to success...this is what we are trying to get around.... watch this.... watch that person...This is what you are

going to have to take account of in dealing with it.

These are the things you need to watch out for, if you want that read, take this slant, otherwise it will be ignored.

Other advice involved talking to people who had done some good work for Semstate over the years and also finding out who “the fumlbers” were and identifying the “key performers”. “Listening to what people were saying” and talking to others – as individuals and through networks in order to find out what was happening and how things were done permeated these interviews. If most of the information needed to do the job comes from knowing who to contact and when, we begin to get a picture of how difficult it might be for an external recruit to fit in, particularly in the early stages.

You have to listen to what people are saying and you have to address what people are saying. You don't have to always agree...cultivate your network.... Get out there and talk to people formally and informally or whatever. It only takes a few minutes and it really is important to scan the environment, the horizon and see where things are coming from and what's going to happen.

I suppose the key point I'd try to get across to them would be from the client's point of view...Generate a sense of empathy with the client in trying to help them solve their particular problems.

All referred in some way to the importance of getting to know “how things are done around here”—internal or structural capital, which is particular, contextual and normative—and probably at least a quarter of Semstate's IC. There is a strong sense from these interviews that Semstate has “a way of doing things”—“there is only one way of doing things and that is the way we are doing it now”—“we don't want change”. The desire on the part of these senior managers to recruit externally may arise from a wish to break up this culture and to get some “new ways” of doing things and have them accepted or institutionalised over time—perhaps using external recruitment strategically for this

purpose. There is a long history in Semstate of protracted and difficult industrial relations negotiations concerning change. Change can be slow, yet Semstate is in transition, is changing; indeed, must change. One can also sense a certain impatience in many of those interviewed who wish to speed up the pace of change and to get results more quickly.

3.5 Tacit knowledge

The respondents believed, on average, that at least half and probably more of the knowledge needed to do their jobs was “in their heads”, that is, it was not written down anywhere—it was tacit. Some believed the percentage to be much higher with figures of 75 per cent to 80 per cent being quoted. All were asked if they personally were doing anything to codify their own knowledge. Four of ten had some kind of system in place. In the case of two of the four, this was informal. In one of the other two cases there was extensive written material about various programmes and agreements—this history had been collected and maintained over a considerable number of years. The other instances involved both specific cases and also more general negotiations, discussions and agreements.

Five of these senior managers mentioned, however, that they were conscious of the fact that they were being observed in some way as they worked; in meetings, during negotiations, handling various situations as they arose, and so on. Their strong opinion was that there was quite an amount of informal learning going on, even though it was not labeled as such. In all cases, such learning was happening within a close-knit group and was very specific—evidence of a type of informal community of practice (CoP). CoPs are ideal vehicles for the promotion and transfer of learning for continuity purposes, between novices and experts as well as amongst experts (Beazley *et al.*, 2002; O'Donnell and Porter, 2003). Most, however, referred to the fact that this knowledge was not written down anywhere:

...it is certainly not in the procedures...it comes from experience. You can't buy it.

You have a Job Spec. But that's as far as it goes. A lot of the way we do our job is

having learnt it...good experience and broad understanding. That's how we do it – in the head.

You've heard it before and you know...what way it's going to go... how it's going to fall for you.... you know how to react.

Eight referred to knowing how the system worked, who to talk to—or as one respondent put it “who not to talk to”—and “knowing the right people” as important pieces of knowledge that they carried “in their heads”. The terms “intuition”, “gut”, “judgement”, “cop on” and “know-how” were also used to describe such background forms of tacit knowing.

3.6 Continuity—threat or opportunity

Those interviewed were asked for their opinions on the large number of exits over the next five years—five (half) of the ten regarded these exits as an opportunity; the other five mainly as a threat. In terms of threat the key point is that all of these people are leaving around the same time. The majority were recruited when Semstate first came into existence over thirty years ago and are now coming up to retirement. This can be referred to as a variant of “The Acute Threat - Catastrophic Knowledge Loss” (Beazley *et al.* (2002: xi) used to describe the losses from the impending baby-boomer retirements in the United States. Two noted examples of where both a manager and an assistant manager in their areas had retired at the same time or within a short period of each other—a lot of “knowledge, expertise and management skills went out (...) overnight”. No internal candidates had emerged to fill these posts. Again it was commented on that there were some good people coming up through the system but that they do not have the required experience at this point—also noted above. Four perceived this threat to be due mainly to the loss of middle management grades—again due to the perceived difficulty in integrating external recruits from a credibility point of view. According to these and other respondents, big learning curves were going to be involved whether the candidates were internal or external:

The big problem is the way the numbers are falling for us,

there are so many ... going out at the same time. If it was more of a trickle we'd be able to deal with it better. But the fact is we are going to lose so many of them.

The assistant manager is retiring this year and the manager is retiring in two and a half years time. So in two and a half years time all the knowledge will be gone. We are about ten years behind in my view.

On the other hand there were those who believed that the loss would not be overwhelming, and that it could in fact be turned to advantage and open up new possibilities. People leaving could be "good or bad especially where people are worn out"; and other more optimistic comments such as:

In fact I think it would be a good thing...get a package together and ...(get) people into the sunset very quickly, the quicker the better for Semstate.

The fact that [so many] people are leaving might be an opportunity to restructure Semstate totally..... we should set out a new platform for the future.

In carrying out these interviews and observing the behaviours and body language of the interviewees, there was no doubt but that there was a deep concern expressed by all, even though their concerns related to different sides of the argument. Strong, even vehement, views are held on both sides. On one side were those who saw a serious threat to Semstate because of a lack of continuity. They feared loss of service to customers and clients, loss of credibility with stakeholders, breakdowns in systems, breakdowns in communication, differing interpretations of agreements....the list was long. This is again in keeping with the views expressed by Beazley *et al.* (2002) who argue that as the importance of knowledge increases the negative impact of knowledge loss for an organisation rises exponentially. The negative effects will differ depending on the organisation but these effects are costly and can send an organisation into a tailspin from which it might not recover. These were the types of

underlying concerns of the senior managers who viewed the impending loss of knowledge as a threat.

On the other hand there were those who felt that Semstate would survive despite this and would perhaps be better off *without* some of the knowledge that Semstate was preserving. Perhaps the time had come to jettison some of it? Its very strong culture reflexively preserves itself and its form or definition of organisational knowledge in a very robust manner, even though, in part at least, it may be past its sell-by-date. This is the implicit argument posed by at least half of the interviewees here. The perception is that Semstate looks back into its historical knowledge store, the safe 'inertial' view, rather than moving forward, the 'adaptive dynamic' in Canella and Lubatkin's (1993) terminology. CM is not solely about preserving old knowledge at the expense of the creation of new knowledge. Preserving existing operational knowledge is a crucial CM element but is not the sole goal. The primary purpose of CM is to create new knowledge based on the existing knowledge (Beazley *et al.*, 2000: 210) and Semstate may not be fully realizing the value of the knowledge and IC that it actually has.

It is not surprising perhaps that the group interviewed was evenly divided in their perceptions—there are clear advantages and disadvantages on both sides, but achieving a pragmatic balance between them is not going to be a simple task. The difficulty in transcending any adaptive-inertial dialectic, of course, lies in identifying who to retain and what to keep, what to jettison and what new or innovative ideas, processes or systems to introduce. There is no simple generic answer here.

3.7 Introducing a CM system— Barriers

With one exception, all believed that a continuity management system should be in place. Without exception, however, all believed that there would be significant cultural barriers to implementing such a system. The main CM issues and suggestions to emerge here included the following: succession planning, rotation both within Semstate and outside, work shadowing, working in teams, mentoring,

coaching, good induction, appropriate management development and appointing people to positions as a development opportunity. While there were emphatic “YES” answers to the concept of bringing in some form of CM system, there was a corresponding emphasis on probable barriers to such a system. Encouragement qualified by pragmatic caution is the main finding here.

Absolutely, there should be a system in place.... There is no doubt about that...(but) we haven't consciously gone out and ear-marked anyone for mentoring because you know that wouldn't sit well in [Semstate]...the culture is not right. The culture would have to change significantly.

Many mentioned that a lot of knowledge exchange was going on informally:

The only reason I knew that was because I met guys and had a cup of coffee with them and it came up in a conversation. There is a lot of stuff going on in little groups and nobody seems to be pulling it together. We know it through the old boy or the old girl network or we know it over a pint or something like that.

One explained that there was a considerable amount of work shadowing going on, also noted above—but again, that it was never called that:

It is better for both the individual and [Semstate] to have specialists specialising... provided the operation is such that there are other people in sufficiently close proximity to be schooled along the line so that all the expertise is not vested in [one] person and leaves with [that] person.

Many expressed concern about union resistance to any form of succession planning—that such a system would be “fraught with danger”—that there would be an element of “teachers pet” and “people being lined up for jobs”. Such a system could be perceived to be favoring some over others. Three cited cost as being a barrier or, more likely, as an “excuse” not to get involved. Letting go of control was

also seen to be a problem, with one manager noting that Semstate “people don't easily give up control”. There was also one view that introducing yet another system (that is, a CM system) could be viewed as a burden—“managers are very busy; they still have to do the day job”. There was also a view that rotation would be “resisted by the unions and by some management grades”.

Something like succession planning would be a problem as it could appear to fast-track some at the expense of others. Who decides on the chosen ones?

Others mentioned the importance some people placed on “contacts” and how they guarded them:

We are very protective of our position and feel that if we pass on too much knowledge we become redundant.

People are always looking at your job wondering when you will move on...(wondering) when you will fall off the edge!

Another issue to emerge relates to the competitive performance bonus in place for Semstate's most senior managers. CM needs to take account of reward systems and how these impact on knowledge sharing. The current structure, it could be argued, is pitting the most senior people against each other and if that happens it is bound to cascade downwards with certain individuals being rewarded at the expense of the team. One respondent posed the apt question:

If you had a performance bonus ... on your salary ... are you going to share your level of knowledge with me? It might be a different situation if I were retiring.

It is notable that every single senior manager interviewed made some comment regarding information and/or knowledge sharing in the context of continuity management. This was either a spontaneous comment or as a result of a supplementary question during the interviews. For some, a CM system would not succeed because people quite simply would not share information/knowledge. Seven of the ten in the group believed that there were various difficulties and

problems around the issue of knowledge sharing—one of the most vexed and complex research areas in the KM field.

I have worked with people who wouldn't tell you the time of day. They feel this is the way they control people. This is disastrous from a succession planning point of view.

Because knowledge has traditionally been considered power and because knowledge creation is difficult work, many people are very reluctant to share it without reward or recognition. The majority of those interviewed in this study believe that the present Semstate culture is not yet “right” for this type of sharing. Knowledge hoarding, however, represents a huge threat to CM. If the hoarder leaves there is no back up; and if the hoarder stays there is no added value as others waste time trying to locate such knowledge by other means—with deleterious effects on both organisational efficiency and effectiveness. It is probable that a serious investigation of the present culture, visualisation of the type of future culture demanded by changing times, and how to go from one to the other is a prerequisite for introducing a successful CM system in Semstate—and perhaps also in others.

4. Conclusion

This paper set out to explore the idea of introducing a CM system in Semstate, an organisation set to lose one third of its senior managers and a significant percentage of its workforce over the next five years. The main findings are that the senior managers interviewed were evenly divided on the question of opportunity versus threat; there is informal learning occurring in pockets where knowledge is certainly being transferred despite the fact that no formal CM system yet exists; there is a clear consensus in favour of introducing a CM system but this is pragmatically qualified by a clear recognition of the barriers, many of which support the research summarised by Beazley *et al.* (2002) outlined briefly above.

Introducing CM raises a number of serious issues, many of which have far reaching implications, not just for Semstate, but also for other organisations contemplating embarking on this road. Significant cultural

change is probably necessary if the requisite knowledge sharing and transfer is to occur. The Intellectual Capital issues raised in a CM context can also be expected to have serious implications for remuneration and reward structures. Succession planning, for example, emerged as a major concern for many people in this study—yet, there are no criteria at present by which successors can be selected. Competencies that take account of the entire scope of what is meant by IC (human, internal, external) need to be developed so that the requirements for management positions can be more open and transparent. CM is a new management function that requires integration with other management functions (such as KM and HRM/HRD) in order to be successful. Succession planning, coaching, mentoring and rotation all have some role to play.

The more critical a job is to the company, the more important it is that it be part of a knowledge continuity management system. You also need to consider such questions as how significantly poor productivity in the job would hurt co-workers or the company and the complexity of the knowledge needed to perform the job successfully. The more sophisticated and complex the knowledge a worker possesses, the more difficult it is to pass on—and the more crucial it is that it be passed on. (Field, 2003)

From a theoretical viewpoint, the difficulty in transcending any adaptive-inertial dialectic (Canella and Lubatkin, 1993) proves useful in that the general finding here is that getting the organisational culture right is a key first step in attempting to introduce a CM system. Without buy-in it will not succeed—and it is probable that this will require fairly radical cultural change, which is never easy. CM is not a quick fix, involves painstaking work, and takes time to complete and initially will probably represent a cost—longer term, however, the benefits are potentially substantial. Comments to the authors welcome.

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6. Appendix A: Interview Guide

- Do you think that senior staff in Semstate are easily replaced from inside if they leave?
- Do you think senior staff would be easily replaced from outside?
- Do you think this loss of senior people has any impact on our clients/customers in terms of service gaps?
- How? Can you elaborate briefly?
- What are the three (3) main sources of information that help you to do your job successfully?
- If you examine your own job, in percentage terms, how much of the knowledge that you need to do it is in your own head?
- What are the three most important things that you would highlight to your successor in knowledge terms, to help her/him to succeed in your present job?
- From your perspective, at what level in the organisation is the greatest threat, if there is one, in terms of discontinuity of knowledge in the organisation when people leave?
- What, if any, barriers would you envisage to the introduction of a continuity management system within Semstate?
- If you had a choice, what method would you suggest to pass knowledge on to your successor or new entrant into Semstate?
- Are you presently doing anything to harvest or codify your own knowledge and /or pass it on at any level to your successor?
- Do you believe Semstate should have a system in place to pass on such knowledge?
- Would such a system succeed?
- Yes? No? Can you elaborate a little

What is the K in KM Technology

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Abstract: This article addresses the problem of how technology adds value to an overall KM solution. It presents the core problem of KM as matching contexts using *knowledge attributes* and defines KM technology as that which manages knowledge attributes. The paper illustrates this by analyzing several positive and negative examples of technologies and presents two challenges for knowledge management as a field. The requirement for KM technology to manage knowledge attributes can be applied in designing effective KM solutions, selecting KM products, devising a proper KM strategy, and controlling investments in KM. The definition of KM technology also provides a focus for research to bridge gaps in technology that currently limit the widespread use of knowledge attributes.

Keywords: KM technology, knowledge attribute, knowledge representation, context matching.

1. Introduction

There are many knowledge management (KM) products in the market. It is often not clear to a KM practitioner whether a KM product is indeed one. In the present work, we propose to classify technologies and tools into KM and non-KM ones based on an analysis of knowledge and how it is managed in knowledge management. Much has been written about how either KM is the same as information management or that it is different from it only in levels of abstraction (Zack, 1999; Grey, 1998; Skyrme 1997). We begin by presenting an overview of an analytical model of knowledge management built upon studies of what knowledge is and how it is transferred from one person to another in an organization (Firestone, 2001; Fuller, 2002; Ruggles, 1997). We model KM as a problem of matching contexts using *knowledge attributes* and show the role of technology in doing this.

Knowledge management is essentially about *knowledge* and about the *transfer of knowledge*. In general, members of an organization possess different kinds of knowledge. The purpose of KM is to facilitate effective transfer of the knowledge to others who have a need for the knowledge in carrying out their responsibilities in the organization. Other activities such as capturing, storing and retrieving knowledge and its meta-data are merely instrumental to the core objective of transferring knowledge to needy members of the organization. For the purposes of the present discussion, we assume that the person who receives the knowledge is a rational agent with

sufficient capabilities to apply the knowledge effectively for the benefit of the organization.

In an ideal organization, anyone who needs some knowledge is always in close proximity (not just physically but also in terms of organizational roles and their relationships) to a person who possesses that knowledge. In reality, this is true to a significant extent only in small organizations. In large organizations, several other orthogonal or conflicting considerations prevent an organization from being structured exactly in the way prescribed above. For example, knowledge use may have to be geographically removed from the source due to conflicting needs of proximity such as to customers. In such organizations, there is a greater need for KM and KM technology and systems to bridge the resulting gaps in locations, time zones, languages, and cultures.

The model of KM described here is applicable to medium and large organizations (with approximately 100 people or more in its membership). This model is applicable to any organization or loosely formed community, although we sometimes refer to terms such as “business processes” or customers, since usually KM is most actively pursued in business organizations (Rao, 2003).

1.1 Modes of knowledge transfer and the role of technology

As stated above, a primary goal of knowledge management is to facilitate the transfer of knowledge from those who

possess it to other members of the organization who need it to carry out their business activities effectively. The original and time-tested means for transferring knowledge is *directly* from one member to another in a synchronous communication between the two. The actual transfer happens typically using spoken (and where necessary, supplemented with written) language as the medium wherein the “speaker” serializes (or linearizes) the knowledge (s)he possesses so that it can be expressed in the language and transmitted to the “listener” who interprets and integrates the information represented in the language into the rest of the knowledge that he or she possesses. An important feature of such a transfer is the interactivity inherent in conversation (Akmajian et al, 1990, see Chapter 9; Grice, 1975) that allows for a variety of mechanisms that make the transfer effective, such as seeking and obtaining clarifications, reverse transfer for the listener to confirm to the speaker that the transfer has been correct, reactive elaboration, implicit negotiation and agreement upon what part of the knowledge can be assumed to be the shared background between the two parties, and so on (van Dijk and Kintsch, 1983).

The effectiveness and efficiency of direct transfer through language are often enhanced by the use of other media such as nonverbal signs, gestures, diagrams and graphical aids (Crystal, 1987, see Part XI). Direct transfer of knowledge in an organizational setting can be one-way through teaching, training, and consulting. It can also be mutual through collaboration where both (or all) collaborating parties provide as well as obtain knowledge from others.

For all direct transfers, the scope and role of KM, in addition to providing the necessary communication infrastructure, is to manage the meta-data of who knows what in the form of an expertise directory that classifies what people know in a systematic way. KM can also facilitate direct transfer by setting up organizational groups (or communities) for ownership, nurture, and accumulation of knowledge in various areas of interest. A secondary role may be to capture some of the knowledge being transferred during collaboration so

that it can be shared in indirect ways at a later time as outlined below.

Direct transfer is very effective but not quite scalable due to time constraints, difficulties in synchronizing knowledge exchange, member attrition and widening geographical, cultural, linguistic, and time-zone spreads in a large organization.

Early inventions of writing, paper, and printing, further enriched by the more recent introduction of computers, computer networks, and their applications such as on-line storage and on-line communication, enabled indirect transfers of knowledge through written communication: books, papers, reports, e-mails, discussion forums, etc. In an indirect transfer, the communication can be asynchronous. The two parties may not know each other and may never meet each other. Traditional mechanisms for scaling up the scope of indirect transfers include publishing and libraries that can be considered early *knowledge dissemination systems*. With the introduction of computers, a member can use computer systems to browse through or search an on-line repository of organizational knowledge and obtain meta-data of others' knowledge.

Indirect transfer of knowledge also employs embodiments (i.e., serialization or linearization) in spoken or written language in addition to other graphical media (together referred to as *content*). However, the embodiments in this case are not generated dynamically at the time of transfer; rather, they are captured and stored by a knowledge management system. Moreover, they must necessarily be accompanied by sufficient meta-data such as ontological classifications (Rosch, 1978; Sowa, 1999; Web Ontology Language (OWL), <http://www.w3.org/TR/2004/REC-owl-guide-20040210/>), background axioms, contextual descriptions and constraints on applicability. This is necessary in the absence of conversational negotiations and nonverbal communication that characterize direct transfers. The lack of such human communication mechanisms necessitates the additional attributes that enable efficient selection of knowledge sources that are both relevant and applicable to the context of a knowledge need in the organization. Relevance

(Baeza-Yates and Ribeiro-Neto, 1999; Salton, 1983) is a measure of how well the subject areas of a knowledge source match those of the present knowledge need. Applicability or usability is a measure of how easily and how effectively a relevant match can be used to satisfy the knowledge need. A knowledge source may be highly relevant yet have low applicability due to a variety of reasons such as its assumed background, lack of clarity, being too specific to the prior context, differences in language or organizational sub-cultures, being out of date, etc.

Indirect transfer has two basic requirements:

- An agent to store and manage sufficiently rich meta-data and make it available to needy members. Agents can be a publisher, a library, or an information store such as websites, KM systems, or an on-line discussion forum.
- A mechanism for identifying an embodiment of knowledge and matching it against future knowledge needs of members. Each embodiment of knowledge must have a signature the attributes of which can be readily matched with the requirements of a member.

As already noted, large organizations cannot adopt an ideal structure where every knowledge need arises in the immediate neighborhood of an appropriate knowledge source. It is insufficient to merely facilitate direct knowledge transfer by providing communication infrastructure and expertise directories. While these can overcome geographical distances to a large extent, they cannot adequately address cultural, linguistic, and time-zone gaps. KM in such organizations must necessarily lean heavily on indirect transfer mechanisms.

2. The KM problem

A knowledge need may arise as a part of any organizational process. For example, a knowledge need may arise in understanding the market, answering a customer's queries, designing a solution to a problem, or planning an event. In a small organization, how to obtain the necessary knowledge to satisfy the need is usually apparent to the person responsible for the process. For example, the person may

know whom to ask in the organization to obtain the right knowledge. In large organizations, it is unlikely that the person will know everybody else or every 'place' in the organization (physical, such as libraries and file cabinets with records, or virtual, such as intranet websites, databases, and digital repositories) so as to determine the right person or place from whom to seek the knowledge. There is hence a need for KM technology and systems to bridge the gap and help the person match the context of the present knowledge need to stored contexts (of previous acquisition or use) most relevant to the present context.

Knowledge management involves capturing content that embodies knowledge as well as meta-data that identifies and describes the knowledge, storing and retrieving them, and motivating members of the organization to contribute, seek and re-use such content and meta-data. It may be noted here that some other activities concerning knowledge, primarily knowledge creation and acquisition, involve organizational functions such as education, training, human resources management, corporate acquisitions, etc, which are normally considered to be outside the scope of knowledge management. While each of these activities poses challenges for technology, organizational processes, and people management, they are merely instrumental to the core purpose of KM which is to re-use knowledge effectively to derive benefits for the organization. Re-using knowledge involves finding the right piece of knowledge in the context of a given knowledge need. This is a nontrivial problem in a large organization where a typical context of re-use has a number of potential matching prior contexts (or appropriate generalizations and abstractions of such contexts) in which the organization obtained or used knowledge. Thus, the core problem for KM in a large organization is one of matching the context of a knowledge need to a number of prior contexts so as to identify ones that are most relevant to the present need. The prior context may be one of acquiring the knowledge in the form of codified content (e.g., a document published within or outside the organization), of capturing the meta-data about the expertise possessed by a member of the organization, or of having applied knowledge to satisfy a

execute a plan, to make a decision or to explain an action. For purposes of KM, knowledge does not mean the deductive or inferential closure of predications. It also includes explanations, interpretations, and annotations on the predications that may be important for relevance and applicability.

The continuum from data to knowledge constitutes a subsumption hierarchy in that information is also data and knowledge is also information. That is, a piece of information can always be considered data but not vice versa. Similarly, knowledge is always information. In view of this, we take the liberty of using the term data below when we need to refer to any of data or information or knowledge (as might be apparent from the use of the term data in meta-data (e.g., Dublin Core Metadata Initiative, <http://www.dublincore.org>) which is further classified below into attributes at the three levels).

Any data that is captured and stored must be accompanied by sufficient meta-data (or data about the data) to be applied usefully in future contexts. Meta-data can be considered to be a set of attributes of the data. For the present purposes, we can ignore the difference between attributes and relations and include binary or n-ary relations in the set of 'attributes'. We propose to classify the attributes into the following three levels:

- *Data Attributes:* meta-data attributes at this level include attributes such as record structure, syntax, size, encoding, etc.
- *Information Attributes:* at the information level, attributes include language, dialect, version, template and format, author's name, date, previous usage statistics, ISBN and other classification numbers, a Resource Definition Framework (RDF, <http://www.w3.org/RDF/>) description, an expert's telephone number and addresses, etc.
- *Knowledge Attributes:* At this level, the attributes describe the knowledge itself as well as its applicability in a context. Attributes that describe the knowledge itself include aboutness, gist, ontological mappings and Web Ontology Language (OWL, <http://www.w3.org/TR/2004/REC-owl-guide-20040210/>) specifications. Aboutness (Bruza, et al, 1999) is a

generalization of the idea of subject or topics. Instead of merely placing the piece of knowledge in one or more bins of a classification system, aboutness enables one to answer the question "is this about x" where x may be a complex description of a context (e.g., a logical combination of several subjects with various further restrictions, conditional relaxations of constraints, etc.). A gist (Wical, 1999), as opposed to an abstract or a summary, need not be a condensed piece of text. Rather, it can be a complex representation of the essential contents of a piece of knowledge that can enable the user to visualize the contents from any chosen point of view. Knowledge attributes concerned with its applicability include the intended target audience, background assumed, ratings and reviews, author's knowledge profile, conditions or constraints to be considered in applying the knowledge, etc.

Knowledge attributes enable better matching of contexts and more effective application of the knowledge by:

- normalizing against differences in language and usage, culture and views of the world, terminologies used, and domains of interest.
- providing grounding for a knowledge asset in the space of all knowledge present in the organization by linking it implicitly with other assets in related areas or through other similarities in knowledge attributes (e.g., in terms of applicability)
- taking the KM solution beyond the content of knowledge by representing attributes of applicability of knowledge to specific contexts of re-use

An important distinction between knowledge and information attributes is that while data and information attributes are about the *container* or embodiment of the knowledge (i.e., a knowledge asset such as a document or a person), knowledge attributes are about the knowledge *contained* in the container.

3.1 Knowledge representation in KM

An important consideration that arises in the context of KM is related to the principles that distinctively define the

properties and specific forms of representation of the knowledge that is managed. For example, what should be the nature and properties of the representation of knowledge that effectively enable its exchange in an organization, as distinct from, say, data and information exchange? While recognizing that this question is of fundamental significance to the area of knowledge management, it is of interest to note that the notion of knowledge representation (KR) has its origins in the classical debates of artificial intelligence (AI) and cognitive sciences (Barr and Feigenbaum, 1981; Brachman and Levesque, 1985; Davis, et al, 1993; Minsky, 1975; Sowa, 1999), whose elements are therefore germane to the present discussion. In the following, we describe this briefly, and define KR in the context of KM through an exploration of the differences between the basic intents of the two fields.

AI and cognitive sciences find it useful to understand KR through the different roles played by a representation (Barr and Feigenbaum, 1981; Davis, et al, 1993). Accordingly, a KR may be considered to be a surrogate used by an agent to reason about the world, inhere and create (a series of) ontological commitments in the agent, be a model that supports reasoning with both sanctioned and recommended sets of inferences, function as a medium of computation, and be a language in which humans express statements about the world. Given the need for ensuring 'reasonably' sound inferences, the basic tools for representation (for e.g., logic, rules, frames, semantic nets) permit of different reasoning models, arising from mathematical logic (e.g., first order logic), cognitive psychology (e.g., goals, plans and complex mental structures) (Johnson-Laird, 1983), biology (e.g., connectionism, geneticism), statistics (e.g., probability theory) and economics (e.g., rationalism and utility theory). It is in the representation of knowledge based on the broad perspective described above – and utilizing minimalist forms to ensure deductive or inferential closure of predications – that AI provides a formal basis for automated reasoning (as may be implemented in an intelligent machine) which, in theory at least, is capable of mirroring and replicating, or modeling and explaining, the human reasoning process.

However, since a fundamental assumption of KM is that discourse forms the essential means of providing semantics in knowledge exchange, knowledge, as noted earlier, does not mean only the core axioms and predications. Furthermore, given that knowledge itself is considered an internalization of the representation in the transferee's mind, the burden of reasoning and the associated computing is largely transferred to his/her cognitive structures (Barsalou, 1992; Jackendoff, 1983). Such internalized knowledge enables the user to act by applying it in a relevant context to execute plans and achieve goals. Internalization (or assimilation) may involve integration with one's conceptual and episodic/experiential memory through association, generalization, tuning of existing knowledge, etc.

Hence, in KM, the need for a representation to support formal reasoning with both sanctioned and recommended sets of inferences, and the need for it to function as a medium of computation are significantly diluted. Thus unburdened, the role of KR in KM can be stated by defining *a knowledge representation as the set of knowledge attributes necessary for efficiently finding relevant and applicable matches for the context of a knowledge need.*

It may be observed that the concept of KR in knowledge management is more in line with recent applications of this concept in the development of the semantic web (<http://www.w3.org/2001/sw>, the semantic web homepage); although presently these applications are to the large part concerned with information level representation except for the ontology based classification of subject matter.

Apart from representing knowledge attributes, for supporting indirect knowledge transfer, KM requires knowledge itself to be represented, albeit in less formal or semi-structured embodiments such as natural language texts or other media. In the case of direct transfer, the knowledge itself may not be represented at all outside of what is attributable to the human experts who possess the knowledge.

Knowledge representations can be designed, stored, secured, transformed, enhanced, etc. In other words, they can be "managed". Knowledge itself can be acquired, augmented, represented (at least partially) and shared, apart from being used (i.e., applied in action).

In light of the above, a useful definition of knowledge management is

the strategic management of knowledge representations and people in an organization using technology and processes to optimize knowledge sharing.

3.2 Data, information and knowledge attributes: an example

Consider the following example that illustrates the differences between a data management system, an information management system, and a knowledge management system.

A data management system may store employee data such as employee numbers, names, departments, and email addresses (Table 1). This data can be retrieved by writing an appropriate query in a machine-readable language like SQL.

Table 1: Numerical and string data about employees in MyCompany

Employee Number: Integer(4 bytes)	Name: String	Department: Enumeration (from DepartmentTable)	Phone number: String of digits	Email address: String (*@*)
123	Helpdesk	MIS	111 2233	help@mis.MyCompany.com
234	John Doe	MIS	111 2244	John234@MyCompany.com
345	Jane Doe	MIS	111 2255	Jane345@MyCompany.com
456	KIA (Knows It All)	MIS	111 2266	KnowsItAll@mis.MyCompany.com

This data is useful only when it is interpreted in an appropriate context to provide information to users. For example, the numbers and strings in the above table can be interpreted to generate information that can answer questions (or information needs) of the kind "How do I contact Mr. X?"

A more involved example of an information need may be: "How can I contact the MIS department?" This involves a more complex translation of the question to arrive at an appropriate data retrieval query. The translation can be done by humans or by computer systems (i.e., information management systems). In either case, this is still an information need and an appropriate answer given the above data may be: You can call their

helpdesk at 111 2233 or email to help@mis.MyCompany.com

However, to meet knowledge needs, new attributes have to be introduced. Consider a knowledge need, such as: "How do I find out about MyCompany's prior credentials and experience in xyz technology?" In the context of this knowledge need, the person who has the need may have a goal such as: "Sell some product or service in xyz technology to a customer." His or her plan for satisfying the goal may involve a step such as: "Present prior customer credentials in xyz technology to the customer." In trying to carry out this step of the plan, the person may generate the knowledge need: "How do I find out about prior customer credentials in xyz technology?"

Table 2: Representation of knowledge attributes of experts in MyCompany

Employee No. (from Employee Table)	Knows about <ontology-nodes>	Expertise rating	Knowledge-sharing cases
123			
234	databases	70%	Case1, Case457
345	Japan	90%	Case2, Case3
456	xyz, past customers	80%	Case23
...			

Let us assume for the purposes of this illustration that the organization does not contain any documentation of prior

customer credentials but that it has several people who possess that knowledge. An appropriate answer to the

knowledge need in this context may be: "Consult Mr. KIA in MIS. His phone number is 111 2266 or email him at KnowsItAll@mis.MyCompany.com"

What does a system need in order to generate the above answer? It needs knowledge representations of the kind shown in Table 2 above. Knowledge attributes such as the areas of expertise of employees such as Mr. KIA knowing about the area of prior customer credentials, ranking and ratings of everyone's expertise in the areas, cases of previous knowledge sharing by them in the areas, etc.

A system that can manage such knowledge attributes and answer the knowledge need is a knowledge management system. The system that answered the information need above is not a KM system since it did not match present and prior contexts at the knowledge level. That system could satisfy the above knowledge need only if the person already knew that Mr. KIA in MIS is a good source of knowledge of prior customer credentials in xyz technology. Similar and more capable technologies for handling knowledge attributes are needed to support KM through indirect transfer.

4. What is KM technology

The term KM technology is often used loosely to include any technology that is used in an overall KM solution, such as a variety of information and content management, communication and collaboration technologies. The few attempts made to put KM technology on firm foundations (e.g., Ruggles, 1997, see pp. 3-4; Tiwana, 2000), however, do not seem to be able to clearly delineate the particular qualities that characterize KM technologies.

As may be apparent from the example above, KM technology uses the same enabling technologies such as pattern matching, data base retrieval, and communication over TCP/IP networks as data processing and information management systems. The difference is entirely in the nature of the attributes managed by the systems.

Any KM technology obviously enables knowledge sharing among the members of

an organization. More importantly, however, a **KM technology** is one that *enables sharing of readily updatable knowledge by efficient matching of present and prior contexts using knowledge attributes*.

This is not to say that information attributes are unimportant to KM; often, attributes such as the language that a knowledge source speaks (a document or a person) or its degree of verbosity, can be an important factor in determining its relevance and applicability to a knowledge need. Nevertheless, information attributes themselves are not sufficient to provide efficient matches of available knowledge to meet knowledge needs.

It may also be noted here that although commonly available communication and collaboration technologies (telephones, electronic mail, message/messenger services, etc.) as well as traditional information distribution media (newspapers, printing and publishing, radio, television, audio and video records, etc.) enable sharing of knowledge, they do not qualify as KM technologies since they do not manage knowledge attributes adequately to meet the knowledge needs of large organizations. Traditional publications in the form of books and journals, in particular, do not enable dynamic knowledge sharing through quick and easy updates. In order to optimize the sharing of knowledge to meet knowledge needs as they arise in an organization, a KM solution must allow the most current knowledge, however informal or ill-packaged it is, to be shared without an undue delay.

Table 3 applies the above definition of KM technology to a number of technologies and states the conditions under which a particular technology is a KM technology, or the reasons why it is not.

Table 3: Illustrative positive and negative examples of KM technology

	Technology	KM √ / Non-KM ×	Why not KM or KM only if
1	Coffee cup, water cooler, ...	×	do not manage any knowledge attributes
2	Telephone/voicemail/instant messenger	×	only an enabling technology for communication
3	Spreadsheet	×	manages only data and data attributes
4	Database	×	manages data and data/information attributes
5	Email	×	does not typically manage any knowledge attributes of the contents of the messages
6	Email question auto-answering system	√	is able to match the knowledge needs expressed in a question to prior (or frequently answered) question-answer pairs
7	On-line discussion forum, community of practice, agony aunt columns in newspapers...	√	for e.g., search/navigation is supported through ontology nodes and specifications of applicability and relevance
8	Chat/whiteboarding/project sharing	√	is able to capture sessions and classify them automatically using knowledge attributes
9	Content management	√	supports knowledge-level functionality such as auto-classification of content against ontologies, retrieval by aboutness and extraction of gists
10	Expertise directory	√	provides matches by subject areas, level of expertise, reviews and ratings, etc
11	Knowledge discovery, data mining, ...	√	automatically discovers knowledge to fill gaps in knowledge repositories
12	Intelligent agent, ibot, ...	√	for e.g., is agent for K-attribute elicitation from those having knowledge needs, intelligent agent for conversational negotiation with KM systems
13	Web server, portal, ...	×	manages only content
14	Traditional library	×	knowledge is not readily updatable
15	ERP system	×	manages data and data/information attributes
16	Document security package	×	prevents knowledge sharing in some cases
17	Collaborative authoring tool	×	handles only information attributes
18	E-learning system	×	currently, unable to represent and manage learning objectives or evaluate students at the knowledge level
19	Search engine	×	provides matches using only information attributes
20	On-line review and rating system	√	generates applicability attributes

5. Challenges for KM

The ideas of knowledge attributes and their use in KM tools for effective knowledge sharing can be applied to pose two challenges to the field of KM:

- **Cultural challenge:** How to get people in an organization to appreciate the value of knowledge attributes and how to motivate them to put in the effort required, if any, to generate or extract knowledge attributes and use technology that exploits knowledge attributes? Reasons for not using knowledge attributes may be complacency, apathy, lack of awareness, lack of

understanding or proof of their value, or technology not yet being up to the mark.

- **Technological challenge:** How to build KM systems that make effective use of knowledge attributes to enrich user interactions with systems on the lines of human conversational interactions? Hurdles in research and development directed towards this goal include too much hype and confusion in KM product markets (Wilson, 2002), lack of conviction and funding, and significant gaps in necessary technology.

Humans can, for example, instantaneously determine the relevance of a text to a context, or effortlessly capture the gist of a document from a desired point of view. In terms of creating similar abilities in systems, there have been a few somewhat successful attempts to build technology that can automatically derive knowledge attributes from information attributes, often using statistical techniques with ample amounts of empirical training (e.g., automatic theme and gist extraction and automatic conceptual classification). In general, however, in today's state of the art of technology, keyword searches, extracted summaries (Mani and Maybury, 1999), and pigeonhole classifications continue to be readily accepted as KM technology. For KM to clearly demonstrate value to large organizations, there is an urgent need to appreciate that KM technology should be able to do more.

A related challenge for KM systems is to prevent fragmentation of knowledge in growing organizations where knowledge sources tend to become either disconnected or incompatible with each other. Preventing fragmentation requires certain knowledge attributes (e.g., taxonomy, applicability attributes) to be centrally managed. This poses both cultural and technological challenges, for e.g., in creating and managing a unified classification system with multiple views for different constituencies in the organization. KM systems, on the other hand, ought to be decentralized or loosely federated and not only well-integrated with all enterprise information systems but also modularized and easily distributable to keep pace with changing organizational needs.

6. Conclusion

KM can benefit from technology that manages knowledge attributes as well as from a variety of non-KM enabling technologies for communication, information management, and others. Understanding what is managed by KM technology is essential to the proper design of KM solutions and selection of KM products. This understanding also enables us to focus on the effectiveness of managing knowledge in an organization rather than continuing to expect returns from an inadequate KM solution such as a simple combination of a search engine, an

intranet portal, and an on-line chat system. It allows the organization to devise a proper KM strategy and control its investments in KM. One can also use the idea of knowledge attributes as a basis to develop a model of assessing the maturity of KM implementations and for providing diagnostic feedback on improving the maturity. The definition of KM technology provided in this paper also provides a focus for research in KM technology to bridge the gaps that currently limit the widespread use of knowledge attributes.

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Transformational and Transactional Leadership Predictors of the 'Stimulant' Determinants to Creativity in Organisational Work Environments

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Abstract: This paper examines the relationship between the leadership dimensions associated with Bass's (1985) model, and the 'stimulant' and 'obstacle' determinants of the work environment for creativity. There are three major findings in this research. First, the relationship between transformational and transactional leadership and the 'stimulant' determinants of the work environment for creativity is significant and positive. Second, the 'obstacle' determinants of the work environment for creativity are negatively related with both transactional and transformational leadership. Finally, transformational leadership is more strongly correlated than transactional leadership with the 'stimulant' determinants of the work environment for creativity. Thus, transformational leadership is an increasingly important aspect in today's organisations in creating a corporate culture and the work environment that stimulates employees' creativity and innovation.

Keywords: creative work environment ♦ innovation ♦ knowledge management ♦ organisational creativity ♦ transformational and transactional leadership.

1. Introduction

'Create, innovate or die!' That has increasingly become the rallying cry of today's managers. In a dynamic world of global competition, organisations must innovate and create new products and services and adopt state-of-the-art technology if they are to compete successfully (Kay, 1993; Richards, Foster & Morgan, 1998). In general usage, creativity means the ability of people, and hence the ability of employees, to combine ideas in a unique way or to make unusual associations between ideas (Amabile, 1996; Reiter-Palmon & Illies, 2004). Consequently, organisations need to create a climate that encourages and stimulates employees' creative thinking (Amabile, 1988; Goldsmith, 1996). In other words, organisations must try to remove work and organisational barriers that might impede creativity. By doing so, they may replace employees' traditional vertical thinking with zigzag or lateral thinking and might promote divergent thinking by breaking or even challenging the mental models in an individual, and sometimes treating problems as opportunities (Rickards, 1990).

As a result, researchers have become increasingly interested in studying environmental and work factors conducive to creativity and innovation (Amabile, Conti, Coon, Lazenby & Herron, 1996; Ford, 1996; Oldham & Cummings, 1996). Theory and research suggest that

employees have creative potential if we can learn to unleash it. Creative potential might be unleashed when employees are given adequate resources to conduct their work (Delbecq & Mills, 1985), when their work is intellectually challenging (Amabile & Grysiewicz, 1987), when they are given high level of autonomy and control over their own work (King & West, 1985), and when they given intrinsic task motivation (Robbins, 2003). In relation to leadership and intrinsic motivation, a study by Tyagi (1985) of 168 life insurance salespersons showed that supportive and facilitative leadership accounts for 38 percent of the variance in salespersons' extrinsic motivation and only 16 percent of their intrinsic motivation. Thus, one cannot immovably suggest that supportive leadership will enhance employees' creativity through intrinsic motivation. Moreover, although Amabile and Grysiewicz (1987) revealed that leader's enthusiasm, interest, and commitment to new ideas and challenges encouraged scientists' creativity, leadership has not been treated as a particularly important influence on creativity (Mumford, Scott, Gaddis & Strange, 2002).

Overall, the literature linking leader behaviours to individual creative performance is scant (Amabile, Schatzel, Moneta & Kramer, 2004), and the literature linking transformational and transactional leadership to work environment dimensions that are most

conducive to creativity and innovation is even smaller. To this end, this research started by asking the following questions. To what extent will leaders, who provide adequate resources and delegate authority to their subordinates, affect the determinants of the creative work environment, which in turn, affect creativity and innovation? Which leadership styles best supports the 'stimulant', and which, supports the 'obstacle' determinants of the work environment for creativity. Do leadership behaviours have at all an effect on removing work and organisational barriers that might impede creativity? The answers to these questions are some of the objectives of this paper.

The research reported in this study investigates the relationship between transformational and transactional leadership and the determinants of the creative work environment. The study involves a questionnaire-based survey of members of self-managing teams from a high technology organisation operating in the United Arab Emirates.

2. Literature review

2.1 Models of creativity – the work environment for creativity

Current views on organisational creativity focus on the outcomes or creative products (i.e. goods and services). A creative product is defined as one that is both (a) novel or original and (b) potentially useful or appropriate to the organisation (Amabile, 1996; Ford, 1996; Mumford & Gustafson, 1988). Various factors contribute to the generation of creative products, both at the individual and organisational levels (Mumford & Gustafson, 1988).

At the individual level, an extensive body of research suggests that individual creativity essentially requires expertise, creative-thinking skills, and intrinsic task motivation (Amabile, 1997). Expertise refers to knowledge, proficiencies, and abilities of employees to make creative contributions to their fields. Creative-thinking skills include cognitive styles, cognitive strategies, as well as personality variables that influence the application of these creative-thinking skills. Task motivation refers to the desire to work on something because it is interesting,

involving, exciting, satisfying, or personally challenging. Task motivation is crucial in turning creative potential into actual creative ideas (Robbins, 2003). Studies confirm that the higher the level of each of these three components, the higher the creativity.

At the organisational level, researchers have also included individual characteristics as part of the broader framework explaining creativity in the work place. Woodman, Sawyer and Griffin (1993), included personality variables, cognitive factors, intrinsic motivation, and knowledge in their model of organisational creativity. Yet, research in social psychology suggests that supportive behaviour on the part of others in the work place (i.e. co-workers and supervisors) enhances employees' creativity (Amabile et al., 1996; Oldham & Cummings, 1996; Tierney, Farmer and Graen, 1999). Other areas of research have suggested that organisational support and evaluation of new ideas is necessary to encourage employees' creativity (Kanter, 1983). Rewards and bonuses were also reported as essential ingredients in the process of creating a creative work environment (Amabile et al., 1996). Moreover, it has been suggested that there are factors (i.e. internal political problems, conservatism and rigid formal structures) that could impede creativity amongst individuals (Amabile & Grysiewicz, 1987).

The above literature suggests that individual creativity is a complex phenomenon that is influenced by multiple individual-level variables as well as contextual and environmental variables. The focus then of individual creativity is on the specific contextual variable of leadership and on the theories of organisational creativity – the componential theory of Amabile (1988), the interactionist theory of Woodman et al. (1993), and the multiple social domains theory of Ford (1996) – all of which include the work environment as an influence on employee creativity.

In relation to the environmental variables, Amabile et al.'s (2004) componential theory of creativity is the only theory that specifies *creativity features* that contribute to the perceived work environment for creativity. But, how can organisations assess the dimensions of the perceived

work environment that might influence employees' creativity? Amabile and colleagues (1996) have drawn on the literature of creativity and developed an instrument which assesses the dimensions of the work environment that have been suggested in empirical research and theory as essential for organisational creativity. This instrument is referred in the literature as KEYS. Eight determinants (dimensions) of the work environment for creativity are measured by KEYS (Amabile, 1995). Of the eight, six are referred to as 'stimulant' dimensions and have a positive (+) influence on the creative work environment, while the remaining two are referred to as 'obstacle' dimensions and have a negative (-) effect (Amabile et al., 1996). The eight determinants, and the main areas covered by each, are shown in the Appendix.

In relation to leadership it is suggested that leadership is a crucial variable contributing to the culture and climate of the organisation and perception of support for creativity and innovation (Amabile & Gyskiewicz, 1989; Cummings & Oldham, 1997; Mumford, Whetzel & Reiter-Palmon, 1997; Mumford et al. 2002). Therefore, there must be a dynamic interaction between leadership and creativity in a way of supporting, encouraging and energising the perceptions and behaviours of employees that influence the creative work environment.

2.2 Specific leader behaviours and creativity

The literature over the past 30 years has documented the importance of perceived leader support for subordinate creativity (For a review, see Mumford et al., 2002). Studies have demonstrated that team members' collective view of support from their leader is associated with the team's success in creative endeavours (Amabile & Conti, 1999; Amabile et al. 1996). But which leadership style best supports subordinates' creative thinking? Is it the Stogdill's (1974) Ohio Studies of initiating structure and consideration? It is the Blake and Mouton's (1964) task-orientation and relationship-orientation leadership? Is it the Vroom and Yetton's (1973) participative leadership, or the Bass's (1985) transformational and transactional leadership?

A review of the literature suggests that neither the classic Ohio two-factor leadership model, nor the Ekvall (1991) relationship-orientation, and change-orientation leadership, can easily accommodate the facilitator kind of leadership that is needed for creativity. The literature suggests that a leadership role of a facilitative kind fosters the generation of new (creative) outputs (Ekvall, 1991). It is also reported that supportive, no-controlling supervision, enhances creativity (Oldham & Cummings, 1996), and employees are more creative when they are given high levels of autonomy (King & West, 1985). From the above literature one can argue that creative leadership style seems to have much in common with Bass's (1985) transformational leadership (Rickards & Moger, 2000). It is thus, reasonable to expect that the leadership style that focuses on specific techniques, such as, involving employees in the decision-making process and problem-solving, empowering, and supporting them to develop greater autonomy, coaching and teaching them, and helping them to look at old problems in new ways (Burns, 1978; Bass, 1985, 1990), is essential to influence the behaviour of employees in creating a work environment conducive to creativity. The leadership style focusing on such specific techniques is known as 'transformational' leadership. Consequently, the dimensions of transformational and transactional leadership were employed to predict the determinants of the creative work environment.

2.2.1 Transformational and transactional leadership

Transformational and transactional leadership dimensions were derived from Bass's (1985) theory and research. Transformational leaders are those who "inspire followers to transcend their self-interests and who are capable of having a profound and extraordinary effect on followers" (Robbins, 2003: 343). On the other hand, transactional leaders are those who "guide or motivate their followers in the direction of established goals by clarifying role and task requirements (Robbins, 2003: 343). Bass (1985) developed the multifactor leadership questionnaire (MLQ-Form 5), which measures five leadership factors.

The five factors tapped by the MLQ-5 include: *charismatic behaviour*, *individualised consideration* and *intellectual stimulation*, forming the transformational leadership dimension. *Contingent reward* and *management-by-exception (MBE) passive*, forming the transactional leadership dimension. The following definitions are taken from Hater and Bass (1988: 696).

Transformational leadership

- *Charismatic behaviour*: 'the leader instills pride, faith, and respect, has a gift for seeing what is really important, and transmits a sense of mission'.
- *Individualised consideration*: 'the leader delegates projects to stimulate learning experiences, provides coaching and teaching, and treats each follower as individual'.
- *Intellectual stimulation*: 'the leader arouses followers to think in new ways and emphasises problem solving and the use of reasoning before taking action'.

Transactional leadership

- *Contingent reward*: 'the leader provides rewards if followers perform in accordance with contracts or expend the necessary effort'.
- *Management-by-exception passive*: 'the leader avoids giving directions if the old ways are working and allows followers to continue doing their jobs as always if performance goals are met'.

A review of the literature suggests that subordinates' creativity is a function of their perceptions of the general work environment for creativity, which is, in turn, a function of their relationship with the leader; a leader who is characterised by trust, mutual linking, and respect (Zhou & Shalley, in press). The foundation of creative leadership then is based on specific leader behaviours akin to relationship-oriented ("consideration") and transformational leadership (Rickards & Moger, 2000). Moreover, Jones (1996) suggested that the leader with hierarchical attitudes (i.e. diametrically opposite to creative leader) will create a rigid formal structure which blocks dialogue and hence creativity. It is thus reasonable to hypothesise that the factors representing the 'stimulant' components of the creative

work environment will be more strongly, and more positively correlated with the factors of transformational leadership, than will be the factors representing the 'obstacle' components of the creative work environment. The assumed connectedness between transformational leadership and the determinants of the work environment for creativity is expressed in Hypothesis 1.

Hypothesis 1: Correlations between each of the transformational leadership behaviours and the 'stimulant' determinants of the creative work environment will be stronger, and more positive, than those with the 'obstacle' determinants of the creative work environment.

Moreover, Amabile and colleagues (2004) have provided empirical evidence suggesting that team leader supportive behaviour, which includes both task-oriented and relationship-oriented support, is an important aspect of the perceived work environment for creativity. It is thus plausible to predict that the factors representing the 'stimulant' components of the creative work environment will be more strongly, and more positively correlated with the factors of transactional leadership, than will be the factors representing the 'obstacle' components of the creative work environment. The assumed connectedness between transactional leadership and the determinants of the work environment for creativity is expressed in Hypothesis 2.

Hypothesis 2: Correlations between each of the transactional leadership behaviours and the 'stimulant' determinants of the creative work environment will be stronger, and more positive, than those with the 'obstacle' determinants of the creative work environment.

3. Subjects and procedure

3.1 Sample and procedures

Sample: The study focused in a service organisation operating in the United Arab Emirates (UAE). Nine departments involved in communications technology have participated in the study, all of which are recognised for their creativity. Respondents were full-time employees of the participating departments and

volunteered to participate in the study. Questionnaires, written in English, containing items measuring the determinants of the creative work environment and the dimensions of transformational/transactional leadership were distributed to 173 members of self-managing teams in the nine departments. One hundred eighteen (118) employees returned usable questionnaires; yielding a 68 percent response rate. Most were from the new product development (57 percent), and customer service (17 percent) departments. The remaining ones were spread among various other areas including education/training, consulting, etc (26 percent). The majority were within the 21-30 age group (81 percent). Given the relatively young age of the sample, the level of work experience is accordingly low. Eighty two (82) percent of the respondents have had five or less years of work experience. The respondents were 6 percent female and 94 percent males and all had either a technical or university qualification taught in the English language. Anonymity was guaranteed and no names or other identifying information was asked.

Procedures: Survey questionnaires were pre-tested, using a small number of respondents (about one dozen; the pre-test participants did not participate in the final data collection). As a consequence of the pre-testing, relatively minor modifications were made in the written instructions and in several of the demographic items. The revised survey was then administered to the respondents of the nine departments in their natural work settings. Written instructions, along with brief oral presentations, were given to assure the respondents of anonymity protection and to explain (in broad terms) the purpose of the research. The participants were all given the opportunity to ask questions and were encouraged to answer the survey honestly; anonymity was guaranteed and no names or other identifying information was asked.

3.2 Analytical procedure

Confirmatory factor analyses (CFAs) were performed using the analysis of moment structures (AMOS, version 5) software (Arbuckle, 2003) for the factor analysis of the measurement models. Using CFAs, we assessed the validity of the measurement models of the variables

used in the paper. A mixture of fit-indices was employed to assess the overall fit of the measurement models. The ratio of chi-square to degrees of freedom (χ^2/df) has been computed, with ratios of less than 2.0 indicating a good fit. However, since absolute indices can be adversely effected by sample size (Loehlin, 1992), four other relative indices, the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), the comparative fit index (CFI), and the Tucker and Lewis index (TLI) were computed to provide a more robust evaluation of model fit (Tanaka, 1987; Tucker & Lewis, 1973). For GFI, AGFI, CFI and TLI, coefficients closer to unity indicate a good fit, with acceptable levels of fit being above 0.90 (Marsh, Balla & McDonald, 1988). For root mean square residual (RMR), and root mean square error approximation (RMSEA), evidence of good fit is considered to be values less than 0.05; values from 0.05 to 0.10 are indicative of moderate fit and values greater than 0.10 are taken to be evidence of a poorly fitting model (Browne & Cudeck, 1993).

Given adequate validity of those measures, we reduced the number of indicator variables by creating a composite scale for each latent variable (Politis, 2001). These scales were subjected to a series of correlational and regression analysis.

4. Results

4.1 Measurement models

The variables that we measure on the survey are: transformational and transactional leadership, and the determinants of the work environment for creativity.

4.1.1 Independent variables

Transformational and *transactional* leadership measures were assessed using Bass's (1985) 73-item multifactor leadership questionnaire (MLQ-Form 5). The MLQ-5 questionnaire employs a 5-point response scale (0 = not at all; 4 = frequently if not always) and consists of five subscales: three subscales forming the transformational leadership (i.e. charismatic behaviour, individualised consideration, and intellectual stimulation), and two subscales forming the transactional leadership (i.e. contingent

reward and management-by-exception). We conducted CFA of all MLQ items in order to check for construct independence. We first fit a five-factor model to the data, corresponding to that proposed by Bass. The fit indices of CFI, AGFI, CFI, TLI, RMR, and RMSEA were 0.91, 0.96, 0.97, 0.89, 0.05, and 0.07, respectively, suggesting that the five factor model provides a good fit. Thus, the data supported the independence of five factors, namely, charismatic behaviour ($\alpha = 0.91$); individualised consideration ($\alpha = 0.85$); intellectual stimulation ($\alpha = 0.78$); contingent reward ($\alpha = 0.87$); and management-by-exception ($\alpha = 0.67$). Twelve items of the MLQ were dropped due to cross loading and/or poor loading of the order of, or less than 0.11.

4.1.2 Dependent variables

Determinants of the work environment for creativity made up of eight subcategories, namely, organisational encouragement, supervisory encouragement, work group supports, freedom, sufficient resources, challenging work, workload pressure, and organisational impediments. These categories were assessed using Amabile et al.'s (1996) 66-item instrument (KEYS). The instrument employs a 4-point response scale (1 = never; 4 = always). We conducted CFA of all KEYS items in order to check for construct independence. We first fit an eight-factor model to the data, corresponding to that proposed by Amabile et al. (1996). The fit indices of CFI, AGFI, CFI, TLI, RMR, and RMSEA were 0.88, 0.90, 0.93, 0.89, 0.06, and 0.08, respectively, suggesting that the eight factor model provides a reasonable fit. Thus, the data supported the independence of eight factors, namely, organisational encouragement (8 items, $\alpha = 0.83$), supervisory encouragement (7 items, $\alpha = 0.85$), work group support (8 items, $\alpha = 0.77$), freedom (3 items, $\alpha = 0.67$), sufficient resources (5 items, $\alpha = 0.72$), challenging work (4 items, $\alpha = 0.81$), workload pressure (3 items, $\alpha = 0.80$), and organisational impediments (7 items, $\alpha = 0.72$). Twenty one items of the KEYS were dropped due to cross loading and/or poor loading of the order of, or less than 0.08.

Moreover, for the purpose of this study we created a "stimulant" index to creativity by averaging scores for organisational encouragement, supervisory encouragement, work group support, freedom, sufficient resources, and challenging work items ($\alpha = 0.88$). In addition, we averaged scores from workload pressure and organisational impediments items to form the "obstacle" index to creativity ($\alpha = 0.71$). The model of Figure 1 summarises the variables used in this paper.

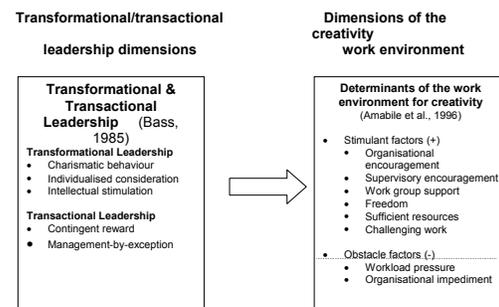


Figure 1: Summary of variables used in the paper

4.2 Hypothesis testing

Correlation analysis was used to examine the patterns of relationship between the leadership style dimensions and the determinants of the work environment for creativity. Table 1 reports the means, standard deviations, and the correlations among all variables included in the analyses.

There are several important observations regarding Table 1. First, it can be noted that all sub-scales display acceptable reliabilities, these being of the order of, or above, the generally accepted value of 0.70 (Hair, Anderson, Tathan & Black, 1995), with the exception of management-by-exception ($\alpha = 0.67$). Second, the correlations between the constructs used in this study are generally lower than their reliability estimate, indicating good discriminant validity for these factors (Hair, et al., 1995).

Table 1: Means, standard deviations, and correlations of leadership and the determinants of the work environment for creativity

Latent variable	Mean ^a	SD	1	2	3	4	5	6	7
Transformational leadership									
Charismatic behaviour	1.93	1.08	.91^b						
Individualised consideration	2.07	1.03	.82	.85					
Intellectual stimulation	2.01	1.06	.76	.69	.78				
Transactional leadership									
Contingent reward	1.91	1.05	.80	.84	.75	.87			
Management by exception (passive)	2.19	0.72	-.20	-.25	-.09	-.16	-.67		
Determinants of the creative work environment									
Stimulant determinant for creativity	2.71	0.49	.26	.38	.31	.22	.15	.88	
Obstacle determinant for creativity	2.71	.57	-.16	-.09	-.15	-.09	-.04	-.26	.71

^a N = 118 individuals of self managing teams; ^b Coefficient alphas (α s) are located along the diagonal.

All correlations above 0.17 are statistically significant, $\rho < 0.01$; all correlations between 0.15 and 0.16 are statistically significant, $\rho < 0.05$.

As shown in Table 1, both hypotheses are supported by this data for both dimensions of the work environment for creativity. As predicted, the three transformational leadership variables showed significant correlations with the *stimulant* factors of creativity. The results indicate that the correlations between transformational leadership variables and the stimulant determinants of creativity are stronger, and more positive, than those with the obstacle determinants of creativity, supporting Hypothesis 1. (In fact, the correlations with the obstacle determinants of creativity are negative and non-significant.) Specifically, the results showed strong positive correlations between the stimulant factors of creativity and charismatic behaviour ($r = 0.26$, $\rho < 0.01$); individualised stimulation ($r = 0.38$, $\rho < 0.01$); and intellectual stimulation ($r = 0.31$, $\rho < 0.01$). Moreover, the results showed non-significant and negative correlations between the obstacle determinants of creativity and charismatic behaviour ($r = -0.16$); individualised stimulation ($r = -0.09$); and intellectual stimulation ($r = -0.15$).

Furthermore, results indicate that the correlations between transactional leadership variables and the stimulant determinants of creativity are stronger, and more positive, than those with the obstacle determinants of creativity, supporting Hypothesis 2. The results

showed moderate positive correlations between the stimulant factors of creativity and contingent rewards ($r = 0.22$, $\rho < 0.01$); and management-by-exception ($r = 0.15$, $\rho < 0.05$), and negative, near zero, and non-significant correlations between the obstacle determinants of creativity and contingent rewards ($r = -0.09$); and management-by-exception ($r = -0.04$).

In view of significant correlations between the variables, further tests were performed to identify the main factors affecting the determinants of the creative work environment. This analysis was performed using regression models. The regression results indicated that the transformational variables jointly (i.e. charismatic behaviour, individualised stimulation, and intellectual stimulation) explained nearly a third variance of the stimulant factors of creativity (R-square = 0.29, $F = 4.7$, $\rho < 0.01$), while the transactional variables alone (i.e. contingent rewards, and management-by-exception) explained only 9% of the variance (R-square = 0.09, $F = 7.1$, $\rho < 0.05$). (Note that both of the independent variables jointly (i.e. transformational and transactional) explained just over a third variance of the stimulant factors of creativity (R-square = 0.34, $F = 3.6$, $\rho < 0.01$.) There was no significant direct effect found of the transformational and transactional variables towards the obstacle factors of creativity (R-square = 0.07, $F = 2.16$, $\rho >$

0.05; R-square = 0.02, F = 1.17, $p > 0.05$, respectively).

5. Discussion

The need of organisations to be more competitive has sparked the interest of researchers and practitioners to understand creativity in the workplace (Mumford et al., 2002). This study examined specific contextual variables of leadership and environmental variables that are conducive to creativity and innovation. Although replication of all research results is certainly desirable, the current study seems to highlight that both transformational and transactional leadership behaviour impact of the stimulant (i.e. organisational encouragement, supervisory encouragement, work group support, freedom, sufficient resources, and challenging work) determinants of the work environment conducive to creativity in an organisation (communications technology) which is recognised for its creativity. The findings are consistent with the realm of supportive management style and employees' creative performance theories. The results of the study reinforce the componential theory of Amabile (1988), and indeed go beyond prior research of particular areas of leader support, such as the leader's tendency to provide both clear strategic direction and procedural autonomy in carrying out the work (Pelz & Andrews 1976), or supportive, no-controlling supervision (Oldham & Cummings, 1996).

The key finding of this study is undoubtedly that the leaders, who see what is important, transmit a sense of mission, provide coaching/teaching, and arouse employees to think in new ways and emphasise problem solving, are most effective in facilitating the stimulant determinants of the creative work environment, as established by Amabile et al. (1996). Specifically, the three transformational leadership variables alone explained over 29% of the variance of the stimulant determinants of creativity. This finding is particularly significant and important in the work environment for creativity landscape that is rich in theory and rhetoric, but scarce in empirical evidence. The findings suggest that it is those particular transformational leader behaviours (i.e. charismatic behaviour,

individualised consideration and intellectual stimulation) that appear to have the impact on the perceived work environment that influence employees' creative freedom, encouragement and intrinsic motivation for creativity. These leadership behaviours are indeed essential in the process of creating new knowledge, applying knowledge and in the words of Peter Druker (1993) "making it productive".

Furthermore, it is also important to note that the remaining 71% of the variance is not explained by the variables tested in this study. One could assume that a portion of the remaining variance could be explained by other leadership styles, such as Stogdill's (1974) consideration leadership, and Manz and Sims's (1987) self-management leadership, both of which contain certain themes common to those measured by Bass's (1985) transformational leadership dimensions. In addition, another portion of the remaining variance could be explained by the subordinates' perceptions of themselves – particularly their competence and the value of their work (Amabile et al., 2004), the employees' mood (Isen, 1999); and the employees' personality characteristics (Amabile, 1996; Feist, 1999). Thus, future research should examine models that integrate the Ohio studies consideration leadership; the self-management leadership factor of the Manz and Sims's (1987) studies; the transformational/transactional leadership factors of the Bass's (1985) studies; the variables of personality characteristics; employee's mood; and the subordinates' perceptions of themselves.

This study also has implications for theories of leader behaviour. The classic two-factor theory of leader behaviour (Fleishman, 1953) proposes that effective leaders must engage in both task and relationship management (i.e. initiating structure and consideration behaviours). Our findings showed that transformational leadership (comparable to consideration behaviour) is a better predictor of the stimulant determinants of the creative work environment than transactional leadership (comparable to initiating structure). It appears that *effective* creative leadership requires skills not only in managing both subordinate tasks and subordinates relationship, but also in

integrating the two simultaneously. Moreover, our findings indeed support the superiority of transformational over transactional leadership behaviour (Politis, 2002).

In summary, the results of this study have shown that (a) there is a positive and significant relationship between transformational/transactional leadership and the stimulant determinants of the work environment for creativity; (b) the factors representing transformational leadership are better predictors of the stimulant determinants of the creative work environment than those of transactional leadership; and (c) the obstacle determinants of the work environment for creativity are negatively associated with both transformational and transactional leadership.

6. Limitations and future work

While this research has established a clear relationship between transformational and transactional leadership and the stimulant factors to creativity, some caution must be exercised when interpreting these findings due to a number of limiting factors. First, although a quantitative study is able to establish a relatively clear picture of relationships between phenomena, it is less apt at explaining the reasons behind it. Thus, future qualitative research needs to be considered to explore the exact reasons why transformational/transactional leadership tends to lead to stronger associations with the stimulant determinants of the work environment for creativity than with the obstacle determinants for creativity. Other limitations include the use of a relatively undeveloped instrument measuring the perceptions of the creative work environment (note: 21 items were dropped from the KEYS measurement model due to cross or poor loading), inability to establish causality, and the relatively small sample size.

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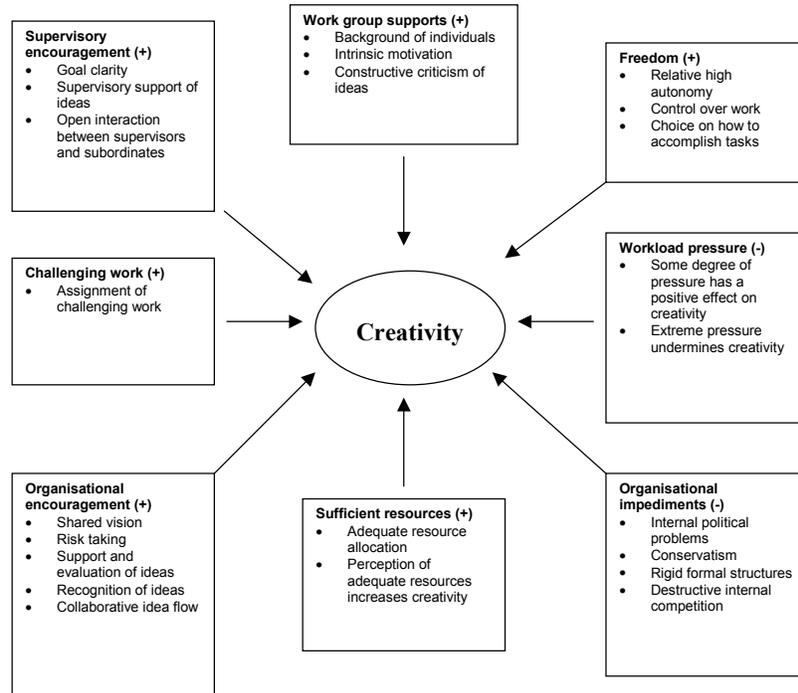
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Appendix

Main areas of each determinant of the creative work environment



Adopted from Amabile et al. (1996)

Note:

'Stimulant' determinants of the creative work environment denoted with (+).

'Obstacle' determinants of the creative work environment denoted with (-).

The Midas Touch in Knowledge Management Projects – Beware, Your Wish Could Come True*

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Abstract: Like king Midas, the champion of a Knowledge Management (KM) initiative might find herself in an awkward situation *because the wish came true*. Successful KM initiatives *can* lead to problems. The case study presented in this article details how a consulting company attempted to support its dispersed staff of consultants through the introduction of a web-based KM portal. The application became popular – too popular in the sense that it led to a deterioration of certain types of knowledge exchange. It achieved the intended goals, but created unforeseen problems.

In the article we explore KM practices and explore the role of contexts for IT-mediated KM. It is suggested that the need to view IT-mediated KM in various wider contexts is even more important than in many other forms of IS implementation. The KM activities are not only related to identifiable tasks and work processes, but also to social interaction, learning and other dynamic processes in the organisation.

Keywords: knowledge management practices, IS success, electronic communities, knowledge management, knowledge documentation, case study, ba

1. Introduction

Articles on knowledge management ventures tend to describe successful – or sometimes unsuccessful – projects. However, the practice from which the stories are collected is not necessarily black or white. Success is a complex issue and apparent success can depend on vantage point and time frame. The successful achievements of project goals can, in a wider context or studied over a longer period of time prove to create unforeseen problems.

In many attempts at IT-mediated Knowledge Management (KM), seemingly good ideas have failed to catch the intended users' attention. Suggestions to remedy such failures have included facilitating the technical access to the application, providing incentives for use of the application (giving rewards or posing authoritarian demands), identifying “killer applications”, etc. But achieving the sought-after use is not necessarily completely beneficial. Like king Midas, the champion of a KM initiative might find herself in an awkward situation *because the wish came true*. Successful KM initiatives *can* lead to problems.

The case presented in this article details how a consulting company attempted to support its dispersed staff of consultants through the introduction of a web-based

KM portal. The application should facilitate the planning, co-ordination, execution and dissemination of lessons learned. By including a highly useful scheduling tool, the threshold to initial and continued use was overcome. Following the case that far, it appears as an enviable success, but looking further, the success had its drawbacks, which will be described below.

In this article we will explore Knowledge Management practices and in particular we will, in light of the case study, explore the role of contexts for IT-mediated KM. *The aim of this article is to further the understanding, both from a practical and a theoretical perspective, of the interplay between IT-mediated solutions and the context in which they are to be used: from a practitioner perspective to reduce the risk of investing in solutions that turn out to add little or no value; from a research perspective to explore cases where the picture describing failure or success is blurred and to learn more about IT-mediated solutions and their contexts.* What first may appear as the “perfect” solution may later turn out to be far from “perfect” when put in its context. Or, put differently: “beware; your wish could come true”.

In the following sections of the article we will first discuss some previous work on Knowledge Management. Then there is a description of the case study Epsilon,

followed by a discussion. Finally we make some concluding remarks.

2. Theoretical foundations

Managing knowledge has always been important in organisations, but the idea of knowledge management as a central task in organisations was forcefully brought to the fore ten years ago in books like *The Knowledge-Creating Company* (Nonaka and Takeuchi, 1995) and *Wellsprings of Knowledge* (Leonard-Barton, 1995). Information systems theorists and practitioners were quick to see and promote the potential of IT in knowledge management ventures, and with the growth of the Internet and the www, connections between knowledge management and web technology began to appear (e.g. Davenport and Prusak, 1998). Nonaka and Takeuchi (1995) suggested that knowledge development to a large extent is a social process, rather than the result of isolated efforts by individuals. The SECI model (Socialisation, Externalisation, Combination and Internalisation, *ibid*, p. 72) described different modes of knowledge development and knowledge transfer, and Nonaka and Toyama (2003) strongly stressed how knowledge evolution moves through these stages in a never-ending spiral. The knowledge acquired through socialisation can at a later stage be made explicit, formulated and externalised, and thus more easily shared with others.

The concepts Socialisation and Externalisation have also led to ideas about different types of knowledge and how they can best be shared. If important knowledge in the organisation can be externalised, there is a potential for the use of IT-based communication and databases for storage and dissemination of knowledge. If the important knowledge is less easily verbalised, socialisation becomes a stronger candidate as preferred mode of transfer, and the role of technology – and other structures for encouraging knowledge transfer – should be focussed on helping people identify others possessing relevant knowledge and getting in contact.

In a study of Chief Knowledge Officers and the knowledge management initiatives they promoted, Earl and Scott (1998)

found that they either had a preference for developing technical systems for managing structural capital or a preference for encouraging social interaction to develop and disseminate knowledge through the interaction between individuals. Hansen et al (1999) coined the labels codification and personalisation for these two strategies, and claimed that it would be better for a company to pursue one strategy or the other, rather than trying to mix them and attempt to do both at once. However, Choi and Lee (2003), studying Korean companies, found that combining a technical and a social focus seemed to provide better results than conforming to the recommendations of Hansen et al. For knowledge management proponents, it can also be heartening to note that the companies in their study that did not engage in systematic knowledge management of any kind performed significantly less well in terms of market share, growth rate, profitability, and innovativeness than the companies that were actively practising knowledge management. However, Choi's and Lee's findings are based on correlations. It is thus not ascertained that knowledge management produced superior performance; it could be that successful companies also practice knowledge management more actively than less successful companies.

Attempts to further the development and transfer of knowledge in the organisation can be expected to profit from an understanding of what constitutes relevant knowledge and how work is performed and decisions made. However, it has been convincingly demonstrated that people often have an incomplete or even erroneous conception of how they work and think; there can be a marked difference between their espoused theory and the actual theory-in-use (Argyris and Schön, 1974; Argyris, 1993). In the tradition of situated work practices, it has also been demonstrated that it can be difficult for someone trying to design IT support for others to really comprehend their perspective, their situated work practice (Suchman, 1995).

In line with the difference between espoused theory and theory-in-use, studies of knowledge workers attempting to acquire IT support have also shown that

it can be difficult to fully grasp ones own situated work practice (Schultze and Boland, 2000). In their study, it took competitive intelligence (CI) analysts almost a year to realise that the knowledge management tool they hoped would facilitate their work actually counteracted their situated work practice. Given a somewhat distorted view of ones work practice, and a strong belief in technical solutions, it is easy to create a mismatch between the solution provided and actual needs. Davenport, in his book *Information Ecology: Mastering the Information and Knowledge Environment* (1997) places a focus on the human aspects of knowledge-sharing, emphasising the risk with a too strong focus on technical applications to support knowledge sharing in organisations.

Understanding the situated work practice that a knowledge management initiative intends to support can thus be expected to be difficult in terms of actually realising all the knowledge and actions involved in performing the job. In addition, the norms and values which govern the work conducted by the role holders – and govern the evaluation of the execution of the role – can be even more difficult to discern and discuss. However, such an understanding is likely to be crucial for achieving useful – and socially feasible – information system support in an organisation (Checkland, 1990; Suchman, 1995; Westelius, 1996).

The difficulties involved in projects for acquiring IT support have also been discussed seen from many other perspectives, for example how to identify software project risks (e.g. Keil et al, 1998), ways of trying to involve users (e.g. Asaro, 2000) or problems related with the interpretive space provided and required by the IT support (Thompson, 2002). But when discussing difficulties and success or failure there is also a need to include aspects of timing, i.e. *when* an implementation of some sort of IT-based support is a success or a failure (e.g. Larsen and Myers, 1999; Scott and Wagner, 2003). Scott and Wagner conclude that judgements of “success or failure are closely related to the timing of evaluation and the vantage point from which such observations are made.” (ibid., p. 310) What appears to be a success at one point in time does not necessarily

have to be a success at a later point in time.

Another important aspect is what makes knowledge exchange and development take place. It has been noted that people participate in knowledge exchange primarily out of community interest rather than out of self-interest (McLure Wasko and Faraj, 2000). Others would suggest that a certain degree of common interest and a shared goal is a necessary precondition (Nonaka and Toyama, 2003; Brännback, 2003). The concept *ba*, the place or setting, virtual or physical, but definitely social, has been advanced as being of pivotal importance. According to that line of thought, building and supporting *ba* should be a key objective for those who want to practice knowledge management. IT support can help facilitate some tasks and exchanges, but social interaction is absolutely essential to a *ba*, which in turn is central to achieving lasting knowledge exchange and development (ibid.).

3. Methodological approach

The case is based on written and oral accounts by key informants. These key informants have worked in the organisation during the period described in the case. They have then reflected on their experience and documented the process and their reflections in writing. We have had access to this documentation and also discussed their perceptions and reflections with them. This has provided us not only with raw data and reflection *in* action from practitioners, but also with their problematisations of the process created through reflection *on* action (cf. Schön, 1983). Our access to an existing account of the process has also reduced the degree to which we, as researchers, have shaped the practitioners’ image of the process through our questions (cf. “The principle of interaction between the researchers and the subjects”, Klein and Myers, 1999). The key informants have also read our account and accepted it as a fair description of their understanding of the process. However, the use of key informants does not guarantee that all members of the case company would share the views presented here (cf. “The principle of multiple interpretations”, Klein and Myers, 1999).

We explore the provocative case by relating theories from the knowledge management and information management fields to see if they appear to explain the development that appeared as unexpected to the practitioners (cf. "generalising from theory to description", Lee and Baskerville 2003.)

4. The Story of Epsilon1

Junior enterprises is a type of consulting company with strong knowledge management ambitions. These consulting companies are formed by university students, who want to apply and develop their knowledge in actual, commercial projects while still at university. To support these enterprises, JADE - The European Confederation of Junior Enterprises, was founded in 1992. Now, twelve years later, JADE counts 20.000 student members, organised in 150 consulting associations in eleven European countries.² Junior enterprises are non-profit organisations, but the students get paid for their work, and successful consultants can even get well paid for their efforts. The organisation we will discuss in this article is such a consulting company, here called "Epsilon" (a pseudonym) formed some fifteen years ago.

4.1 From business concept to going concern

When the consulting company Epsilon was formed in the late 1980's it was a collaborative effort by nine students. Today, close to 75 consultants – students and doctoral students – work in the organisation, and over the years, more than 400 projects have been executed. Acquisition of projects is promoted in five areas: market research; process analysis and process improvement; strategy development; software training; and IT projects. Running such a large enterprise involves administrative activities and a substantial amount of administrative paperwork. It is no longer sufficient to just deal with a specific consulting project at a time in isolation.

¹ We are grateful to Nicolas Kaiser and Fabian Mueller, members of Epsilon, for bringing the case to our attention and sharing their experience with us.

² JADE - The European Confederation of Junior Enterprises, http://www.iadenet.org/downloads/JADE_description.pdf, accessed 2004-06-07

A central challenge is to offer clients competent services while providing challenging and interesting tasks to all affiliated consultants and achieving knowledge transfer from more to less experienced members. Working in interesting projects is fun, tangible and monetarily rewarding. Organising and running the organisation in such a way that it continues to serve its goal of being a training ground for junior consultants is less concrete, and the rewards for those attending to this side of the business are less obvious. Administrative functions and support functions exist, but are typically not remunerated. No specific personnel are hired for these tasks at Epsilon; all members, junior as well as senior, are required to contribute in the back-office work. There is marketing and public relations, personnel acquisition and internal training, project support (providing standardised documents and data on completed projects), technical support (responsible for network administration and technical equipment in the office) and customer services (responsible for client contacts and the alumni-network). But as in many other consulting companies, the size of these back-office functions is kept low, and neither status nor remuneration is at a level with prestigious customer projects. However, these tasks are not just an administrative burden; continued success of the company hinges on that these tasks are attended to – and competently managed.

4.2 The KM system idea takes shape

The administrative burden for a consultant working in a project has also increased as Epsilon has grown, and the consultants started to complain. In 2001, the IT function suggested that a web-based knowledge management and administrative system should be designed and implemented. The idea was that such a system would reduce paperwork and increase the potential for IT-mediated knowledge management. The knowledge management potential consisted of that such a system would facilitate the submission of and access to reusable documents, lessons learned, etc. It could make it easier to transfer experience over time in an organisation with a high staff turnover, and it could possibly make it easier for an individual to find out who had

a specific type of experience, who had participated in which project, etc. The existing system was to a large extent paper-based, and the computerised information systems that existed were only accessible in the office. Consultants in the field, at clients or elsewhere, did not have access to these files. The chief directors and the board of project managers decided to go ahead with the proposed intranet solution. A year later, the IT platform was ready to use.

The executive officers of Epsilon, elected by the associate consultants each year, assign project managers to the customer projects that are secured. The formal contracts with the clients are signed between the client and enterprises set up by the students participating in a project, and the project manager runs the project independently, if everything goes well. The Junior enterprise itself is thus not the client's legal counterpart, but monitors the project, ensuring quality and intervening if something goes wrong. To allow for this quality assurance, the project managers submitted weekly project status reports and attended the weekly board meetings. These and other meetings, and the exchange of documents between the projects and the Junior enterprise office were widely recognised as important parts of the necessary and central knowledge management, but nevertheless they were experienced as a burden, and a lessening of this burden would be appreciated. To the project managers, submitting documents, accessing data at the office and liaising with the back-office functions was viewed as cumbersome and the cause of extra travelling. To the people in project support, getting the documents they needed from the projects, meeting with project members to discuss lessons learned, and encouraging or pleading with the project teams to document their experience was a constant uphill struggle. Those responsible for training found it difficult to accurately assess the training needs of different members for lack of data. Efficient customer service and alumni networking was threatened by poorly updated contact information. Easy data access and well-designed data collection using the Internet, allowing consultants remote access, was viewed as a potential solution to many of the problems.

The intranet that was implemented in the summer 2002 provided users with remote access via username and password. The entrance page could be individualised according to the user's preferences to allow for quick access to frequently used functions. A personal calendar that could be synchronised with Outlook provided a structured way to record appointments and other scheduled obligations. It was also possible to import course schedules from the University servers to facilitate calendar management for the individual student consultant. An internal message server providing the possibility to send short messages to individuals or groups and to attach documents, facilitated communication and exchange of work in progress without relying on external mail systems. A document management tool provided structured access to documents and links relevant to the daily work in projects. A project information section provided online possibilities to submit project summaries, experience reports, etc.

4.3 The favourable reception of the KM intranet

The calendar function with its link to university course schedules, served as a killer application encouraging the consultants to start accessing the intranet and then continue to access it on a regular basis. Internal messaging, access to documents and the possibility to submit documents regardless of your own physical location soon also became appreciated functions. Many of the intended users actually used the platform. Others were more reluctant, and were coaxed into using the intranet because some functions were now only available through this channel, such as schedules for meetings and booking of rooms at the office. Still others continued to refrain from using the intranet, but on the whole there was substantial use, and the intranet seemed to fulfil the expectations that had been placed on it. However, soon a number of unexpected changes started showing. The efficiency-enhancing application had negative effects for some aspects of knowledge management.

4.4 Unexpected changes

There was a change in personal interaction. An intention behind the intranet venture was to reduce the amount

of face-to-face meetings. This worked, but what had not been realised was that in addition to the instrumental document exchange or data transfer function of these meetings, they had served informal, networking and trust-building functions. The frequent face-to-face interaction had made people get to know each other and had provided opportunities to sense how you got along with each other. Especially the loss of informal occasions for meetings between junior members and project managers led to a narrowing of the circle of people being considered when staffing new projects. The new members in the organisation were not included to the same extent as before.

The increased reliance on written documents and written messages initially also led to misinterpretations and mistakes. It took considerable calibrating to learn what combination of meetings, telephone conversations and written communication that was needed to ensure sufficient reliability in the information exchange. Previously, when interaction had mainly been face to face, there had been ample opportunities for instant feedback and real-time interaction to sort out interpretations and check what the counterpart had and had not understood. This "quality control" of the communication had been so prevalent and inconspicuous that the organisational members did not notice it until they saw the effects of its absence.

The previous culture in Epsilon with frequent meetings encouraged teamwork and knowledge exchange across project borders, and it was usual that people would sit and work at the office, and join in each other's discussions. Now, the stronger focus on time-efficient work routines has led to a marked decrease of these creative encounters.

Those responsible for developing the intranet solution have become enthusiastic about the possibilities of the technical solution and have tried to maximise the use and usefulness of the intranet. As personal development is a driving force in the organisation, the organisation's management group has little power to steer them into another direction. So far, the advocates of the technical solution see more advantages than drawbacks of

increased functionality and use, and continue to further the intranet.

To redress some of the problems, the management group of Epsilon has now decided to reintroduce obligatory weekly meetings. It is not yet obvious that this will solve the problems, but it can be expected to help.

5. Discussion

The knowledge-management-supporting intranet application in Epsilon became popular, and served its intended purposes to such an extent that many of the consultants hardly met face to face. The resulting loss of small talk, trust-building with new colleagues and personal contact led to a deterioration of certain types of knowledge exchange, and to a sharp decline in the capability to integrate new consultants in the operation. In the end, a certain amount of obligatory meetings had to be introduced to come to terms with the unintended consequences of the (too) successful Knowledge Management tool.

The problems met could be seen as a result of an over-emphasis on efficiency and a neglect of the importance of building and supporting *ba* (Nonaka and Toyama, 2003; Brännback, 2003). The existing *ba* in the established practice of meeting face to face and of frequently working in a co-located environment was not recognised for what it was. Instead of understanding that the social contact turned the office with its organised and spontaneous meetings into a functioning *ba*, the visionaries behind the organisational development and the supposedly KM-supporting intranet introduced a virtual space that did not have *ba* qualities.

The concept *ba* includes a common goal for those who are to participate in the *ba* and engage in knowledge sharing and development. In Epsilon, the members could in principle be expected to share the idea that knowledge exchange was important and that the consulting projects should be carried out to the satisfaction of the clients. Thus the differences in basic goals illustrated in Brännback's study of biotechnology organisations (Brännback, 2003) were absent in the Epsilon case. Still, the new, IT-mediated collaboration did not provide a fully functional *ba*. The findings from the Epsilon case study do

not support the idea that people tend to participate in knowledge exchange primarily out of community interest rather than out of self-interest, which has been suggested in previous research (McLure Wasko and Faraj, 2000). In the Epsilon case, the findings rather suggest the opposite. A problem that arose when the new intranet facilitated organisational participation at a distance in Epsilon, was that the individual and the immediate project concerns overruled the community interest that expressly constituted a loadstar in the organisation. This could also be linked to the discussion of the human factor for example in Davenport (1997).

Yet another way of expressing this is to view it in light of an over-emphasis on task-oriented matters and a neglect of person-oriented matters (Lundeberg, 1993) or too much focus on the technical application and to little attention to the human aspects of knowledge-sharing (Davenport, 1997). Phrased differently, there was a focus on harder issues (such as accessing documents and schedules) and a neglect of softer issues (such as social small talk). This in turn could be interpreted as a lack of understanding of the importance of these softer issues.

The case of Epsilon could be viewed as an example of practitioners' incomplete understanding of their own situated work practices, which is in line with previous research on the implementation of IT tools for KM (e.g. Schultze and Boland, 2000), and on the difficulty of distinguishing how you work and think (espoused theory) from how you *believe* you act (theory in use) (Argyris and Schön, 1974; Argyris, 1993). When changing a work situation and introducing a new tool, in this case IT-based, there are consequences that may be difficult to understand at first. One key issue here is to what extent the actors in an organisation can realize this and then "correct" the situation that has arisen and make necessary changes. In Epsilon, the management group introduced weekly meetings as a form of compensation for the loss of small talk, etc. On the one hand, damage to the corporate culture of knowledge sharing had then already been done. A more individualistic and short-sightedly production-efficient culture had emerged. On the other hand, the experience of the loss of informal

knowledge sharing and trust building helped members realise the importance of small talk and socialising.

One question to ask is *when* a KM initiative is successful (cf. Larsen and Myers, 1999; Scott and Wagner, 2003). A related question is: what does a successful KM initiative really mean? In the Epsilon case, the KM initiative was successful – in some senses *too* successful. There is an old saying "The road to hell is paved with good intentions" (Samuel Johnson, 1709-1784). In this case there were many good intentions, but the result was not the expected. This could be seen in light of handling change processes and how change efforts can be mishandled (Watzlawick et al, 1974). Watzlawick et al (ibid) have suggested three basic ways of mishandling change: (A) action is necessary but is not taken, (B) action is taken when it should not be, and (C) action is taken at the wrong level. The Epsilon case can be seen as an example of action taken at the wrong level. That is, there was a too strong focus on building something "successful" without taking the larger context into consideration. The action was taken on an IT-mediated KM initiative level, rather than on an organisational level.

When shifting focus to an organisational level the whole discussion could be viewed in light of organisational learning (e.g. Senge, 1990). When an IT-mediated KM initiative like in Epsilon is implemented, the question is in what ways this influences the learning processes in the organisation. The situated work practices are changed, and given that they are not fully understood to begin with, the consequences for learning and organisational development may be difficult to foresee. This in turn implies that KM initiatives in general need to be viewed, analysed and understood from different perspectives. Literature on IS implementation tends to focus on analysing and understanding work processes. A thorough understanding of work processes is important for KM ventures, but in addition, the organisation has to be viewed and understood as a learning system too, and the social activities, roles, norms and values are at least as important to understand as the actual work performed.

6. Concluding remarks

In this article we have aimed at furthering the understanding of the interplay between IT-mediated KM solutions and the context in which they are to be used. In the KM field, much attention and effort has gone into trying to develop tools that are used. Higher use has then been expected to be the measure of success. However, based on the Epsilon case study, we have found that it is not always good when your wish comes true. That is, you may build successful IT-mediated KM solutions, but still not succeed. More specifically we want to point to three issues:

- KM initiatives need to be viewed in their wider contexts and there is a need to understand these contexts. *If not*, a successful KM initiative may fail in important respects due to its incompatibility with its context.
- The Epsilon case study supports previous work saying that people tend to have a limited knowledge about their own work and it is difficult to anticipate consequences of a change, such as an introduction of a KM initiative.
- The word “successful” is problematic without stating “successful according to whom and to what criteria”. That is, an IT-mediated KM initiative may be successful on an IT-system level (useful and used system) but unsuccessful on an organisational level (unwanted effects in the organisation).

Consequently, one thing we can learn is that when developing KM solutions one may need to keep King Midas in mind – the wish may come true, and then what? King Midas managed to persuade the Gods to cancel his wish, and then went to the opposite extreme; he became obsessed with the simple and basic joys in life, and avoided all things elaborate and splendid. We do not advocate following in his footsteps, and neither do we suggest that we should stop attempting to launch knowledge management initiatives. Instead, we believe that trying to imagine the success of the tool in its wider context, and attempting to view it from different perspectives and evaluate it according to different criteria, can help expose ways beforehand in which the success of a KM solution could lead to undesired effects in the organisation. That insight can then be used to modify the initiative in time. We do not claim that it will be easy to achieve

foresight, but we believe that it is worth trying.

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