Knowledge Cooperation in Online Communities: a Duality of Participation and Cultivation

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Abstract: This paper is an attempt to answer the question “How to design for engagement in community-oriented knowledge management?” In order to do this we need an approach that has its primary focus on distinguishing, balancing, connecting and negotiating between knowledge in its two fundamental dimensions: individual and social. The concept of “knowledge cooperation” that we have defined as “the participative cultivation of knowledge in a voluntary, informal social group”, is our proposal for fulfilling the previously mentioned requirements. After introducing this definition of “knowledge cooperation” with its background in community-oriented knowledge management, we will explain and give reasons for its constitutive elements and their unique combination in our approach. On this basis we will then describe the two coupled learning loops (participation and cultivation) which in our conception characterise the dynamics of knowledge cooperation and argue for the importance of looking at participation and cultivation as an interacting duality. Our main message is that the duality of participation and cultivation that constitutes our model of knowledge cooperation allows us both a better understanding of knowledge processes in an online community and to design active, dynamic, healthy communities where cultivating knowledge and participation in cultivating that knowledge mutually activates and sustains each other.

Keywords: online communities, community-oriented knowledge management, participation, cultivation, knowledge cooperation, communities of practice

1. Introduction
A recent survey report on collaboration in enterprises shows that participation in online communities is growing, that technology for online communities is continuing to improve and that retention of community participants is not a significant problem (Ambrozek and Cothrel 2004). Unfortunately, despite these positive signs, one major obstacle remains: the discipline of creating and managing communities is widely perceived as poorly defined. Both experience and research show that we do not know enough about how something resembling an online community of practice (CoP) can be designed (Barab et al. 2004). Some researchers even claim that enthusiasm about CoP is well beyond empirical evidence (Schwen and Hara 2004). In fact, many communities lack sustainability: either they fall apart soon after their initial launch or they adopt a short-term, opportunity driven behaviour which allows them to survive in some way. In both cases however, they are not able to generate enough energy and synergies for engaging in long-term cooperation’s. Moreover their short-term thinking and opportunistic behaviour leads to uncertainty and mistrust between the members and consequently to low quality of shared work results. This is where our concept of “knowledge cooperation” comes into play as an attempt to convert the promise of social networks and collaborative technologies into the reality of active, dynamic, healthy communities integrating learning and knowledge processes. This paper is an attempt to contribute to the discipline of creating and managing online communities, especially those with a focus on knowledge and research, by answering the question “How to design for engagement in community-oriented knowledge management?” In order to do this we need an approach that has its primary focus on distinguishing, balancing, connecting and negotiating between knowledge in its two fundamental dimensions: individual and social.

1. What is “knowledge cooperation”? Knowledge is bound to human action. Knowledge cooperation – the cooperation and collaboration of different domain experts with the aim of stewarding knowledge – is a living process with both tacit and explicit elements, with both individual and social components, a process that constantly changes and further develops through actions and interactions. Knowledge in such processes can not be completely reduced to an object of managerial actions, but must be treated as a kind of organic entity, bound to persons, to interactions as well as to social contexts (Wenger et al. 2002; Bettoni and Schneider 2003; Bettoni et al. 2004). On this background the point of view of work psychology becomes more relevant: thanks to its focus on social dynamics the work psychological approach views knowledge management as analysis and organisation of knowledge oriented cooperation (Classes, Dick and
According to our model, cooperating and collaborating on knowledge (knowledge practice) consists of two cross-coupled learning loops that activate and sustain one another: “cultivation of knowledge” and “participation in knowledge” (Figure 1). Each individual learning loop is defined in its own terms and is in principle autonomous, meaning that it could function alone, independently from the other. As a result the two loops are not mutually exclusive. On the contrary, they must take place together, they are two intrinsic constituents of knowledge cooperation and only their cross-coupling, represented in the diagram by the lemniscate curve (∞ - the infinity symbol), allows to create an interacting, resonating duality with a sufficient activity level. In this duality what is of interest i

(like for example Yellow Pages, Best Practices, Knowledge Assets) there should be no cultivation without participation and no participation without cultivation. The three processes or groups of knowledge processes connected by means the two mentioned learning loops are (Figure 1):

- **Stewarding knowledge** – This group of knowledge processes encompasses processes like acquiring, developing, making transparent, sharing and preserving knowledge. They are used for handing down, reproducing and renewing knowledge and experience. What should be noticed here is that these processes are not considered at a cognitive but at a coordinative-cooperative level (see the cooperation model by Wehner et al. 1998): knowledge stewarding does not intervene therefore directly in individual cognitive processes as too easily alleged by certain critics of Knowledge Management.

- **Applying knowledge** – This group of knowledge processes collects what happens when knowledge resources are used in business processes. The learning loop of ‘cultivation’ is established, if employees of the formal organisation (teams, departments) informally participate at the same time also in communities of practice (Wenger et al. 2002, 18 ff). This multiple membership creates a learning loop which has its focal point in the employee: she gains experiences in her daily work within business processes and can incorporate them in the community of practice, where this knowledge is stewarded collectively and prepared for flowing back to the business processes from where it originated.

- **Socialising knowledge** – This group of knowledge processes collects what happens in personal and institutional relationships
between the people involved in stewarding and applying knowledge. Relevant dimensions to be considered here are for example those which lead to effective knowledge sharing like trust, metaknowledge, accessibility, engagement in problem-solving and safety (Cross et al. 2003). Important elements to be considered in this group are: involved people as individual persons, their ties, their interactions (regularity, frequency and rhythm), the atmosphere, the evolution of individual and collective identities and, last but not least, spaces (physical or virtual) for meeting together. This group is very important because it allows taking into account the social aspects of stewarding knowledge, applying it and learning together.

2. Participation and cultivation as an interacting duality

In our concept of Knowledge Cooperation the circularity of participation and cultivation and the interaction (cross-coupling) of these loops can be modelled more technically (Figure 2) as consisting of two feedback loops applied as control systems to knowledge stewarding viewed as a performing system whose performance (knowledge practice, including stewarted knowledge) must be maintained in line with reference values (organisational performance and culture) in the presence of disturbances. As in physiological or ecological systems, feedback is here the process by which the system’s inputs are altered by its output (stewarded knowledge). But which are the reasons that make this design suitable for better understanding knowledge processes and for designing healthy communities? Our basic idea in developing this model was to focus on the issue of “engagement” as a central design feature. The question is then: how to get a lasting engagement in the community? The most common approach is to look for incentives, for motivation (Bettoni et al. 2003). This may be a useful perspective in many organisational development initiatives, but in the case of knowledge we claim (and will argue for in a future paper) that the incentives view on engagement should be extended by a complementary and at least equally important consideration of the issue of “meaning”. In fact our knowledge is of course strongly related to motivation but probably much more intimately connected and directly influenced by our experience of meaning. More specifically our claim is that if we want to get enough engagement for stewarding knowledge in a community of practice, then we need to:

- Better understand the human experience of meaning
- Extend our community design by a design for meaning.

Figure 2: Cybernetic view of knowledge cooperation
A basic aspect of our engagement is that we strive for experiencing our actions, our practice as meaningful; we do not simply want to get something done (a report written, an event organised, a request answered, etc.): what counts in what we do is always more than the result; it is the experience of meaning connected with that result. In the end the meaning we produce matters even more than the product or service we deliver. The kind of meaning involved here is an experience of everyday life, the experience that what we did, are doing or plan to do “makes sense” to us. But how do we operate to produce these meanings and to put them in relation to the histories of meanings of which they are part? In his investigation of this issue Wenger (1998, p. 53) introduces the notion of negotiation of meaning as “the process by which we experience the world and our engagement in it as meaningful.” This process has the following characteristics:

- An active, dynamic, historical process
- It affects the elements which shape it
- The meaning we experience is not imposed, it is produced, but not from scratch
- The meaning we experience is not pre-existing and not simply made up
- The meaning we experience does not exist as an independent entity outside the process
- The meaning we experience exists in the process (in fieri)

Which elements are necessary for constituting a process with these characteristics? Wenger proposes a model which distinguishes two constituent processes: 1) a process embodied in human operators, called participation; 2) a process embodied in an artificial operand (artefact), called reification. The human operators contribute to the negotiation of meaning by their histories of interactions in the practices of a community. The artificial operand contributes to the negotiation of meaning by reflecting aspects of the practice of the community (histories of transformations). Thus the negotiation of meaning takes place as a convergence of two histories, that of the human operators and that of the artificial operands. In Wenger’s model participation is conceived as: a) the social experience of living in the world in terms of membership in social communities; b) active involvement in social enterprises. In the same model reification is seen as the process of giving form to our understandings, experiences, and practice by producing objects which express them. Writing down a law, producing a tool or even putting back a book in a shelf are examples of this process. Participation and reification are both distinct and complementary. They cannot be considered in isolation, they come as a pair. They form a unity in their duality (Wenger 1998, p. 62).

According to this model, our experience of meaning is viewed as a duality, as an interplay of participation and reification with the following implications: a) when you understand one, you should also understand the other; b) when one is given, you should wonder where the other is; c) when you enable one, you should also enable the other; d) one comes about through the other, but they cannot replace each other. By taking seriously Wenger’s theory and appreciating its potential impact on knowledge management we can now deduce the following main guideline for our design for meaning:

*If meaning as a constituent of a social theory of learning should be viewed as a duality of participation and reification, then engagement in stewarding knowledge should be implemented as a duality of two corresponding processes, in our case participation in knowledge and cultivation of knowledge.*

To conceive and implement participation and cultivation as a duality means that they should take place together, they should both require and enable each other. There should not be any cultivation without participation and no participation without cultivation. Participation and cultivation should imply each other. Increasing the level of cultivation should not substitute an equal amount of participation; on the contrary it should tend to require an increase of participation. Cultivation of knowledge should always rest on participation in knowledge: applying knowledge requires a history of participation as a context for its interpretation. In turn, also participation in knowledge should rest on cultivation because it always involves words, concepts and artefacts that allow it to proceed. Finally, the processes of participation and cultivation should not be considered just as a distinction between people (human operators) and explicit knowledge (artificial operands, things) that embody them. In terms of meaning, people and things cannot be defined independently of each other. On one hand our sense of ourselves includes the objects of our practice; on the other hand what these objects are depends on the people that shape them through their experiences.

### 3. Participation and cultivation: An experiment

At the Swiss Distance University of Applied Sciences (FFHS) we are experimenting with this model of Knowledge Cooperation in the realisation of a virtual research networking space...
called "CoRe Square" and implemented in MOODLE (Bettoni et al. 2006). This networking space for research activities is a central issue in an ongoing project that has as its goal the integration of teaching and research by means of the design launch and cultivation of an online "community of research" (acronym: CoRe) for distributed research cooperation by 3 types of research partners: lecturers, students and research staff. In the current version the CoRe Square space is divided in the following seven areas that correspond to aspects of community life: Individual Hut, Community Circle, Domain Club, Practice Lab, Connections Room, Leadership Lounge and Technology Corner. Following the design for meaning guideline presented above, we have designed the inner structure of all these seven activity spaces as one or more pairs of tools, each of which should form a unity in its duality. In terms of technology each pair is a dyad constituted by a forum-tool and a wiki-tool (Figure 3).

The forum is a tool for enabling participation in knowledge: creating new discussion threads, reading posts and replying to them supports participation as the social experience of being connected with other and being actively involved in a collective enterprise (stewarding research knowledge). The wiki is a tool for enabling cultivation of knowledge that preserves the results of conversations (new ideas, insights, best practices, lessons learned, definitions, procedures, etc.) by organising them in a structured way and independently of time.

Figure 3: – Dyad tool of knowledge cooperation
Following this design, in the current version of CoRe Square the seven activity spaces contain for example the following dyads: a) Individual Hut: each member has an own forum ("personal blog") and an own wiki; b) Community Circle: a forum for talking about experiences with the platform and a wiki for making a systematic overview of these experiences; c) Domain Club: a wiki for collecting an overview of research methods and a forum for talking about individual methods; d) Practice Lab: each project has an own forum for talking about project steps and issues and an associated wiki for a systematic overview of project work and outcomes; e) Leadership Lounge: a wiki where members can sign up for tasks and a forum for talking about engagement for the community.

Figure 4: Practice lab area
As an example of an activity area the “Practice Lab” is shown in Figure 4. Just below the title bar there is a file named “… about Practice Lab”. It explains the primary activity in this area. Further explanations are given in three additional “about” files below it. The Practice Lab is an area for research practice, i.e. working in research projects, writing articles and giving presentations at conferences. Each research project has an own forum for conversations about project steps and issues and an associated wiki for a systematic overview of conversation results, project work and
research outcomes. With many projects the topic area would become very long and difficult to navigate. For this reason we have assigned an individual project area (a MOODLE topic) to each project and collected all project names and short descriptions in a table from where a links leads to the associated project area. Below the file with the project table the Project Lab gives access to 4 dyads: Cases, Stories, Publications and Conferences.

4. Conclusion

In June 2006 CoRe has been launched as a pilot community during a future search event and Core Square opened to all participants of that event (a community of about 50 persons). Since then many dyads Forum and Wiki have been set up and used by its members. The pilot phase will last until June 2007 when all current CoRe members will be invited to the 1st CoRe Annual Conference with the aim of evaluating the pilot and develop proposals for the main CoRe cultivation project that will start in September 2007. From that moment we plan to start an empirical investigation (formative evaluation) for assessing the suitability of Knowledge Cooperation and of our dyad tool as a way for fostering and maintaining engagement in community-oriented knowledge management.

References


Alternative Accounting to Manage Intellectual Capital

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Abstract: The connection of intangible assets to cash flow generation is a major management issue. In addition, a majority of the investment is made in the intangible capital items. This paper intends to present an approach that supports the continuous measurement of intangible assets and allows an extended value based management framework that considers both tangible and intangible elements.

The value of a company includes significant elements that are not described by the generally accepted accounting methods such as relationship capital, organizational capital, and knowledge and competence of employees. These elements are possible to be presented in an expanded balance sheet.

We face challenges when we try to quantify the elements for a concrete date or when we intend to capture the exact changes throughout a certain period. Based on generally accepted accounting standards, the investment into intellectual assets is mostly handled as cost. This cost is accountable against the revenue of the period therefore decreasing the period's profit. This approach does not allow the carrying forward of any cost element for future periods, even in the case of a long term cost.

If we reconsider our cost management framework and the costs that serve the development or replacement of intellectual capital items we manage as capital expenditures in intellectual capital items and not as a period’s expense, we could build up a ground-up approach to the handling of intellectual capital items. This approach results in the compilation of two balance sheets and profit & loss accounts that are alternative versions of each other. The visualization of intellectual assets and intellectual capital might significantly change the decision making process and the general thinking of the management.

The authors suggest further research in order to support the development of the conceptual framework and the operational rules of practice.

Keywords: intellectual capital; value based management; measurement; alternative accounting; intangible balanced sheet

1. Introduction

Thinking based on axioms is of great importance for both science and practice. Once the axioms are defined according to the empirical postulates we can safely rely on them. This fact simplifies and therefore supports any further thinking. It is important that simplification based on axioms can only support thinking in case it is in harmony with the empirical postulates. In changing circumstances the axioms should be reviewed from time to time in order to keep conformity with empirical postulates. The axiomatic framework set by Euclides and Ptolemaios was in full harmony with the requirements of an ancient society. In modern society however, these axiomatic frameworks have needed to be adjusted. There are plenty of axioms used in economics. These axioms support management thinking by providing general guidance. We should not take these axioms as unquestionable rules: in case conflicts are identified among axioms and the empirical requirements, the axioms should be carefully rethought and – if needed – readjusted.

In our research we also identified an area where the related axioms and the empirical requirements conflict: the proper identification and management of the real asset value of an enterprise. The value of a company includes significant elements that are not described by the generally accepted accounting methods. The customer and supplier relationships, the knowledge related to the organisation and the knowledge and competence owned by employees are such elements. Current accounting practices – in general – do not allow for the visualisation of these assets (often referred as intellectual assets, or intellectual capital\(^1\)) in the company’s balance sheet. There is one exception

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\(^1\) Intellectual capital and Intellectual assets are referring to the same resources, therefore could be used as synonyms, although the “intellectual asset” label refers to the asset side of the balance sheet while the “intellectual capital” refers to the ownership of these assets. Throughout the text we are using both terms as synonyms.
however; in the case of a company acquisition the buyer is allowed to represent goodwill in its accounts when the book value of the purchased entity is below the purchase price. The importance of intellectual capital in the value of a company is increasing rapidly. Due to the fact, that accounting standards do not support the reporting of these assets, the task of management teams is getting even more complex because it is extremely difficult to manage something that you cannot properly visualise. Our intention is to provide guidelines and support for the entities that intend to manage these elements by integrating related management information into existing reporting frameworks. By doing this we can help these companies operate more efficiently. For this task we also need to touch and rethink certain axioms of economics.

2. The shift among tangible and intangible assets

- Fewer and fewer companies have operations primarily involving physical assets. Instead, most companies are service providers.
- Among production factors there is a remarkable shift to the intangible (i.e. intellectual) elements.

The above statements are true in most industry sectors worldwide. Research shows that on average 75% of the company’s value is not described on its Balance sheet (Zambon 2005). Investigation and research carried out by the authors among Hungarian entities resulted in similar findings. Companies taking action in this field are not limited to certain industry segments. In general those entities are more open to putting a larger emphasis on these assets that have a higher “intellectual capital index”. There are several reasons why we should concentrate on this process. In general, the value of a company is significantly higher than its book value; therefore we cannot neglect answering the question why this occurs. The increasing company value – in most cases – does not mean that the total book value of assets is growing with the same rhythm, moreover the proportion of total book value of assets to company value is getting smaller as the company value grows. In such a situation we should be able to predict the resulting increasing company value. Does the profit making capability of the physical assets grow with an increased marginal productivity or are there hidden assets behind the ones presented in the balance sheet? The book value only represents the value of the physical assets and the value of certain – but limited – intangibles (e.g. software and patents).

The market value of a company consists of other elements, such as
- Relationship capital (external structure related value)
- Organisational capital (internal structure related value)
- Knowledge and competence of employees (employee related value)

Relationship capital includes customer, supplier and other relationships. In addition this represents references, public relationship value and the image of the company (and its products). These elements could represent a significant proportion of the company’s value. Yet only small portions of such elements (such as patents) are allowed to be indicated in the company accounts. Organisational capital includes standardised and customised processes, information and administration systems/frameworks and company culture. These elements differentiate the entity from similar organisations (besides relationship capital and individual employees) and allow the organisation to be unique in its own way. Knowledge and competence of employees describes the value assigned to individual employees. This refers to the capability of employees to create material or immaterial assets and properties. These elements are strongly related to the manpower of the company (or are very difficult to harvest it without them) therefore we could define them as knowledge capital or intellectual capital. Based on the previously described factors, the balance sheet describing the capital of a company should be expanded by these newly introduced elements. The expanded balance sheet is described in Figure 1.

3. How can we identify and quantify the intellectual capital of an entity?

Theoretically we could easily identify the elements of intellectual capital. The theoretical identification does not need exact data, and the components will be the same for every company. However, we face challenges when we try to quantify the elements for a concrete date or when we intend to capture the exact changes throughout a certain period. The simplest approach to capturing the amount of intellectual capital is to first determine:
- The market value of the company, or
- The quantified strategic plan of the company.

In the latter case we could identify the discounted free cash flow of the entity based on the strategic plan. This enables us to measure the value of the company, therefore finally version B, equals version A.

\[ z = \frac{(\text{Company Value} - \text{Book value of assets})}{\text{Company value}} \]
In case of listed companies the value of the entity is always available (although not always reliable for various reasons) – version A –, while for unlisted companies it is available only on a case-by-case basis (i.e. when having an offer from a potential investor). Should there be any problem with the availability of market value, we can always rely on version B, to identify the required information. The basic – and a bit simplified – formula for identifying total amount of intellectual capital is to subtract the book value of total assets from the market value of the company. Having this data available – unfortunately – does not provide information about the elements of intellectual capital.

Since the value of the company comes from both the physical assets and the intellectual assets of the entity, proper value based management requires the management of the intellectual assets, too. The balanced way of managing the value of a company is accomplished by concentrating on both crucial elements. When managing material assets, we have a lot of information available from the conventional management reports, where we can see the physical assets, the working capital and other elements in detail. The process of identifying intellectual capital that we investigated above only gives us an overall value. This identification process does not give us understanding and therefore the ability to manage the individual components of intellectual capital. We need to find a proper way to capture this information.

4. Money spent on intellectual capital – is it cost or investment?

Based on generally accepted accounting standards, the investment into intellectual assets is mostly handled as cost. This cost is accountable against the revenue of the period therefore decreasing the period’s profit. This approach does not allow the carrying forward of any cost element for future periods, even in the case of a long-term cost (like the tutorial fee of an internal training). There is one exception that we have already mentioned: in the case of a company acquisition the buyer is allowed to represent goodwill in its accounts if the book value of the purchased entity is below the purchase price. The generally accepted accounting standards require having the chart of accounts as described in Appendix 1.

- Includes those accounts that are describing the book value of the entity’s assets such as tangible assets, current assets, cash and bank, long term financial assets and prepayments
- Includes an intangible account that summarises those assets that are intangible, but allowed to be presented in the balance sheet (e.g. patents, software)
• Includes the most important liabilities that are necessary to determine the company’s shareholders’ equity
• The chart describes the creation of assets and the patterns of change, it also describes the balance between assets and liabilities.

These accounting rules are extremely important for our analysis, because the axioms behind this logical framework are the points that we would like to modify slightly in order to have an alternative (updated) accounting structure.

The cautious, conservative approach of generally accepted accounting methods is understandable. This only supports those quantifying methods that are fully defendable and reliable, and therefore it provides stability for the measurement process.

5. Alternative chart of accounts

We can capture the value of the company more precisely if we do not distinguish between the creation of tangible capital expenditures, intangible capital expenditures – that are allowed to be accounted for as assets by accounting standards – and other intangible capital expenditures not handled by accounting standards. Moreover the volume of the latter group is more significant than conventional intangibles. Resources invested to intellectual capital – in our view – are basically capital expenditures and not expenses.

Without visualising and controlling this process we cannot manage our company properly. This approach allows us to measure better the real extent of the profit of every period. If we reconsider our cost management framework and costs that serve the development or replacement of intellectual capital items we manage as capital expenditures in intellectual capital items and not as period’s expense, we could build up a ground up approach of handling of intellectual capital items. Of course this requires a significantly modified cost accounting framework. In this framework we should make a decision on each and every individual cost item which asset category it belongs, and what the proportion is that could be capitalised (based on its efficiency). Besides this, we should determine the depreciation rule and the impairment measurement of each group of assets, too. This method expands the generally used chart of accounts with alternative accounts (see Appendix 2).

The Figure in Appendix 2 does not include accounts that are not important for visualising the creation of intellectual capital. These are not influenced by the newly introduced elements. Neglecting these accounts allows us to simplify the chart, but of course these accounts remain in use. The main difference between the two charts of accounts is that we separated the first expense flow on Appendix 1 into two relevant pieces. In the figure in Appendix 2 we separated those expenses that refer to the creation of intellectual assets (1b expense flow) and we determined the capitalisation of these expenses. This method produces fewer expenses in our profit and loss of the first period compared to the conventional approach, but – in parallel with this – additional depreciation cost should be presented relating to the new categories of assets in each period.

On the contrary the measurement of intellectual capital is highly uncertain. This is true, but we believe that this should not mean that we exclude any element just because there is uncertainty assigned. If declare any intellectual capital related event as cost related to the current period, we do not allow for the visualisation of certain assets. Therefore finally the total assets we present in the company’s books will be far below the real value of the company. As the intellectual capital is growing at an accelerating rate, the proportion of company value presented in the books is getting smaller and smaller and the value based management is becoming more and more difficult due to the fact that the necessary information for decision making is not visualised, and therefore it cannot be obtained.

This new cost management approach results in profit reallocation among different periods. The total effect of profit reallocation is zero in the long term (although the costs are redefined as capital expenditures, the newly created assets should be depreciated during the time horizon), therefore compared to the conventional approach this approach creates different foundation for management decisions. This approach could be helpful for management if they see the conventional reports in parallel with the extended reporting. Companies have to calculate taxes based on their conventional accounting statements, therefore the modification of the chart of accounts should not result in neglecting tax accounting information. In the new structure we should be able to visualise both the conventional and the extended accounting information.

The extended accounting approach not only modifies the asset side of the balance sheet but also requires an alternative calculation of shareholders’ equity (see Appendix 3).

Shareholders’ equity and profit/loss for the year can be calculated in an alternative way:
With the help of the wide arrows we can obtain the company’s shareholders’ equity and profit/loss for the period according to accounting standards. In this case we apply cost items of accounting standards, which measure the company’s shareholders’ equity and the change of shareholders’ equity.

On the side of dotted arrows we determine the company’s intellectual assets and its shareholders’ equity and profit/loss for the period influenced by its intellectual assets. This method results in different values than the values calculated based on the conventional accounting standards. This approach results in the compilation of two balance sheets and profit and loss accounts that are alternative versions of each other.

The balance sheet compiled by accounting standards includes assets and liabilities. Assets consist of intangible assets, tangible assets, long-term financial assets, cash and bank, other current assets and prepayments. Liabilities consist of visible shareholders’ equity, provisions, short-term and long-term liabilities and accruals. The balance between the two sides is kept stable.

The balance sheet that allows us to support the measurement of the company’s enterprise value, includes additional intellectual assets, such as internal structure related, external structure related and individuals’ competence related elements. These additional intellectual assets are balanced by the invisible shareholders’ equity on the other side of the balance sheet.

Management that is used to solely relying on conventional accounting information might be frightened to give up this comfortable framework. The introduction of extended elements however is not contrary to the classic way of reporting, but rather it can provide useful additional information that might be critical for certain management decisions. Besides the calculation of cash flow related information remains exactly the same in both approaches.

Similar to conventional group of assets, the efficiency and obsolescence of intellectual assets is a crucial topic, as well. The method of intellectual asset evaluation should be the same that is used in the case of tangible assets according to IFRS. At the end of each period we have to measure the actual value of our intellectual assets (item by item) and decide upon their impairment loss.

6. Controls related to intellectual capital

The visualisation of intellectual capital is not yet a settled procedure; therefore it is difficult to provide exact guidance for decision-making dilemmas assigned to the topic. Several samples show that if one can misuse something then it will be misused. Accounting standards disallow the application of alternative solutions, because they might take uncertainties into accounting measures. The figures of one of the largest Hungarian pharmaceutical companies (Figure 2) support the difficulties of the visualisation of intellectual capital.

![Graph showing visible and invisible capital of Richter Gedeon Ltd.](image)

**Figure 2**: Visible and invisible capital of Richter Gedeon Ltd.

Estimations of enterprise value are very sensitive to prospective expectations. This can be presented by the enterprise value estimated based on share prices. Stability of enterprise value measured by discounted cash flow (DCF) is deceptive. This is also sensitive to the applied...
discount rate and weighted average cost of capital (WACC). Growth of book value is significant and stable. The problem is that the book value is not in the neighbourhood of enterprise value, it is less than the half of the company’s enterprise value. An accounting approach that continuously undervalues the company's enterprise value with such an extent could be questionable by this market data. When measuring the company’s intellectual capital the management intends to gather information for its own purposes, thus it does not want to give a short weight and cheat itself. Of course, mistakes are always possible. The situation is similar to planning: the planning process is the real value for the management and not the plan itself. Translating it to the company valuation: the base value is the process of company valuation (and the related value based management) and not the enterprise value itself.

The good planner knows that planning is indispensable despite the fact that a plan is often built on some level of uncertainty. Risk management and sensitivity analysis should handle uncertainties during the planning process. The person who deals with measurement of company value has to do something similar: he has to identify the sensitive points of the adopted procedure and work out methods for decreasing the volume of sensitivity. Uncertainties can be managed in different ways:

- The first way can be the methodology of discounted cash flow (DCF) based company valuation. This method calculates enterprise value – total value of assets operated by the company (Mills, 1998) and – based on the discounted cash flows produced by the company in the foreseeable future. In the case of listed companies this method can be completed by the share price based company valuation method.
- The other way can be the alternative (expanded) accounting approach presented above.

Alternative accounting could be an important control instrument. It is possible, that if we capitalise all types of intellectual capital expenditures, which are not allowed to be accounted for as assets by accounting standards, we might get higher intellectual capital value than the difference between the DCF-based enterprise value and the tangible assets would allow. In such a case the intellectual assets might be under managed, or not efficient and therefore their value is not appropriate, thus an impairment should be applied. However, if the intellectual capital calculated during the bottom to top approach is smaller than the difference between the DCF-based enterprise value and the tangible assets, we have another problem that requires action. In this case we might not had identified some items of intellectual capital which might lead to the under management of these assets without proper management focus.

There are some other instruments – scorecards – that support the managing of uncertainties. These include Skandia Navigator, (Edvinson and Malone, 1997) Intangible Asset Monitor (Sveiby, 2003) and Balanced Scorecard (Kaplan and Norton, 1996). All these instruments try to grasp the efficiency of intangible assets from the point of view of financial result of the entity. During the identification and quantification process of the company’s intellectual capital we face significantly larger uncertainties than during the process of identifying the visible (tangible) capital based on the physical assets. In order to support these efforts we need to have scorecards and efficiency indexes. These indexes monitor the company’s invisible capital (although they are not measuring it). Basically they all operate based on four viewpoints: financial, (customer/client) relationship, organisational and human. The general rule is that if the value of capitalised intellectual assets is exceeds the intellectual capital measured by DCF, the value of scorecard indexes will be unfavourable. This might help a lot in the management of the elements of intellectual capital. The use of scorecards might be a cost effective way of monitoring intellectual capital elements. Overall the annual itemised review (audit) of intellectual assets cannot be avoided by the simple use of scorecards.

The detailed monitoring of intellectual capital will require a lot of resources (both money and time). A profit-oriented company will undertake itself to these additional tasks only if the additional costs and efforts increase the profit and make cost management more efficient. This method provides a basis for the consistent valuation of a complex asset base that is fundamental for an effective cost management framework. Management can control a company’s costs only if it is fully aware of the characteristics of the company’s assets (including cost of operation and profit generating capability). Due to the fact that the majority of the assets are intellectual, we cannot have an effective cost control environment without having controlling the management of intellectual assets. The new approach gives additional responsibility to the management, thereafter they need to operate based on extended return indexes (such as “ROCA” \(^3\)) instead of the old indexes (like ROA\(^4\)). The former deals with the modified profit figure and the expanded asset base compared to the latter one. This might significantly change the

\(^3\) Return on Complex Assets
\(^4\) Return on Assets
decision making process and the general thinking of the management.

This new approach does not mean that we can increase our intellectual capital endlessly, without limits. Ascending capital expenditures in intellectual capital, which is a routinely and mechanically increased capital expenditure, imply the devaluation of capitalisation index (i.e. a worsening marginal utility ratio). So the decreasing proportion of capital expenditures increases the relevant intellectual capital items and the enterprise value. The rest is depreciated (or impaired) during the period, and finally becomes period cost. Identification of intellectual capital items does not mean that the classical efforts to reduce costs are useless. We cannot avoid the cost efficiency steps with capitalisation of expenses as intellectual assets, either. Parallel with the calculation of intellectual capital items we have to elaborate the continuous examination of efficiency of these new assets. The effect of an intellectual capital structure controlled with efficiency could be the same as the effect of a well thought out cost reduction and cost control procedure.

7. Examples of axioms that need to be rethought

Every economist is aware of the following two definitions:

- Variable costs are costs that are changing proportionally as the production level is changing
- Fixed costs are costs that are not dependent upon exact production level in a given range of production

Relating to these definitions the following chart is often presented (Figure 3)

![Figure 3: The conventional interpretation of fixed and variable costs](image)

This approach is in harmony with the focus areas of conventional accounting. In this respect this simplified approach might be adequate; however those who continuously face management decisions are aware of the fact that the real characteristics of costs are more complex. The next chart (Figure 4) is presenting the nature of costs in a more complex way.

![Figure 4: Fixed and variable costs based on empirical observation](image)

It is obvious that even the so-called fixed costs are subject to change as the dimension of production expands. Of course this does not mean that they share the characteristics of variable costs that more flexibly and quickly react upon changes in production levels. Fixed costs however are likely to change slowly and gradually as production level is changing up- or downwards.
This is why the previous definition contains the “in a given range of production” section. The main difference of the two cost categories therefore is mainly the way they change and not whether they change. What is perplexing in the definition of fixed cost is the missing element of what this cost is depending on. Answering this question is extremely important for a manager who intends to control the overall cost level of his company.

Regarding variable costs, there is no direct proportion between the changing level of production and the sum of variable costs. As the production level increases, the sum of variable costs is likely to follow a sinus curve set alongside a straight line. The level of incremental increase is likely to vary as we progress with increasing production level. This is due to the fact that even variable costs are influenced by the capacity of production (in the form of fixed assets as conventional accounting describes). The following chart (Figure 5) describes the complex relationship among cost categories and capacities.

As we move in time alongside the horizontal axis and we follow the increasing level of production in Figure 5, we see that a certain mix of physical and intellectual assets is necessary for the start of production. As we move on, it might be necessary to obtain new assets. The purchase of assets – whether physical or intellectual – requires money, therefore we move this liquid asset to another asset category. This is considered to be an investment in conventional accounting therefore the amount spent on the acquisition is capitalised. We can account for costs after the new asset has commenced its operation. When we start our production we are sacrificing certain resources for future revenue (and of course profit).

The use of capacities (assets) are obvious: we need energy, certain materials and labour costs to have these capacities (assets) operating. The second cost category is necessary because the capacities (assets) are wearing out as we use them: we need maintenance, repair and replacement. Two special – and very important – elements of this cost category are depreciation and amortisation. In case the capacity level is steady in a certain period of time, the characteristics of the first cost category is similar to variable costs, while the characteristics of the second category is similar to fixed costs.

We should not forget however what we saw of variable costs in figure 4: there is no direct proportion between the production level and the sum of variable cost. When putting this to the context of capacity (asset) related cost, we should note that there are levels of production when the use of capacities (assets) is not optimal: when we reach the limits of capacities (assets) – either upwards or downwards – the incremental cost of an additional unit’s production will increase. So far we have mainly referred to production related capacities (assets). Are these statements...
applicable for administrative functionalities (like sales and general administration)? Capacities in administration have similar characteristics as in production. These capacities are kept for supporting the core operation. Significant portion of capacities of administration (and sales) are human capacities. The use of these capacities is similar to capacities in production. The two capacity related cost groups are also identifiable. Cost relating to the operation of capacities of administration (and sales) is acting as variable costs, while the cost of keeping and maintaining capacities of administration (and sales) are acting as fixed costs; similar to capacities in production. The advantage of alternative accounting is cacheable in case we intend to understand the complexity of cost categories and we intend to make effective decisions relating to costs. As figure 5 describes, overall cost level is increasing significantly in case we increase our capacities (regardless whether they are relating to front office or back office functionalities). For effective cost management we need to be aware of the exact characteristics of our capacities (both tangible and intellectual). This allows us to judge what is the effectiveness of each individual capacity item (or item group) and what is the value added to profit generation. In conventional accounting environment we could only concentrate on certain capacities, the elements of intellectual capital (as we saw it on Figure 1) remain hidden. For an effective cost management we need an extension to alternative accounting in order to include all capacities (assets) that are related to the operation of an entity. By using alternative accounting we:

- Introduce new asset categories to our balance sheet
- Work out the itemised view on the new asset categories
- Define and use an upgraded accounting policy that handles the new categories and support the visualisation of their fair value
- Reconsider our cost management framework
- Put fixed and variable costs to a new context
- Link cost categories with capacities (operating vs. keeping the capacities)
- Put all the previous points to one overall framework

8. Further steps

Based on research carried out so far, it is clear that the introduction of alternative charts of accounts and the quantification of the intellectual property elements would cause debates among financial experts and academics. The level of uncertainty assigned to the valuation of individual intellectual property items, the depreciation and impairment process related to these elements and the inclusion of this approach into everyday management decisions are areas where further investigation is required. We would like to open a debate that requires the involvement of both acting management accountants and academic researchers, with the aim of identifying those elements of the approach that need further research. Through the development of this conceptual framework we expect to work out a general approach for the introduction and continuous use of alternative charts of accounts.

References

Danka Starovic and Bernard Marr, CIMA (Chartered Institute of Management Accountants), Cranfield School of Management, technical.services@cimaglobal.com 28. pages.
International Accounting Standards 2003, IAS 36, 38
Kaplan, Robert S. - Atkinson, Anthony A. : *Advanced Management Accounting*.
Appendix 1 - Chart of accounts according to the generally accepted accounting standards
Appendix 2 - Chart of accounts expanded by alternative accounts
Appendix 3 - Principle of alternative accounting that supports the management of intellectual capital
Successful Sharing of Project Knowledge: Initiation, Implementation and Institutionalisation

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Abstract: Interdisciplinary project teams foster the creation of new ideas and innovations to meet customer needs and to challenge competition under the pre-condition that the team and knowledge transfer processes are running smoothly and efficiently. In practice knowledge created in projects often is lost when the team splits up and the members return to their tasks in the organisation. This leads to inefficiency as time and money is spent in inventing things, which are already known inside the organisation. The case study outlines how knowledge and potentials for improvement can be explored and synergies can be realised. Our approach offers guidelines to accumulate transfer and utilise knowledge acquired in projects to improve future business. Through a knowledge-oriented concept the consulting and software implementation process of the case study’s company is optimised. This offers the possibility to integrate organisational change management know-how and furthermore it gives the opportunity for a critical reflection of finished and ongoing projects. In this process “best practices” and “lessons learned” are explored to foster a better planning and realisation of projects on the long run.

Keywords: knowledge sharing, best practice, lessons learned, knowledge creation, community of practice

1. Introduction

The paper highlights the importance of an intelligent approach to knowledge sharing demonstrated on a practically approved procedure of knowledge sharing on a project management level. Furthermore the concept and process for a successful institutionalisation of Knowledge Management to foster communication and sharing among people is described via a case based systematic through a procedure of “knowledge-oriented project supervision”. Starting from the case’s background and major occurring problems (chapter 2), the necessity of sharing mechanisms in practice and the possibilities to initialise knowledge sharing is explained (chapter 3). It illustrates how experienced lessons learned of old projects could be integrated to improve new projects. The implementation of knowledge sharing procedures needs specific guidelines (chapter 4); following the case a process-oriented focus to optimise project management via Knowledge Management techniques is visualised. Specific criteria for success are needed to foster and promote and institutionalise the whole process (chapter 5). Key facts are reflected and different points for a further discussion are highlighted (chapter 6).

2. Background and problem identification

The case study’s company is dealing with specialised “Customer Relationship Management” (CRM) software and wants to optimise processes in the consulting department. The consultants are responsible for the implementation of the software in banks worldwide. Over 90 % of the turnaround is realised with international customers in Europe, Africa and Asia. The marketing and sales department is responsible for the acquisition of customer orders; software specialists develop the individualised software solutions in house. Marketing and sales passes the projects to the consultants; their main task is the implementation of the software on-site at the customer. The consultants are working in different project teams, work overextends them and there is no time to train newcomers. The consultants are specialists in CRM-software but most of them are not experienced in organisational change processes, which are accompanying software implementations. They are aware of the importance of accompanying organisational support in software implementation processes and see the necessity to improve their organisational change know-how. The consultants have changing roles in different projects because the project teams are arranged depending on urgency and disposability. Dealing with special customer requests they have to be familiar with every detail of the software features. In addition they need competence in consulting, organisational development and change management to ensure a successful implementation of the software at the customer. The project managers are coordinating different projects. Due to the fact that one team’s project manager can be a participant of another team, overlaps and bottlenecks might arise. There is a lack of planning, structures and processes for
the projects – the whole project management has to be evaluated, reflected and improved. The consultants are acting according their own experience; they have to improvise quite often.

As a result of these conditions the training of newcomers proves to be a long-term process and important projects are predominantly processed. Project managers have no chance to be actively integrated in present projects, they become frustrated and the fluctuation is relatively high. To provide good customer service and avoid internal problems the top management wants to improve project management through Knowledge Management. As the enterprise has few experiences with Knowledge Management methods, our institute as external partner is authorised for the implementation of knowledge sharing processes. The consulting department of the company is selected as Knowledge Management’s first field of realisation. Exchange of experience in this area promises a high profit because coordinating the software project and the implementation processes are challenging and frequently similar difficulties occur at different customers. The project should also help to integrate and inform “newcomers” that they become familiar with typical software implementation procedures. Another reason for the project initiative is that experiences gained in projects are only partly available for colleagues because they are not systematically shared and documented; exchange of experience works only through informal talks. If required meetings within the individual project teams are called up; a general and organised exchange between project teams does not take place. Frequent problems and solutions are not analysed and productively used for new projects. Consultants are often out of the office; therefore informal knowledge exchange is difficult. The systematic approach towards Knowledge Management should help to conquer these problems and to discover and use synergy potential.

3. Initialisation of project knowledge sharing

Theory and practice show that employees spend about 30 minutes per day to search for needed information to work effectively. This is approximately five per cent of the whole working time (Heck, 2002). Initiatives to share knowledge or to show ways how to use knowledge sources help to minimise this search time and the related costs. Rosenkopf advises to focus on dynamic knowledge networks (e.g. among employees) to realise competitive advantages. These networks influence technological and performance outcomes whereby a systematic approach to

by the experienced consultants. Furthermore employees are called “newcomers” who are not new anymore but already one or two years within the company. So the term “new” means in this context “having no project experience” which is a consequence of the lacking systematic knowledge sharing and training. Therefore new information and knowledge is needed (Rosenkopf, 2000). Company project experiences consistently show that projects mostly stay unquestioned. This can primarily be seen as a reflection of the existing project culture of a company, e.g. a company jumps from project to project without questioning relevant criteria for success or failure of specific project steps. If anything is questioned than just who are the ones responsible for the failure: a play of accusing and justification instead of learning from failures and improving systems, procedures or processes in the organisation. Learning from each other seems to be out in the age of “distance learning” via CD-ROM or e-learning tools (Pfeffer/Sutton, 2001) but learning by doing and learning from experiences is very effective. In many cases when problems have to be solved or “new avenues to fast track thinking and innovation” have to be explored (Rylatt, 2003): gather the right people around the table!

Because of the aforementioned problems and basic conditions in the working environment of the consultants, knowledge-oriented project supervision meetings are introduced in order to conquer the increasing pressure of quality in consulting. In this context first the term “knowledge-oriented” refers to knowledge acquisition, reflection and use that is realised in these project supervision meetings. Second the term “supervision” is originally rooted in the American linguistic area and means control and/or monitoring (Scobel 1995). In this process “best practices” and “lessons learned” are explored to foster a better planning and realisation of projects. Through this process in our case the consultants have the chance to improve their work and to practice critical reflection. Internal facilitators are trained for a better future knowledge transfer. Furthermore the possibility for holistic learning is enhanced through the documentation and transfer of the results to all involved colleagues. Regarding holistic learning a “Management of Knowledge” is not the best approach as it concentrates primarily on explicit knowledge, which can be seen as one of the slightest parts of knowledge inside an organisation. Through these circumstances the efficiency and actual practicality of Knowledge Management attempts of this kind can be evaluated as rather superficial. On the contrary the creation of the context for promotional, organisational, general conditions (constraints) is
The basis for the generation, transfer, actualisation and usability of knowledge itself. This is why knowledge management should deal with the design of promoting circumstances for the preferential treatment of the resource knowledge. This leads to the demand for a "Management for Knowledge" and the necessity of a composition of "contextually sensitive organisational consciousness" and "management knowledge". From a practical point of view following factors, which definitely determine the success, are needed:

- Strategic relevance of knowledge for the organisation
- Commitment from top-deciders (promotion and active participation)
- Ensure employee acceptance (communicate objectives and benefits)
- Knowledge-oriented organisational-diagnostic (organisational status-quo)
- Integrative concept (design, program, road map)
- Development of promoting contexts (incentive system, structures etc.)
- Constitution of a knowledge-oriented organisational culture (trust, cooperation, reflection, learning)
- Continuous development of competences (at management and employee level)
- Construction of a usable IT-infrastructure (technologies and media for knowledge transfer, saving, retrieval and integration of existing structures and systems)
- Promotion of integrative processes (interaction, communication and participation of employees)
- Coordination of planning and control processes (indicators/measuring system)
- Knowledge transfer from the environment into the company (external experts/partners and stakeholders)
- Documentation of „lessons-learned“ and „best practices“ (use and sharing of experience)
- Evaluation of the effects of KM-strategies and methods (and communication of the results within the organisation)

The principle of "Management for Knowledge" follows the system- and structure-theoretical basis, which says that the (re)producing self-developed order in the deep structure of the organisation continuously manages the handling of knowledge rather invisible through monitoring, interpretation, combination and associated meanings (Neumann 2000). The “organisational order of knowledge” (Neumann 2000) takes over the main function of a pre-anticipated management system, because it determines what kinds of data develop to information, what kind of knowledge will be generated, integrated, distributed, used or refused. Furthermore it establishes the knowledge-based acting inside the organisation. This order is based on knowledge that is embedded in structures, routines, competences, technologies etc. and on which current acting implicitly referred to.

Figure 1: Success criteria of the “Management for Knowledge”

For knowledge-oriented project-initiatives it is recommendable to start with the constructive reflection of ongoing or already finished projects. In our case consultants who had to implement a specific IT-system shared their knowledge in continuous project supervision meetings to discuss their project experiences in a structured way. It makes sense to use projects and the consequentially gained “lessons learned” and “best practices” in the sense of KM to learn for
similar future projects. For that purpose it is necessary to openly ask and honestly answer critical questions during project meetings as well as during a concluding project-review, and to document the results: (1) What was good, what was bad? (2) What would we change as a project team, if the project started again? (3) What did we learn from the specific project? (4) What do we know now and what didn’t we know before? With questions like that project meetings get a new structure.

This certainly means a change in the sense of a knowledge-oriented handling of projects that are always a mirror for the organisation and its organisational culture. The results of the supervision meetings have to be documented and shared with the colleagues; information and communication technologies are helpful in this context to foster knowledge transfer. The following illustration shows how “lessons learned” can be included to improve new project activities. The left column shows the old way; projects stay unquestioned and the potential for learning and further development is lost. The right column underlines an ideal solution to improve current and future processes through including “lessons learned”.

Figure 2: Integration of project experience in new projects

Project risks like planning-, conversion- and surrounding field risks (Redlefsen 1997) need to be made conscious and prevented purposefully. External supervisors accompany the meetings, in order to ensure that relevant, usable final results in the form of “best practices” and “lessons learned” are developed. In this connection supervision is not top down guided as a form of control, but is organised as a cooperative, critical and steered process. Central aims of knowledge-oriented project supervision are: systematic examination of the own work, the production of ideas and mental impetuses by the experience of others and gaining insights in colleague’s work. The participants develop individual learning and consulting competence through the detailed analysis of projects and the discussion in supervision-groups, whereby their work is substantially facilitated and professionalised at the customer. Ideally these attempts lead to the projection of a positive image of the company regarding products and their implementation as well as to satisfied customers and motivated consultants.

4. Implementation of project knowledge sharing mechanisms

Knowledge Management projects are successful when they have direct positive influence on day-to-day business. KM initiatives have to be aligned at strategic goals, should influence or even change them in a future oriented way. Prerequisite for that is comprehensive understanding of knowledge assets and knowledge needs within an organisation. (Palass/Servatius 2001) In this case study especially knowledge about customer-oriented software implementation processes is missing which is critical for the future of the organisation. The consultants are aware of the fact that successful implementation needs more than high quality software but also high quality processes and context-oriented organisational change know-how. Therefore the next step is to find a suitable process for sharing knowledge about these sensitive procedures at the customers to ensure a quick and efficient knowledge flow. Starting knowledge-oriented project supervision the
respective project must be defined, whereby tasks, goals and strategies are considered and the basic conditions for the project are clarified. On the basis of a prepared problem list, completed during the meetings, background and causes are analysed. Resuming ideas for solution and a process design are developed, which are operationalised and concretised in an action-list. Measures must be evaluated for negotiability and practical fit ("obstacle course") through a critical test of the action-list, whereby simulations and worst-case scenarios can be used as supporting tools. Due to experiences in projects and reflection in the meetings "lessons learned" are documented and possibilities for improvement are compiled. A structured and clearly communicated procedure for introduction of knowledge-oriented project supervision contributes crucially to a successful progress. The transparency of the process reduces uncertainty and contributes to the acceptance by the concerned employees.

Figure 3: Guidelines for a knowledge-oriented project supervision process

The supervision takes place in a multi-personal-setting, i.e. the consultants meet in relatively regular intervals in a "group-system", which stands "differently connected to the institutionalised social systems" (Schreyögg 1991), whereby each participant has the task to actively describe a "learning project". Per meeting a learning project is presented, discussed and analysed by the supervision group. "Learning projects" are respective problem fields and challenges as well as solutions from the work of the consultants, whereby the following conditions should be given:

- Work basis: The respective subject should be related to the field of activity during the project.
- Significance: The questions brought into the supervision group are important for the respective participant (no "alibi" exercises).
- Relevance: In the supervision circle behaviour, structure and process questions are raised.
- Influence: Each supervision participant has direct influence.

- Process: Problem solutions are developed through an ongoing process.
- Interaction: Communication and co-operation are crucial preconditions for a problem solution (link to KM: knowledge transfer processes).

Important for the success of knowledge-oriented supervision meetings are open communication and the development of a productive meeting culture. The team has to know exactly what are the reasons and the outcome of the meetings and of their contribution. If the team is not yet familiar with each other a team-building phase has to be included. From the structure-theoretical point of view an integration and use of knowledge result only, if the involved actors ("knowledge agents") reproduce their knowledge-enriched actions; they have to use "lessons learned" and "best practices" in daily work. Furthermore they refer in their interactions to changing structures, sets of rules and resources. The definition of rules for the supervision meetings, suitable for the respective context, is therefore essential during the supervision process. For the successful
knowledge exchange between the consultants it is crucial to establish a meeting culture, which promotes the open exchange, the expression of constructional criticism and the development of solutions.

To guarantee a high quality regarding content, the participants receive a precise workflow for the project supervision in form of a checklist. This list assists the consultants in planning the reflection and presentation of their projects whereby the following topics have to be considered:

- Project based review about the software implementation procedure and regarding milestones, workflows
- Personal review about the processes, problems and barriers
- Critical reflection of the whole project
- Future prospects for running projects and potential for improvement and simplification
- Problem solutions and action list
- Critical view of the action list
- Learning’s and discussion within the supervision group

The discussion of the projects along different criteria and the exploration of learning experiences are central for a successful knowledge-oriented project reflection. In this regard the supervisor’s role as a facilitator is demanded to give necessary mental impetuses to the group, without an anticipatory solution or a too strong influence on participants. The use of different observation levels during the supervision process is crucial, whereby e.g. the following three dimensions should be considered (Scala/Grossman 1997, p. 70 ff.):

- Personal characteristics of the supervisor
- Personal relations and group dynamic
- Formal and informal structures of the organisation

The supervisor is constantly monitoring the processes to be able to set interventions for the promotion of a target oriented reflection and to foster a fruitful culture within the group during the whole project supervision process. The supervisor’s role is crucial as sensitive context steering and sensibility for group dynamics are indispensable. For this task an experienced and accepted person is needed – external supervisors are a good choice to get professionally started with the knowledge-oriented project supervision process.

5. Institutionalisation of project knowledge sharing for future success

At the beginning of KM intentions one must define the strategy and targets of KM attempts. The strategic orientation regarding knowledge-based processes and practices depends on considerations about the organisational purpose. A “strategic architecture” (Hamel/Prahalad, 1995) for the purpose of knowledge development has to be created which determines how the specific company will meet its competition in future. This conception contains perceptions about the future of the specific company, formulated in universal metaphors, analogies, symbols and models, which represent the core concepts of the company and clarify the self-conception (Neumann, 2000; Neumann/Stingl/Grillitsch, 2002 und 2004). The design of the “strategic architecture” depends on the organisation, its processes, procedures, cultural characteristics, core competences and core knowledge. The “strategic architecture” should be as holistic as possible because the success of knowledge-oriented project management depends on promoting organisational frameworks and supporting IT-infrastructure. The investment in knowledge management needs to be directly interconnected with the consciousness and ability to change and transfer the organisation step by step according to present and future needs. Knowledge-oriented project supervision meetings are one step toward intelligent, self-reflecting and collaborating employees who can act as “change agents” in their own work environment. Central experiences, findings and potential solutions to problems have to be documented and communicated. In this case study “feedback meetings” are used to explore the relevant information of the different knowledge-oriented supervision meetings and to think about necessary organisational changes within the software implementation process. These meetings are also used to reflect about the performance of the supervision meetings themselves to ensure a productive learning environment for all participants and to realise potential for improvement within the learning process as well.

To use the advantages of knowledge-oriented project supervision in the long run, the supervision meetings must be institutionalised in the organisation. Therefore some organisational preconditions are necessary. In our case the following steps are undertaken:

- Commitment of top management for the project supervision meetings
- Structured procedure for the implementation
- Training of internal moderators
Collection and documentation of “best practices” and “lessons learned”
Reflection and evaluation of the project supervision meetings
Improvement of the meetings and the documentation according to participants needs
Supporting IT-infrastructure to foster knowledge transfer
Clear roles and responsibilities, in meetings and for documentation

The quality of the supervision meetings depends on the quality of the participant’s contributions and particularly on communication and reflection culture in the supervision group. Supervision acting forms the basis of the "supervision culture" (Petzold, 1998), which is coined by perception parameters, normative guidance concepts, interpretation work and action strategies for supervision work. In order to succeed the desired supervision culture must be created and institutionalised from the beginning. Qualitative team supervision provides the feeling of action in a "safe place", in which the group tackles sensitive topics guided by a reliable supervisor. Without “direct action and decision pressure” an area for suppressed questions, conflicts and problematic topics is generated where these issues can be addressed, reflected and clarified (Pühl, 1998). In this regard the supervisor’s role as a facilitator must give necessary mental impetuses to the group, without an anticipatory solution or a too strong influence on participants. Through the spontaneous, in a way self-organised creation of rules, the locally existing knowledge of the knowledge agents is used in the best way. In rules about learning- and selection processes, the knowledge and the experiences of the different experts are integrated. Only through the possibility of relating to knowledge in a current action, knowledge is effective as an “accurate or valid awareness” (Giddens, 1984) about a situation or problem. In the collective reflection of activities/projects the problem solving potential is activated. New or improved solutions can be found which leads in our case to process innovation. These collective activities lead to a self-referential circle and act as a starting point for further actions, which finally shape the identity of the system. Everyone is responsible for “sparking ideas” and their transformation into “useful innovation” (Mauzy/Harriman, 2003). KM has always to do with change whereby the degree of change should suit the aimed-at purpose to be effective. The most important influential factors for excellent companies’ performance results and according KM-attempts are fruitful relationships among people, result-based leadership, communication and teamwork.

The cases IT-software Company decides to implement an IT-Tool adapted to the special needs and wants of the consultants to facilitate their software implementation work. Software experts in house design a specific programme in cooperation with the consultants. The programme contains five different key areas: (1) the role and work of a consultant, (2) important aspects of change management, (3) process consultation and process modelling, (4) communication mediums and methods, (5) a step-by-step consulting process model. Findings of the supervision meetings are documented in the system and the consultants are adding new information constantly. Apart from facilitating the consultant’s work this tool also helps newcomers to get insights into process projects, workflows, tasks, problems and possible solutions. Regarding IT-systems an ongoing check is recommendable to what extent the instrument is actually used, which supporting functions are really needed and if the content is still actually relevant. According to Romhardt all instruments which are used repeatedly develop a specific self-dynamic and tend to remain unchanged and unreflected - finding suitable and usable instruments and dispose the other ones is real live problem solving (Romhardt 2002). IT-systems should be easy to handle for the users, with a transparent structure and relevant, up to date information. One or more responsibles (depending on the systems dimensions) are needed for administrative support – then a system can be successfully institutionalised.

For systems, people, processes and instruments learning and reflection are the basis for a strategic orientation towards Knowledge Management, which helps to adapt to new conditions, and can offer effective methods for solving new problems. Active solution- and application-oriented Knowledge Management forms the foundation for a broad, in-house knowledge base. Therefore employees need time to reflect experiences, communicate with colleagues and to document their knowledge (e.g. into IT-systems). Wildemann demands that promised time resources are earmarked for Knowledge Management, these resources should be used for trainings how to handle knowledge bases as well for knowledge input, searching and active use in daily business (Wildemann 2001). A target oriented and efficient exchange of experiences requires high initial investments into the system along with the conception and organisation of feedback mechanisms. These points mentioned have to be integrated in a concise general concept to ensure knowledge transfer, which only emerges from the reflection and evaluation of new methods,
processes and experiences. (Della Schiava / Rees 1999)

6. Discussion and suggestions

In this chapter we summarise core ideas and aspects of successful knowledge-oriented project supervision meetings from our experience. A practical and structured approach to Knowledge Management ensures transparency, orientation for the participants and clear tasks, roles and procedures. Therefore we recommend considering at least three stages for KM initiatives, which are the stages of “initialisation”, “implementation” and “institutionalisation”. Initialisation - in the sense of „cultural change“ knowledge management projects are always highly complex, multi-dimensional, far reaching challenging areas with numerous impacts (looking right and left, back and forth, etc.), this results in a mostly consequently, concentrated and adjusted way of a cascading realisation of separate steps of change. Rethinking and reframing (change of paradigms, change in consciousness) need to be started at the managerial top-level, because it is transmitted and carried by them. This means a creation of organisational consciousness through kick-off workshops and sensibilisation seminars for the realisation of the organisational processes, the identification of problem areas and for the necessary changes. The top and middle management activity and commitment is an important multiplier for the success of knowledge management initiatives. Through the personal commitment and the willingness to realise KM, multiply available single-activities of KM are constituted as a broad movement (Palass/Servatius 2001). The main task of managers lies in the creation of a promoting work environment, in which many people have gained an identity, sense, behaviour, etc.) to get the results, it gets. There are also many different methods, instruments and techniques. We think that the principle of “put the whole system in the room” is the most useful. This means to work together with a representative community of organisational members (picture the organisation with its characteristics and ways of functioning) in a workshop on the possible causes of specific problems. This creates transparency; makes the problem landscape more conscious; decreases one-sided interpretations, prejudices, attribution, fantasies and projections and furthermore promotes an open discourse process.

Implementation - time plays a mostly underestimated and important role for the initiation of planned knowledge management and change-programs as well as for the right timing (kairos) of interventions (window of opportunity). The related relevant questions are: “How much change is necessary at what point in time?” and “How much change is useful at the present development stage?” Through the ongoing serious, open and collaborative answering of the questions an excessive demand as well as unnecessary burden can be prevented (following the “right” company’s velocity). Communications, exchange of information and media work are essential criteria’s for success in the sense of „management of knowledge and change“. Team development and team supervision should help to build, develop and reflectively assist teamwork. The separate task and target-oriented configured groups pass consequently the diverse team-dynamic phases of development till they are a powerful, effective, target-oriented, learning and result-responsible team which is based on functional trust. The primary interest of the task force is the improvement of the cause, but they know about the interpersonal relations and their impact on the task’s success probability. The team members need to know about each one’s strengths, potentials, affinities, interests as well as...
weaknesses for the classification and acceptance of roles. Besides this social competence the teams moreover need to have professional competence and knowledge regarding project management, method and tool use, techniques of decisioning and problem solving. If it is necessary this can be conveyed in separate training elements.

Institutionalisation - through team supervision the lonesome existence of the realisation goal getter is reduced. Different process- and result owners come continuously together in supervisory groups to expand the project specific problems. This means they collectively diagnose the specific starting situation, promoting and hindering framework, plan separate steps of action and alternative processes, reflect and prove them reciprocally and go back to practice with concrete realisation arrangement plans. They use the knowledge of many group-members in similar situations. They interchange knowledge within a community, communicate and pick up role-specific problem areas, expectations and misgivings as a central theme. That way they can assist each other, what again leads to incentives and staying power. Besides this supervisory meetings (escorted by external consultants in the role of reflectors, process specialists and if necessary responsible for input) the specific team-members meet each other in the mean time. This helps each other in the way of an “intervision” for the specific project-work and leads to an identification and use of existing employee potential. Communication and participation is essential in each step of the KM-initiative: In the initialisation phase participants need a clear transmission of vision, target, and strategy as well as a concise concept for the KM-attempt. During ongoing processes of the implementation phase responsibilities depend on feedback, reports of actual steps, problems, possible solutions and intermediate results to provide motivation and help to avoid critical errors. In the institutionalisation phase core outcomes are communicated and the whole KM-project should be reflected and evaluated. Furthermore it is essential to consider the right time, intensity, use of media and an informational and communicative language.

7. Conclusion
The cognitive comprehension about the necessity of an efficient utilisation of knowledge in the company’s code of practice permanently increases, though the company’s pressure of troubles and change in an increasing knowledge competition primarily provides the increasing probability for serious steps towards realisation. For this case not only established theoretical models need to be generated but also feasible ways of implementation in sense of a systemic Management for Knowledge. For a successful, systematic integration of KM in applied project management and furthermore for an enhancement of excellent procedures, cross-project supervision meetings are one possible solution to transfer “best practices” and “lessons learned”. These structured supervision meetings crucially contribute on the one hand to the social dimension of enterprises (formal and informal communication and information) and on the other hand they optimise project processes and give the opportunity to learn from already realised projects (do not reinvent the wheel!). Effective and efficient knowledge-oriented project management lays in the balance of organisational framework and supporting IT-infrastructure. Each company needs its own specifically designed and adjusted KM solution to foster innovation and development of business excellent strategies, structures, processes and products. Organisational consciousness, as the ability to think in structures and processes (Buchinger 1997), is the core principle of knowledge-oriented project supervision. This competence is developed systematically, supported by external supervisors, through the analysis of projects. But even knowledge management is only a kind of construction of reality among many others and does not supply universal rules for the development of companies. Investment in KM needs to be directly connected with change and improvement of the organisation step by step. It lies in the hand of the company itself to put one’s money where one’s mouth is.

References

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Knowledge Management in a Virtual Community of Practice using Discourse Analysis

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Abstract: The topic of Community-of-Practice (CoP) has been discussed in the management literature in the earlier part of 1990’s, and since attracted a lot of attention from academics and professionals around the globe. Communities of Practice (CoP) have become a strategic approach for fostering learning and transferring knowledge. However, there are a few studies, which explain what makes a community to engage in a discussion to share their knowledge and experience. This paper discusses the anatomy of a CoP, and examines a number of knowledge management tools such as story telling and discourse analysis to illustrate how knowledge is transferred and learning takes place in a virtual Community of Practice. Results are presented from a ‘live’ virtual community of practice, which is in the maturity period of its life cycle to discuss the role of domain experts and moderators how they facilitate to engage the community in dialogues and help generate the new knowledge. Also using Nonaka and Takeuchi’s knowledge spiral model it is explained how learning takes place in this virtual community of practice.

Keywords: Community of practice, discourse analysis, knowledge management, story telling, Nonaka and Takeuchi’s knowledge spiral model.

1. Introduction

A recent survey by the Institut für e-Management e. V. (2001) proposes Communities of Practice (CoPs) as one of the top ten topics of Knowledge Management (KM). Co-founders of this concept, Lave and Wenger, go to extent of considering CoPs “an intrinsic condition for the existence of knowledge” (Kimble; Barlow, 2000). The CoP has been particularly recognised as main tool for converting “implicit” knowledge into “explicit” form of knowledge (Davenport and Prusak 1998). Reports from American Productivity and Quality Center (APQC, 2000) survey suggest that 95% of the Best Practice organisations consider CoPs very important to their KM Strategy. According to the survey, firms such as Ernst and Young consider CoPs an equivalent to Knowledge Management. Almost 33% participants included in the survey represented consulting firms, which demonstrate that consulting which highly knowledge-intensive industry value CoPs as a valid method knowledge acquisition and transfer. In this paper Wenger’s and Snyder’s definition is considered for co-presence of distributed groups if they can still be considered Community-of-Practice (2000). Lave’s and Wenger’s initial analysis relate to the groups those were exclusively co-located in non-IT-settings (e.g. tailors, quartermasters, butchers and claims processors). They suggest that the co-presence should not be seen as essential condition for forming a CoP (McDermott, 1999). Since Brown’s and Duguid’s (1996) influential case study on CoP at Xerox, other case studies of distributed and computer–mediated Communities have been published as explained in the subsequent sections.

2. Community-of-practice (CoP)

The famous case study with Xerox PARC, done by Brown and Duguid in 1996, helped rejuvenating the modern notion of “Community of Practice” (CoP). They defined CoPs as “peers in the execution of real work, held together by a common sense of purpose and a real need to know what each other knows” (Brown and Duguid, 1998). Again, Wenger and Snyder (2000) two of the most recognised theorists on the topic define CoP as “groups of people informally bound together by shared expertise and passion for a joint enterprise” (Wenger, 2000) The key points of other CoP definitions include knowledge sharing, learning (Reinemann-Rothmeier and Mandl, 1999), a common practice or solving of common problems of the group and construction of a common knowledge repository (Stewart, 1996, McDermott, 1999). However, there is a close relationship of CoP topic with the notion of “Business Communities” which is defined as groups formed around a topic, which is relevant for business (Gruban, 2001). It is assumed that these groups have been working for some time together, while manifest other characteristics of being a community, such as, sharing a common meaning: identity and common language derive from common practice and common interest(s) (Hildreth et al, 1998). We, therefore agree with following working definition of CoP for the purpose of this paper:

“Group(s) of people, which have an interest in the same topic over a longer period of
time and who are engaged in an activity of sharing their opinions on this topic.”
(Probst, 1999)

Wegner (1998b) define life cycle of a CoP into five stages of maturity as shown in Figure 1.

Figure 1: Life Cycle of a Community of Practice (CoP)
The first stage Potential is about finding people with similar interests, establishing contacts, and building informal relations. The second stage Coalescing is where identity is formed and the values are discussed. The members move from a loose network to a common sense of purpose. This is an engagement stage where discussions in the field of interest start taking shape. The third stage Active is where CoP becomes highly dynamic and comes into its own by engaging in a high level of activity. This is where permanent generation of new knowledge takes place. The fourth stage is Dispersed where at first members of the periphery and then core members themselves lose interest in the topic. As there is less activity, the influx of new knowledge is reduced, which makes the CoP become less attractive. The fifth stage Memorable is the collection of memorabilia. Here the CoP is dispersed, however tales and anecdotes live on for a while. People still associate with the CoP as a significant part of their identity. In each of these stages of the life cycle the CoP is confronted with specific problems and therefore there are different ways to support a CoP. Cohen (1998) argues that the evolution of CoP life cycle has a strong correlations with its membership size. The CoP counts the most members in the stage of coalescing and activity. When the number of members exceeds a certain limit, cohesion is not valid any longer and sub-communities are formed. In this article we describe a CoP which is mature (started in 1991) and is in the “active” stage of its life cycle.

3. Understanding knowledge dynamics

Literature provides very clear links of learning and knowledge management (Hafeez and Abdelmeguid, 2003). Also learning is an essential ingredient for developing individual and corporate competences in the knowledge society (Hafeez et al., 2002a, 200b, 2002c). Here we would consider two specific tools for knowledge management, namely, Nonaka and Takeuchi’s spiral model (1995) and story telling. We would argue these are useful tools to explain knowledge dynamics in a virtual CoP context.

3.1 Knowledge transfer (SECI) spiral model

Nonaka and Takeuchi (1995) spiral model illustrates how knowledge is created and transferred in an organisation through interactions between tacit and explicit knowledge. More specifically they recognise these interactions as ‘knowledge conversion’. There are four modes of knowledge conversion, namely, socialisation, externalisation, combination and internalisation (see Figure 2) as summarised in the following:

- **Socialisation** (from tacit to tacit): where knowledge transfer takes place in a tacit form. Here, an individual acquires tacit knowledge directly from others through shared experience, observation, imitation and so on.

- **Externalisation** (from tacit to explicit): through articulation of tacit knowledge into explicit concepts. This field prompted by meaningful dialogues or reflections.

- **Combination** (from explicit to explicit): through a systematisation of concepts drawing on different bodies of explicit knowledge present in the environment of an organisation.

- **Internalisation** (from explicit to tacit): through a process of "learning by doing" and through a verbalisation and documentation of experiences.

The main benefit of this model is that it provides a mechanism to provide an understanding on the
epistemology and dynamism of knowledge itself, and provides a framework for management of the relevant knowledge management processes from the ontological perspective. We will use this framework to discuss how knowledge is shared and generated and learning take place in a virtual CoP.

![SECI Diagram](image)

**Figure 2**: SECI diagram representing four modes of Knowledge conversions (Source: Nonaka and Takeuchi, 1995)

### 3.2 Story telling

Storytelling is the use of stories in organisations as a communication tool to share knowledge (Snowden, 1999). Stories can be used to serve a number of different purposes in an organisation to meet different context, for example Denning (2000) identifies that there are eight purposes for storytelling, which all relates to expressing complicated ideas and concepts. The aim is to produce clear communication for converting knowledge into a form in which easier for others to understand. In a CoP context, socialising in a formal or informal way provides opportunities for stories to be told as people relate their experiences and it is through the medium of story telling that people are encouraged to share knowledge. For us storytelling is a powerful transformational tool which if used appropriately can facilitate sharing of knowledge in a virtual CoP. Recent research undertaken by (Sinclair, 2005) shows that stories can carry symbolic information and convey meaning as well as greatly enhance both commitment and recollection as it help readers feel a closer connection to the issues and people whom the stories are told about. We would explain how various domain experts have made use of story telling in our case virtual CoP for generating participant’s interests and keeping them engaged with dialogue.

### 3.3 Discourse analysis

Discourse analysis is a way of identifying, categories and developing relationships between exchanges, sequences, and episodes of messages (Sherry, 2000). Discourse analysis is good way of determining the relationships between the concepts that are presented and discussed in the conversation. Spradley (1980) recommends four levels of investigation in order to conduct a discourse analysis as explained in Table 1.

<table>
<thead>
<tr>
<th>Level of investigation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain analysis</td>
<td>This means capturing the parts or elements of cultural meaning that occur in the conversation by identifying the discrete set of moves used by the participants.</td>
</tr>
<tr>
<td>Taxonomic analysis</td>
<td>This is a search for the way that the cultural domains are organised. It usually involves drawing a graphical interpretation of the ways in which the individual participants’ moves, form groups and patterns that structure the conversation.</td>
</tr>
<tr>
<td>Componential analysis</td>
<td>This means searching for the attributes of the terms in each domain, the characteristic phrases or sentences that tend to recur within each category of moves.</td>
</tr>
<tr>
<td>Theme analysis</td>
<td>The last and final step is to search for patterns or recurrent relationships among domains. If certain moves or language functions tend to enhance learning, then these patterns need to be identified.</td>
</tr>
</tbody>
</table>
In a virtual CoP context, we feel the above relationships, as well as the interaction of the moderator could construct the subsequent structure of the conversation. Such electronic dialogue could be characterised by a dynamic membership of the community members that are distributed across space and through time. We have further developed the discourse according to the nature of the discourse and type of discourse as explained in the next section.

4. Methodology

System Dynamics association has been around for about 50 years to act as a platform to develop System Dynamics Discipline. The System Dynamics (SD) discipline itself was conceived due to the cross-fertilisation of the fields of management science, control theory and computer simulations. It aims to represent time behaviour of a “real world” system using some well-known pattern such as learning curve or S-curve. More complex models are readily developed using non-linear algebraic equations, however, the main aim is to understand the dynamics and behavioural changes in a system over time rather focusing on actual numbers or quantitative outputs. Such analysis is therefore suitable to study medium to long-term changes in a system or organisation to generate or test appropriate policies.

The analysis in this paper concerns the System Dynamics CoP, which related to System dynamics Society. The System Dynamics Society was established around thirty years ago with key aim to provide Platform. For researchers, educationalist and practitioners for exchange of ideas. Over the years the Activities Of the Society have evolved in many forms such as organising workshops, conferences and doctoral colloquiums. The front end of the website is illustrated in Figure 3, (this may be viewed at: http://www.ventanasystems.co.uk/forum/)

Figure 3: SD CoP interface: http://www.ventanasystems.co.uk/forum/

The virtual systems dynamics CoP is a specialist community involving technical expertise of domain experts, teachers, consultants and students. The reason for choosing this CoP was our own knowledge, interest and expertise of this subject area. Also we have been part of this community since the coalescing stage (within the first 4 years) of its inception and have been a member of it for the past 16 years. This allows us to ascertain the membership position within the community and make us understand who is the domain expert in the different areas of the System Dynamics (SD) discipline. Also we have an active participant in the past for various discussions of this CoP. However, we have been an observant during the case study period. We analyse two topics of discussions which overall reflect a period of two years. However, duration of discussion for each of these topics lasted not more than 20 days. We have analysed these topics by who are the participants of the discussion (for example, topic initiator, community member, domain expert (DE)) (see Table 3) We have given each member a code (for example, A, B, C, etc.) to further analyse their overall contribution in a quantitative way during the whole discourse. We have counted total number of messages for each topic and have categorised the Message length under 1-50...
words: Very Short (VS); 51-100 words: Short (S); 101-250 words: Medium (M); 251-500 words: Long (L); 501-1000 words: Very Long (VL); +1000 words: Extended Contribution (EC).

We have classified the nature of discourse within discussion as follows:
- Inquiry (Inq.): to inquiring specific knowledge (technical or non-technical); this is mainly used to initiate the discourse.
- Explanation (Exp.): to make something clear by giving reasons
- Story telling (ST): to narrate an interesting event to enhance an idea
- Support: to show one’s loyalty or approval of belief

We have classified each reply into five types of discourse:
- Technical Dialogue (Tech): Participants apply specific knowledge (qualitative or quantitative) from a particular field
- Experiential Dialogue (E): Participants use anecdotes and reflections based on from their own experiences to argue for their case.
- Philosophical Dialogue (Ph): Participants refer to or are guided by a particular school of thought.

The analysis discussed in this paper illustrate how domain expert in the field are acting as a voluntary mentors for educating the students, semi experts and experts in the field. We also illustrate how these mentor experts share their subjective and tacit knowledge to act as a catalyst to generate new ideas, and maintain the interest of the community to remain engaged in a dialogue. Some recent studies have already shown that leadership is a key success factor for managing a virtual community of practice (Bourhis et al.; 2005). We further explore a number of knowledge management tools to illustrate how learning takes place in this CoP and individual as well as domain knowledge is expanded.

5. Case study: System dynamic society virtual CoP

We have selected two topics from the System Dynamic virtual CoP for further analysis as illustrated in Table 2.

<table>
<thead>
<tr>
<th>Topic</th>
<th>No. of replies</th>
<th>Topic generator</th>
<th>Posted on</th>
<th>Discussion date</th>
<th>Discussion period</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Can system dynamics models learn</td>
<td>46</td>
<td>Martin F. G. Schaffernicht</td>
<td>17 April 2003</td>
<td>18/4/03 to 7/5/03</td>
</tr>
<tr>
<td>2</td>
<td>Using statistics in dynamic models</td>
<td>28</td>
<td>Jay Forrest</td>
<td>29 Jan 2004</td>
<td>29/1/04 to 6/2/04</td>
</tr>
</tbody>
</table>

An analysis of these topics is presented in the subsequent sub-sections.

5.1 Topic 1- ‘Can SD models learn?’

The Query: Inspired by the development in the machine learning field, the CoP bulletin board received a question from one member (Martin Schaffernicht) inquiring:

"Is it possible to build a system dynamic model that 'learns'?"

Developing a context to his query, Martin Schaffernicht argues that this is possible only in so far as some decisions may change values of converters that are used by other decisions; but if learning means that some existing variable is replaced by a new one (second loop changes objectives and values), it seems hardly possible. His specific request worded “if anyone have an academic paper or some other written material about this theme”.

Explaining the Nature of discourse: Over the past twenty years many of the non-deterministic problems are modelled using some learning algorithms such as neural networks, fuzzy logic, genetic algorithm or some other kind of probabilistic reasoning method such as stochastic automata. The non-deterministic problem are those where an exact mathematical solution does not exists, and only way to achieve a near optimum solution through trial and error. This discipline is more recently evolved as “machine learning”. 

Table 2: A list of selected topics from SD CoP
learning” and the underlying logic of these models is to bring the output of the model as close to target as possible. Therefore after each simulation, an error function (which is the difference between the target and actual output) is generated. If the new error function is less than the previous one, a corresponding input is generated based on a fractional association to the new error function such that overtime the error reduce to zero or as close as possible. In contrast, system dynamics generates a non-exact solution based on complex mathematics. However, the SD algorithm does not go through any optimisation runs to find a near exact solution, as explained earlier the main aim of SD study is to understand the time behaviour of a system in terms of increasing or decreasing trends such as impact of educational interventions to cut down smoking in teenagers, which would be quantifiable after a few years of implementation.

Figure 4 shows the time history and Table 3 provides a discourse analysis how the discussion took place.

![Can SD Models learn](image)

**Figure 4:** Discussion profile for the Topic “Can SD models learn”

We would regard the query as a mixed type as it include search for technical information as well as need for developing an academic dialogue to provide an answer to this discussion. The query initially attracted 18 responses over the first 5 days. The first contributions expressed opinions regarding different System Dynamic approaches. The overall analysis suggests that the members who participated here were the active participants of this debate. From our knowledge of the subject area we would regard them as domain experts. Figure 4 shows that the message sent on the 1st of May 2003 by J. Lauble was the last substantive contribution to the discussion. There were two further contributions made in this CoP, however, these were general comments to support the previous arguments and to thank participants for their inputs.

The topic can be regarded as highly technical, which, in general, led to a very focused discussion. However, despite its highly technical nature, most of the experts posted relatively long (250-500 words) or very long (501-1000 words) messages. The interests from other members in terms of accepting or rejecting different opinions encouraged the experts to make further contributions. An analysis of the total dialogue reveals that, overall, academic contributions to the discussion were almost 40%, whereas around 16% came from experts belonging to some professional organisation (for example Strategy Academic Solution, PA Consulting Group and Sports Business Simulation Inc.).
Table 3: Discourse analysis for the Topic: “Can SD models learn?”

<table>
<thead>
<tr>
<th>Number of participants</th>
<th>Community Members</th>
<th>Membership Code</th>
<th>Number of Messages</th>
<th>Message Length (in words)</th>
<th>Nature of Discourse</th>
<th>Type of Discourse</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>M Schafernicht</td>
<td>1</td>
<td>S (topic initiator)</td>
<td>Inq. (topic generator)</td>
<td>Mix</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Bill Harris</td>
<td>A</td>
<td>VS first reply (DE)</td>
<td>Exp.</td>
<td>Ac</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Paul Newton</td>
<td>B</td>
<td>VS</td>
<td>Exp.</td>
<td>Ac</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Ignacio Mayano</td>
<td>C</td>
<td>M, M,</td>
<td>ST, Exp.</td>
<td>E, Mix</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Raymond Joseph</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Magna Myrveit</td>
<td>F</td>
<td>M</td>
<td>Support</td>
<td>Ph</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>George Backus</td>
<td>G</td>
<td>S</td>
<td>ST, Exp. Exp.</td>
<td>Ph</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>John Sterman</td>
<td>H</td>
<td>M, VL, L (DE)</td>
<td>Exp., Support</td>
<td>Mix, Ac, Ac</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Alan Graham</td>
<td>I</td>
<td>L, M</td>
<td>Exp., Cont.</td>
<td>Ac, Mix</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Yamen Barles</td>
<td>J</td>
<td>L, L</td>
<td>Support</td>
<td>Ph, Mix</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>George Lofdahl</td>
<td>K</td>
<td>S</td>
<td>ST, Exp., Exp., Exp., Exp.</td>
<td>Ac</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Jim Hines</td>
<td>L</td>
<td>S, L, M, L, L</td>
<td>Support, Cont., Exp.</td>
<td>Ac, E, Mix, Ac, Mix</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Bill Braun</td>
<td>M</td>
<td>S, VL, S</td>
<td>Cont., Exp.</td>
<td>Ph, Mix, Ac</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Rainer</td>
<td>N</td>
<td>L</td>
<td>Exp.</td>
<td>Ac, Mix</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Niko Papula</td>
<td>O</td>
<td>M</td>
<td>Cont.</td>
<td>Ac</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Rod Brown</td>
<td>P</td>
<td>VS</td>
<td>Exp.</td>
<td>Ac</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Finn Jackson</td>
<td>Q</td>
<td>L</td>
<td>Support</td>
<td>Mix</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Maisha Price</td>
<td>R</td>
<td>VL</td>
<td>Support</td>
<td>Mix</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Cleotilde Gonzalez</td>
<td>S</td>
<td>S</td>
<td>Exp., Exp.</td>
<td>Ac</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>George Richardson</td>
<td>T</td>
<td>L, VL (DE)</td>
<td>Support</td>
<td>Ac, Mix</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Brain Daingerfield</td>
<td>U</td>
<td>L</td>
<td>Support</td>
<td>Mix</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Martens</td>
<td>V</td>
<td>M</td>
<td>Exp.</td>
<td>Ac</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>F. G. Schafernicht</td>
<td>W</td>
<td>L</td>
<td>Inq.</td>
<td>Mix</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Carlos Arisa</td>
<td>X</td>
<td>M</td>
<td>Exp.</td>
<td>Ac</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Dave Paker</td>
<td>Y</td>
<td>M</td>
<td>Support</td>
<td>Mix</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Z. Abraham</td>
<td>Z</td>
<td>L</td>
<td>Inq. and Exp.</td>
<td>Ac</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Allocar Strasbourg</td>
<td>AA</td>
<td>VL</td>
<td>Support</td>
<td>Mix</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Jim Thompson</td>
<td>AB</td>
<td>S</td>
<td>Support</td>
<td>Ph</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>David Kreutzer</td>
<td>AC</td>
<td>L (last reply)</td>
<td></td>
<td>Mix</td>
<td></td>
</tr>
</tbody>
</table>

Key:
Community member: Domain Expert (DE)
Message Length (in words): 1-50 Very Short (VS); 51-100 Short (S); 101-250 Medium (M); 251-500 Long (L); 501-1000 Very Long (VL); +1000 extended contribution (EC)
Nature of discourse: Explanation (Exp.); Support; Contradict (Cont.); Storytelling (ST); Inquiry (Inq.)
Type of Discourse: Technical (Tech); Experience (E); Philosophy (Ph); Academic (Ac)

We have used life cycle term very loosely here to explain the life cycle of the topic itself rather life cycle for the community of practice as suggested by Wenger (1998). Figure 4 illustrates various fluctuations in the intensity of discussions. We would relate some of these fluctuations due to the breadth of the topic area-giving rise to related sub-questions, but not attracting much attention from wider community members. However, in our view the main reason for the success of this topic as can be seen from the discussion profile (Figure 4) is that every time the community started to lose interest with the topic (the “dispersed stage”), a new related question was posted that sparked off the interest from other members, upon which domain experts were quick to jump in to share tacit knowledge and experience by giving opinions. In total, five sub questions were raised during this discussion. These were as follows:

- What kinds of things could continuous aggregate models like system dynamics models learn?
- Did the system lose focus?
- Does the SD model meet all "learning" needs?
• Are there other arguments for SD being used in learning?
• Why did a correspondent make bad decisions despite possessing sufficient information to make more appropriate decisions regarding SD?

The nature of the discussion was predominantly explanation. The discussion classification was mostly academic or mixed where participants combined more than one dialogue such as technical, philosophical, or experience in their messages (see Table 3).

Figure 5 provides a percentage contribution of the key authors illustrating that the engagement of various domain experts of the discipline provided the stimulus in this debate. There were 29 members involved in this discussion of which we would regard fourteen (14) having substantial experience in the discipline. These experts belonged to academic institutions, businesses as well professional organisations. The analysis suggests that the domain experts overall posted 36% of the total replies. The replies constitutes, giving relevant suggestion to participants, express their own opinions and relating to their own experiences to contextualise any emerging questions and sometimes even acting as a moderator to summarise the discussion in a concise way.

Figure 5: Authors relative contribution in the discourse: ‘Can SD models learn’

5.2 Topic 2- Using SD in statistics

The Query: This topic was generated by the originator of system dynamics discipline Jay Forrester himself. The topic was initially springs from a previous discussion on the subject by another domain expert Jim Hines. The question worded:

“How statistics can be used in the System Dynamics Models”?

The Nature of discourse: The query was actually trying to give an answer to the question itself. The question was posed in an academic context and caused an initial flash of interest with five contributions being posted to the discussion on 29th January 2004. These contributions expressed opinions representing a range of positions; primarily there was a division between those who considered stories to be a valid means of understanding cultural transmission in themselves and those who suggested that the strength of such stories in transmitting cultures could be tested through statistical analysis. One contributor sought to find a middle-way between these two opposing views by emphasising the value of using stories and statistics together. From this contributor’s perspectives, anecdotes provided a picture of events while statistics could be used to explore how applicable these stories might be to other situations.

As the discourse of the discussion moved from a relatively general set of responses into more detailed consideration of analytical rigour (for example the reliability of statistical testing), the
number of responses declined significantly. This decline was reversed, however, when one respondent involved in the detailed methodological discussion included a number of additional comments on the topic in hand. The wider range of subjects for people to address seemed to stimulate renewed interest and point of entry for potential participants. As illustrated in Figure 6 that participation rate increased after such interventions. This interest was sustained up until 3rd of February 2004, although total participation never reached the initial interest in the topic. On 3rd of February 2004 John Gunkler tried to focus to the nature of the discussion by pointing towards the original question asking the community whether the topics had become too broad (for example the almost philosophical discussions on the nature of proof occurring on 1st and 2nd February 2004); and whether the thread should be broken into separate discussions. Thereafter contributions to this discussion declined with the final entry being made on 6th February 2004 when J. Lauble usefully summarised the points raised and thereby provided a concise conclusion to this discussion.

Based on the fact that all the participating members have knowledge about SD discipline, nearly one third of contributions came from domain experts. This composition of the participant group may be a reason for the broad nature of the discussion, as opposed to a series of narrowly focused contributions closely related to the topic under discussion. As acknowledged by John Gunkler this does produce an interesting discussion and can stimulate creation of potential new threads but can also require some experts to help retain the focus of discussions; or even bring discussion back on track. The summary provided by the final contributor is a good example of how an expert can perform a “management” role in such wide-ranging discussions, the comprehensive entry posted by an expert who summarises the previous arguments clearly and added some new material to stimulate further discussion. In this discussion, altogether eighteen members took part. Out of those, we regard ten (about 56%) are the domain experts belonging to either academia or business and consulting organisations. The nature of the discussion took the forms of explanation and support in most replies, in spite of there being other forms that could have been utilised, such as storytelling, inquiry and contradiction (see Table 4). Observing the general tone and language adopted by the participants, the discussion appeared to be one of friendly exchange based around developing mutual understanding around this topic. Even when participants disagreed, they either made efforts to point out where they could agree with another contributor, or were very articulate in explaining the basis for their disagreement. The extracts, which we term explanatory, had worked examples or experiential dialogue in an attempt to clarify the points what a contributor was trying to make. Around 61% of the contributions could be classified as either long (251-500 words) or very long (501 – 1000 words), whereas, 39% were medium (101 – 250 words) or short (51 to 100 words) replies (see Table 4). Similar to the first topic, three domain experts lead this discussion as they posted 43% of the overall contributions (12 contributions out of 28).

Using statistics in SD

![Figure 6: Discussion profile for the Topic “Using statistics in SD”](image)

6. Discussion

One key area of our interest with this research is to find out how knowledge transfer takes place in virtual community of practice. Adapted from Nonaka and Takeuchi (1995), Figure 7 provides a summary of the results in terms of how a CoP allow transfer of knowledge and instigate learning
within the virtual community. The analysis reveals that the Systems Dynamics CoP under investigation do facilitate the processes of socialisation, externalisation and combination. The community organise annual seminars and special chapter workshops each year that help to socialise and develop community ethos. Thereby, it allows members to share knowledge through chat rooms in a virtual context. Interacting with domain experts creates new knowledge. The CoP practice hold a structured archive that contains all the discussions ever took place since the start of the CoP in a topic-by-topic structure. In the combination process, the structured archive that the CoP hold, makes it possible for members to access information over a period of time, and benefits through the use of "organisation memory" if one is faced in a knowledge crises situation. Also, some of the topics that are discussed in virtual context become a topic for future face-to-face workshops and conferences. System Dynamics society issues its own electronic newsletter for promoting events, courses, publications and stories that helps in the internalisation of knowledge within the community boundary. The analysis of the SD CoP reveals how individual's tacit knowledge may be transferred into explicit knowledge and communicated. Participants adopt devices of story telling and other appropriate interventions not only to crystallise their own tacit knowledge but also to express their views and thereby share their knowledge. This demonstrates not only a willingness to engage with CoP members on a particular topic for exchanging knowledge. From the analyses of these topics, it is evidenced that some of the participants hidden or 'tacit' knowledge is converted to explicit knowledge, as the information is stored in a systematic way.

Using statistics in dynamic models

![Figure 7: Authors relative contribution in the discourse: “Using statistics in dynamic models”](image)

Table 4: Discourse analysis of the Topic: Using statistics in SD

<table>
<thead>
<tr>
<th>Number of</th>
<th>Community</th>
<th>Membership Code</th>
<th>No. of Messages</th>
<th>Message Length (in words)</th>
<th>Nature of Discourse</th>
<th>Type of Discourse</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jay Forrester</td>
<td>A</td>
<td>2</td>
<td>L (topic generator)</td>
<td>Exp.</td>
<td>Ac</td>
</tr>
<tr>
<td>2</td>
<td>Joel Rahn</td>
<td>B</td>
<td>1</td>
<td>L (first reply), VL</td>
<td>Support and Exp.</td>
<td>Mix, Mix</td>
</tr>
<tr>
<td>3</td>
<td>Kim Warren</td>
<td>C</td>
<td>1</td>
<td>M, VL, M</td>
<td>Exp.</td>
<td>Mix</td>
</tr>
<tr>
<td>4</td>
<td>Jim Hines</td>
<td>D</td>
<td>2</td>
<td>M (DE)</td>
<td>Support</td>
<td>Ac</td>
</tr>
<tr>
<td>5</td>
<td>Finn Jackson</td>
<td>E</td>
<td>2</td>
<td>S, L</td>
<td>Exp. and ST, Expanding Inq, Exp (DE)</td>
<td>Mix</td>
</tr>
<tr>
<td>6</td>
<td>Bill Harris</td>
<td>F</td>
<td>1</td>
<td>L</td>
<td>Support</td>
<td>Ac</td>
</tr>
<tr>
<td>7</td>
<td>Lorendahl</td>
<td>G</td>
<td>1</td>
<td>M, EC, M</td>
<td>Exp.</td>
<td>Ac</td>
</tr>
<tr>
<td>8</td>
<td>John Voyer</td>
<td>H</td>
<td>1</td>
<td>L</td>
<td>Exp.</td>
<td>Mix</td>
</tr>
<tr>
<td>9</td>
<td>Alan Graham</td>
<td>I</td>
<td>3</td>
<td>L</td>
<td>Exp.</td>
<td>Ac</td>
</tr>
<tr>
<td>10</td>
<td>Camilo Olayo</td>
<td>J</td>
<td>1</td>
<td>E*C</td>
<td>Exp.</td>
<td>Mix</td>
</tr>
<tr>
<td>11</td>
<td>George</td>
<td>K</td>
<td>1</td>
<td>M</td>
<td>ST</td>
<td>Ac</td>
</tr>
<tr>
<td>12</td>
<td>Backus</td>
<td>L</td>
<td>1</td>
<td>M</td>
<td>Exp.</td>
<td>Mix</td>
</tr>
<tr>
<td>13</td>
<td>Michael Evans</td>
<td>M</td>
<td>1</td>
<td>M</td>
<td>Support and Exp.</td>
<td>Ac</td>
</tr>
<tr>
<td>14</td>
<td>Kia Arild Lohre</td>
<td>N</td>
<td>1</td>
<td>M</td>
<td>Exp.</td>
<td>Ac</td>
</tr>
<tr>
<td>15</td>
<td>Santago</td>
<td>O</td>
<td>1</td>
<td>L</td>
<td>Exp.</td>
<td>Ac</td>
</tr>
<tr>
<td>16</td>
<td>Arango</td>
<td>P</td>
<td>1</td>
<td>L, M, VL, M, VL, M, VL (last reply)</td>
<td>Support and Exp.</td>
<td>Ac, Mix</td>
</tr>
<tr>
<td>17</td>
<td>John Gunkler</td>
<td>Q</td>
<td>6</td>
<td>Exp.</td>
<td>Exp.</td>
<td>Ac, Mix, Ac</td>
</tr>
</tbody>
</table>
# To Tacit Knowledge

**Socialisation**
- Planned expert conference and chapter meetings
- Community stories

# To Explicit Knowledge

**Externalisation**
- Sub-CoP
- Emails and newsletters
- Detailed knowledge stores, databases and bulletin boards

## From Tacit Knowledge

- **Internalisation**
  - Email newsletter
  - Community ethos

- **Combination**
  - Emails (no chat rooms)
  - Ventana interface which include:
    - Welcome and General Information
    - SD Mailing List Archive *(This is here as a read-only resource)*
    - System Dynamics Discussion *(members post any SD related questions to this forum)*

### Figure 8: SECI Spiral diagram for the System Dynamics Community of Practice (Adapted from Nonaka and Takeuchi, 1995).

## 7. Conclusion

The topic of Community-of-Practice (CoP) has been discussed in the management literature since the earlier part of 1990’s, and has attracted a lot of attention from academics and professionals around the globe. However, there are a small number of studies, which explain what makes a community to engage in a discussion to share their knowledge and experience. This paper discusses how knowledge transfer takes place in a virtual community of practice. The discourse analysis conducted in this study illustrates that participation of domain experts play a crucial role to conduct a vibrant and meaningful debate. The domain experts not only provided the needed stimulus when the discussions was cooling off but also intervened to help focus on the main issues of the debate when the community was about to disperse the essence of the debate in sub threads. Also they provided a meaningful dialogue at times to sum up the debate. It is also interesting to note that although the SD CoP is a mature site existed for over twenty years; there was little crossover between the domain experts for the two topics. In addition, our analysis suggests if a topic is initiated by a domain expert (Topic 2), it attracted relatively more domain experts for the discussion. Moreover the responses were relatively more personalise as these were directed to a particular domain expert either supporting or contradicting his/her views. However, topic initiated by a well-known domain expert does not necessarily means more contents and debate, as the participation level and membership for Topic 1 initiated by non-domain expert was relatively higher. However, for the both cases, the members adopted an explanatory discourse with academic style, and relied upon medium (100 – 250 words) and long (251–500 words) messages. We find Nonaka and Takeuchi’s knowledge spiral model, story telling and discourse analysis as useful knowledge management tools to investigate and explain how knowledge is transferred and learning takes place in a virtual Community of Practice context. Also, we have found out that domain experts relatively used a story telling approach to develop their arguments.

The System Dynamics CoP under investigation facilitates the processes of socialisation, externalisation and combination through chat rooms where new knowledge is created by interacting with more knowledgeable participants. In the combination process, the structured archive that the CoP hold, make it possible for members to access to all past and present discussions if needed when faced by a particular problem. Our analysis also reveals that socialising through face-to-face chapter meetings and annual conferences have been a crucial mechanism for the community members to develop community ethos and personalisation to become more enthused in virtual debates. This paper reports on two discussions that had good “replies” rate involving a disparate group of participants. The limited contribution by most individuals taking part in these discussions is somewhat unfortunate because it does not allow us to see how
individuals’ views developed through the interactive process of this discussion. This limitation to the study is readily accepted, however, it this does not prevent us to support the broader methodological approach we have adopted to analyse a virtual CoP.

References


Hafeez K and Alghatas F. “Knowledge Dynamics within Multilingual Communities of practice” is already accepted and will be published on SCMS Journal of Indian Management Oct-Dec. 2006 Issue which will be released on January 2007.


Sharratt, M. and Usoro, A. “Understanding Knowledge-Sharing in Online Communities of Practice”
System Dynamics website, accessible at: http://www.ventanasystems.co.uk/forum/ (Accessed on 30/01/06)
Knowledge Creation through University-Industry Collaborative Research Projects

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Abstract: It is obvious from the study of literature that university-industry (U-I) relationships and their subsequent knowledge transfers are topics of high political, economical, managerial and academic interest. Indeed, technological knowledge is seen as a major source of long-term economic growth and its transfer to the firm is critical since it acts as a significant innovation factor. In order to access this knowledge, a portfolio of sourcing strategies is available to the firm: knowledge creation through internal R&D departments, knowledge sharing with suppliers or market relationships, and also transfer from knowledge institutions such as public and private research centres. In this paper, we recognize that University is a central source of knowledge but we question the general belief that knowledge is per se flowing between private and academic sphere through the conduct of University-Industry relationships. As a result, this paper presents our literature analysis concerning this research topic and explores one particular mean of inter-organisational knowledge transfer, namely the University-Industry collaborative research project. We present findings from an exploratory study, which aims at examining knowledge flows and collaborative behaviours at stake in such research projects. This interview survey has been realised with respondents actively involved in Belgian university-industry (U-I) interactions and provides qualitative data analysed through the theoretical framework of organisational knowledge creation developed by Nonaka and Takeuchi. We found evidence supporting the existence of a knowledge spiral as a dynamic for the whole projects and identified some knowledge-based limits to the reconciliation process between university’s interests and company’s needs.

Keywords: university-industry interactions, knowledge transfer, Nonaka

1. Introduction

Assuming that transfer activities between academic and private sectors will contribute to business competitiveness and economic growth (Hitt et al. 2000), researchers have intensively investigated university-industry (U-I) relationships. This research field has been highly influenced by quantitative approaches favouring patents and publications as the main used spillover indicators but it also provides evidence about the significance of traditional open sciences channels (Cohen et al. 1998) and other knowledge interactions such as informal relationships and joint R&D projects. In this paper we present our literature analysis concerning this research topic as well as the results of an exploratory interview survey conducted toward relevant actors in the field of university-industry relationships such as junior and senior academic researchers, Technology Transfer Office members and research project managers. The first part of this paper will be dedicated to the place of university as a knowledge supplier, in particular through U-I collaborative research project. In the following section, we shall describe the theoretical framework used to examine knowledge flows at stake in such projects, namely the SECI process of Nonaka. Next sections will present findings and draw paths for further research.

2. Knowledge transfer through U-I collaborative projects

The knowledge created in the academic sphere takes various paths before finally reaching a competitive recipient, from patent and licences to research publication or consulting. Actually, knowledge is created throughout the three main functions of universities: the education of workers-to-be, the development and dissemination of research work, and their active participation to social and economic development, which has led to the concept of entrepreneurial universities (Etzkowitz and Leydesdorff 2000; Van Looy et al. 2006). This variety of channels leads to a real challenge for researchers interested in the field. We can distinguish between two broad perspectives to approach University-Industry knowledge flows as a research object. In the first one, which we refer to as “untargeted knowledge transfer”, knowledge diffusion occurs from the University to the Industry in a one-way relationship. Traditional instruments of open sciences (i.e. publication, conference proceedings) are associated with this perspective, which examines the transfer of codified knowledge originating from academic institutions to unidentified target. From this point of view, knowledge is also defined as a public good. Indeed, knowledge is non-rival per definition since our consumption of it does not hamper further consumption. It becomes a public good when there is no efficient way to prevent free riders from...
accessing it (Maskus and Reichman 2004), or in other words when its access is not restricted to selected and identified agents. Following this definition, patent is an interesting contributor to public knowledge stock through its mandatory publication. Nevertheless, patent has an ambiguous role in this process. It is an indirect source of public knowledge through the mechanism of disclosure, but it is also a direct and excludable source: from the moment an exclusive license is set up between the university and a private firm, the piece of knowledge encapsulated in the patent loses its non-excludable nature. The second perspective proposed in this paper thus concerns “targeted knowledge transfer” between a university and one (or more) specific private partner(s), like in licensing, consulting, or collaborative research, when the knowledge interaction gives the private partner the opportunity to access some level of knowledge appropriation. Note that the partial exclusion of other agents is not only due to contractual agreements; it is also caused by the particular nature of knowledge which is transferred through direct interactions (Marr 2005). Indeed, the tacit dimension of the knowledge that will be exchanged also makes it difficult to replicate for external organisations or individuals.

#### Table 1: U-I Knowledge Transfer

<table>
<thead>
<tr>
<th>Direction</th>
<th>Untargeted KT</th>
<th>Targeted KT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of knowledge</td>
<td>Public, explicit K</td>
<td>Private, explicit and tacit K</td>
</tr>
<tr>
<td>Instruments</td>
<td>Publication, conference proceedings, patent</td>
<td>Consulting, collaborative project, exclusive licenses</td>
</tr>
</tbody>
</table>

Untargeted and targeted knowledge transfers have different but complementary epistemologies. Indeed, knowledge diffusion through publications and patents occurs under a codified, articulated form while the specific relationship built up through targeted transfer allows the sharing of explicit and tacit knowledge. Those different perspectives also suggest a specific meaning of the knowledge interactions. On the one hand, university is seen as the central source of knowledge, reaching recipients in a one-way relationship. On the other hand, the knowledge interaction through targeted transfer implies critical feedbacks from the recipient, the interaction eventually affecting both partners on their research and transfer activities. Accordingly, the study of untargeted or targeted knowledge flows implies distinctive research tools and methodological approaches. A positivist approach seems appropriate to understand and measure knowledge flows under an explicit form such as patents and other formalised sources. An interpretivist or constructivist approach should be more suitable to fully explore knowledge flows occurring through interactions: whereas objective quantitative methods would fail short to capture the tacit component of targeted knowledge flows, a subjective qualitative approach would give the researcher deeper insights about such created knowledge.

While examining the literature dealing with U-I knowledge flows, we observed that an important part of it presents quantitative measurement of untargeted knowledge transfer. This perspective studies open knowledge diffusion in an aggregated way, looking at various means of knowledge transfer but mostly paying attention to publication and patent citations as spill-over indicators. As important as it is, this piece of literature (Jaffe and Trajtenberg, 1998; Autant-Bernard 2001; Rothaermel and Thursby 2005) fails to explore the specific flows at stake in particular projects and the way to maximise benefits for each partner. As a result, the way by which knowledge is exchanged between partners in bilateral agreements is still relatively unknown (Agrawal 2001). Based on this statement, we decided to explore U-I knowledge flows occurring in the context of one of those interactive channels, the U-I collaborative research project. Landry and Amara (1998) defined the collaborative research as “exchange relationships in formal research projects undertaken by university researchers and other research partners”. In the context of University-Industry collaborative research, the project is jointly defined and conducted by the science institution and its private partner (Debackere and Veugelers 2005).

The collaborative research project has several strong theoretical advantages. First, the formalisation of interactions through a shared covenant precisely defines the objectives and responsibilities of each partner to ensure the success of the collaboration (Barnes et al. 2002). Secondly, it is a strong form of partnership (Landry and Amara, 1998) inducing a propitious ground for trust building. Thirdly, frequent personal contacts result in an efficient collaboration and the transfer of tacit knowledge between partners (Schartinger et al. 2002). Based on those assumptions and the general belief that collaborations are “good things and should be encouraged” (Katz and Martin, 1997), the collaborative research project has received a growing attention in recent years, both from public concern (European Commission 2000; OCDE 2003), academic world (Davenport et al. 1999;
Hall et al. 2001; Hall 2004; Johnson and Johnston 2004) and practitioners. Until recently, the U-I collaborative project has been mainly explored as an activity. The practical goal of researchers was therefore to develop management practices leading to successful projects. Generic motives for collaborations and barriers inhibiting partnership activities were investigated while some authors turned to the experience of it through the examination of success factors, using multiple research methodologies, from case studies to quantitative analysis of contextual and organisational factors (e.g. Barnes et al. 2002; Mora-Valentin et al. 2004). However, the effectiveness of knowledge transfer is not equal to the success of its dedicated activities (Bozeman 2000; Davenport et al. 1999). For instance, personal feelings about the achievement or successful resources and deadlines management may support the success of the project even if the knowledge transfer itself has been neglected.

As a result, the knowledge processes underlying collaborative research which relate to “day-to-day operations of knowledge creation and innovation management” (Debackere 2000) remain unknown while they may go through some difficulties based on the intrinsic nature of those inter-organisational projects. In addition, changes in the academic environment have put U-I knowledge diffusion in trouble. As an example, the various national “Bay-Dohl Act like” policies and the Lisbon strategy have initiated an irreversible trend toward systematic valorisation of academic research in Europe. Changing environmental conditions have re-defined the conventions that used to rule relationships between universities and companies, urging for a deeper understanding of knowledge creation and transfer mechanisms between partners.

3. Theoretical framework

Knowledge transfer, and broadly speaking knowledge management, is traditionally considered as an internal phenomenon, which implies knowledge assets management through building and reinforcement of competences (Amesse and Cohendet 2001) within the organisation to ensure a positive contribution to the firm. From this perspective, when knowledge comes from an external source, as through collaborative research project, the key challenge is to develop competences to acquire, communicate, apply, accept and finally assimilate its content (Gilbert and Corday-Hayes 1996). In such a conceptual framework, the knowledge creator has a passive role of transmitter, most of the absorptive work being made in the target organisation. Likewise, the target organisation has no influence on the creation process. Nevertheless, the iterative and systemic view of innovation (Goh 2005) that has driven the development of the National Innovation System (Freeman 1988; Lundvall, 1992; Nelson 1993), the Mode 2 of the knowledge production system (Gibbons et al. 1993) and the Triple Helix Model (Etzkowitz and Leydesdorff 2000) argues for connections and feedbacks between partners, through interactive learning and the building of absorptive capacities. Recent publications (Castiaux 2006; Johnson and Johnston 2005) made interesting attempts to apply this theoretical framework to inter-organisational context. Those authors used the knowledge spiral of Nonaka and Takeuchi (1995) to explore collaborative modes and the creating process at stake in university-industry collaborative projects where personal contacts between academic researchers and the industrial partner create the appropriate ground for tacit and explicit knowledge sharing. This is shown in Figure 1.

Figure 1: The Knowledge spiral, adapted from (Nonaka et al. 2000)

First introduced in the work of Polanyi (1967), tacit knowledge is defined by Reed and DeFillippi (1990) as the “implicit and noncodifiable accumulation of skills that result from learning by doing”. Bozeman (2000), likewise some other authors (Spender 1996), enlarged that definition by including the fraction of knowledge that is not articulated or explained yet. Quoting Howells (1995), “It would appear that the tacit is not forever tacit; with effort it can be partially formalised and partially communicated”. Using the metaphor of the knowledge spiral instead of the circle, the SECI (Socialisation; Externalisation; Combination; Internalisation) process developed by Nonaka and Takeuchi does not only describe the formalisation and communication mechanisms.
between partners but it also draws attention to the knowledge creation potential enabled by the transitions between tacit and explicit states. The Socialisation step is described in (Nonaka et al. 2000) as the “process of converting new tacit knowledge through shared experience”. The contacts presiding at this phase are rather informal, allowing for the transmission of tacit knowledge (Castiaux 2006). The Externalisation step is defined in (Nonaka et al. 2000) as “the process of articulating tacit knowledge into explicit knowledge”. It allows an easier and better diffusion of knowledge in the organisation. Following (Nonaka et al. 2000), “Combination is the process of converting explicit knowledge into more complex and systematic sets of explicit knowledge”. In this phase, the organisations are completely devoted to the exploitation of previously acquired knowledge. As defined in (Nonaka et al. 2000), “Internalisation is the process of embodying explicit knowledge into tacit knowledge”. It is related to the lessons learned from exploitation.

Following Nonaka and Takeuchi, the SECI process can be viewed as an upward spiral from the individual level to the organisational level and eventually between organisations. However, inter-organisational sharing may occur before that the whole organisation, the university or the company, has gained from the knowledge process. Moreover, inter-organisational knowledge transfer may be a predator for organisational learning due to contractual agreements. This concern is central to the engagement in viable collaborative projects as well as their assessment. As suggested by Cyert and Goodman (1997): “the essential issue is whether these relationships (UI alliances) create learning for a few individuals or whether the learning’s are diffused throughout the organisation”. In the next sections, we try to uncover the knowledge spiral at stake in U-I collaboration projects by applying the theoretical framework of Nonaka to a qualitative dataset gathered through semi-structured interviews.

4. Interview survey

4.1 Research purpose

The exploratory study developed in the next sections aims at a deeper understanding of U-I collaborative research projects and of their underlying knowledge flows as perceived by the respondents. Another research purpose is to reduce the scope of our research interest. Indeed, our definition of collaborative research still encompasses a large range of projects, characterised by specific intellectual property right agreements and different degrees of financial or scientific involvement of partners.

4.2 Methodology

A qualitative approach was appropriate given a twofold reason. First of all, it was theoretically relevant given the epistemological approach chosen to explore knowledge flows as “targeted transfer”. The significant tacit component of knowledge flows as well as people-related concerns proper to U-I collaboration (Davenport et al. 1999) bear out this direction. Secondly, this explorative study is our first empirical contact with the field we are studying. Performing semi-structured interviews (and subsequent discussions) was a good method to gather rich data about the ground of U-I relationships and to learn to understand this problematic. The study has been conducted toward actors involved in the innovation process, particularly in Wallonian (French speaking part of Belgium) university-industry relationships. We followed an information-based sampling strategy in order to maximise learning from our respondents: different profiles were selected to capture data about U-I relationship from diverse perspectives. As a result, senior and junior academic researchers, technology intermediaries and RandD managers were asked during recorded semi-structured interviews about their experience of inter-institutional collaborations in general and of collaborative research projects in particular. The recorded interviews were systematically transcribed and coded in order to get reliable primary data that were analysed through pattern matching and explanation building techniques (Lee 1999). Table 2. presents the actual respondents’ distribution. In addition to those respondents, three members of university Technology Transfer Offices, one more junior researcher and one academic RandD manager were interviewed but not recorded and therefore not included in the table.

### Table 2.: Respondent distribution

<table>
<thead>
<tr>
<th>Respondent category</th>
<th>Academic</th>
<th>Non academic</th>
<th>Cumulative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Researcher</td>
<td>6</td>
<td>--</td>
<td>6</td>
</tr>
<tr>
<td>RandD manager</td>
<td>1</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Individual entrepreneur</td>
<td>1</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>Technological intermediary</td>
<td>2</td>
<td>2</td>
<td>17</td>
</tr>
</tbody>
</table>

In the next sections, we present findings focusing on communication means and knowledge creation evidence through the SECI process of Nonaka and Takeuchi. The examination of each knowledge conversion mode is followed by a synthesis presenting the knowledge creation
process as well as project’s attributes impacting its different steps. Some extracts of the interviews’ transcripts were used to illustrate findings and were accordingly included in the text. As interviews were performed in French, the original interviews’ fragments are presented as endnotes.

5. The SECI process

5.1 Socialisation

Evidence highlights the key role of the socialisation process at the early beginning of the project in building credibility between potential partners. Indeed, institutional representatives from each side of the partnership-to-be share tacit knowledge about their own skills and capabilities by socialising through observation and discussion, fostering trust which can be defined in this context as a set of beliefs and expectations about the ability of the partner to perform the collaborative tasks and his disposition to act as agreed (adapted from Castelfranchi 2004). Tacit knowledge about the research problem is also shared; the confrontation of experience eventually leads to the redirection of the research activities. This is an interesting illustration of the bilateral leads to the redirection of the research activities. As socialisation is perceived as a cultural gap. This problem does not seem to occur when a prior relationship exists between partners such as friendship, family and repeated partnering. A solution consists in using a third-party, a technological mediator, which acts as a broker and contributes to trust and credibility building between partners. As socialisation is mainly performed though informal contacts, it may bring an explanation about the lack of success perceived by respondents about formalised events organised by technological intermediaries to bring research centres and industrial actors together in some kind of research exchanges. It rather supports their action as a discrete broker bringing together the knowledge seller and the knowledge buyer in an informal context. Note that even if some respondents perceived the research exchanges as unsuccessful, we personally attended such an event where we met more than 80 research centres and 150 firms’ representatives, arguing for a real interest for inter-sector interactions.

Eventually, partners share their ideas and confront institutional positions. As a result, the socialisation process also allows for the creation of tacit knowledge about tasks and partners’ responsibilities that will be formalised through the externalisation process.

5.2 Externalisation

The externalisation process formalised the knowledge interactions through a shared covenant, the formal research agreement. This phase strongly depends on the socialisation process as the created tacit knowledge about respective responsibilities and deliverables is converted into explicit knowledge firstly through dialogue and eventually under the form of research contract and confidential agreement. This explicit knowledge should allow for an unambiguous and visible definition of the collaborative work throughout the project. Besides, this phase is characterised by institutional commitment. Indeed, whereas the academic researchers on their own mainly perform the remaining activities, externalisation through formal agreement involves University as an institution through its Technology Transfer Office, which is in charge of contractual, and appropriation issues. As a matter of fact, the success factor identified by Barnes et al. (2002) about formalisation of interactions may also have some impact on the knowledge process. Indeed, findings indicate that physical evidence of confidential agreements enhance the commitment of individuals working on the project and act as a mediator with regard to subsequent knowledge transfers, are they under a tacit or explicit form. Furthermore, the formalisation makes easier the transfer of knowledge created through socialisation and dialogue to researchers who did not take part of it but worked afterward on the project.

Those findings are in line with previous studies focusing on factors affecting collaborative research. However, the knowledge processes may also suffer from some impediment effects. For instance, strict written confidential agreements can be perceived as very restricting by academic researchers while effective secrecy requirements are not so firm, leading to suboptimal knowledge creation. It happened when the socialisation mode failed to create sufficient common perspectives about the collaborative field. As a result, we found that the formalisation phase may have some fostering and hampering impact on knowledge creation and sharing practices and therefore should be carefully conducted by organisational
representatives as well as researchers. This mechanism postulates the significance of this phase to become a shared value between partners. While systematic formalisation of interactions turns out to be the rule rather than the exception in the academic community, industrial contacts lacking scientific competences may address this issue quite differently. Once again, technological intermediaries can help value sharing through prior negotiations and the acknowledgment of the need for formalisation.

5.3 Combination

As the research work defined in the joint research agreement goes on, knowledge is developed and converted into more complex sets. Through interview analysis, we identified two main tangible supports for knowledge transfer in collaborative research projects. First of all, project reports have been identified as central supports for knowledge transfer between partners. Beside its channel function, the role of this articulated piece of knowledge is to create meeting opportunities, eventually leading to face-to-face knowledge exchanges and tacit sharing.

“We often attend meetings where people did not have time to read the technical report. The best means of informing about progress are the meetings, with discussion, but the report must be, remains necessary to keep a track of what has been carried out.” [2]

Although discussions seem more important during the project than the reports on which they are based, tangible knowledge forms are unavoidable supports for transfers between partners and as outline for further partnerships. Combination also plays a key role in the reconciliation process between industrial and academic needs. Indeed, findings indicate that targeted knowledge flows through collaborative project do not perfectly prevent the diffusion of public knowledge toward competitive outsiders and the academic community. Similarly, findings from Cassier (2002) suggests that despite confidentiality agreements, academic researchers involved in U-I collaborative projects easily conciliate disclosure and reserve, for instance by differentiating between public and private conclusions. For example, we observed that publications and conferences were stated as mandatory objectives in the project agreement of a junior researcher, allowing for the convergence of academic and industrial goals. However, the convergence may be at the cost of publication richness. As other respondents pointed out:

“There are sometimes problems to publish because of the constraints of confidentiality. We are stuck in the middle because we make fundamental developments, which we want to be able to communicate to the scientific community, and then there is a lot of data that we cannot mention, therefore it looses some value. It is not the priority of the firm to see the research results published.” [3]

Evidence identified perceived limited diffusion of research results for appropriation reasons. As previous research (e.g. Van Looy et al. 2006) found a positive relationship between engagement in contract research with industry and scientific performance measured in publication outputs, it would be interesting to have a closer look on how the balance actually occurred between knowledge diffusion and appropriation.

5.4 Internalisation

Internalisation refers to the lessons learned from the collaboration activities, the research work and the exploitation of created knowledge. The search for research excellence as a motive for U-I collaboration (Link and Scott 2005) is confirmed by our data, for the industrial partner who exploits scientific outcomes but also for academic researchers who reach access to the industrial reality and accordingly enhance their understanding of the science field. Nevertheless, respondents agreed that massive scientific knowledge was not an automatic outcome from U-I research projects but that trust, credibility and social network enhancements were of underestimated benefits. For instance, academic respondents admitted that collaborative research created the opportunities to build relationships with other scientific partners of the company, eventually leading to academic (U-U) collaborations on more fundamental issues. Furthermore, relationship established between the company and the academic researchers allows for further knowledge transfer outside the project framework, which is in line with Singh’s conclusion (2005) about collaborative networks as a determinant of knowledge flows.

Trust has a central role throughout the conversion processes, as a condition for conducting collaborative behaviour, as a mediator for knowledge sharing and interest reconciliation, and eventually as an intangible outcome from the U-I knowledge transfer. For instance, two senior researchers observed that their collaborative projects tend to lead to repeated partnerships and even privileged relationships. Beliefs about respective capabilities and motivations are reinforced between partners, but it can be extended toward external economic agents. For instance, the reputation of the academic laboratory as a valuable partner increases the
credibility of its associated company toward venture capitalists or public authorities. In fact, by collaborating companies signal their openness to the external environment (Fontana et al. 2006). As an example, we found that companies conducting U-I collaboration were signalling a specific profile to external actors. As a member of the management team of a Science Park said:

"(…) Effective collaborations between industry and research (…) are not a criterion of eligibility, it is a validation. (…) It makes possible to say: indeed, this company can be classified as having a technological innovative profile.” [4]

As a result, embodied social and scientific knowledge gained from the collaboration is now a starting point for new collaborative projects, with the same collaborators or through new partnerships enabled by their enhanced social network.

6. Knowledge creation process in collaborative research

Nonaka and Takeuchi proposed an integrated model of the organisational knowledge creation process that should in their own words “be interpreted as an ideal example of the process” (Nonaka and Takeuchi 1995, p84). In this section, we adapted the original models from Nonaka and Takeuchi (1995) and Nonaka (1994) to describe the knowledge process developed in collaborative projects and present attributes affecting its components. Briefly, we argue that an ideal knowledge process is composed of several concurrent phases: tacit knowledge sharing leading to the development of common concepts which are crystallised in a first time into written agreement and lately into publications, reports, new process or products. The externalisation and combination modes are tools for concept creation and crystallisation: individuals combine new and existing knowledge through presentation, telephone conversation and electronic mail but we found that reports and subsequent meetings were perceived as the more used means for the transfer between partners who shared explicit knowledge as well as tacit one. Those knowledge-mediating artefacts are then justified by academic peers through acceptance in top journals and by the company through the effective exploitation of created knowledge in its daily activities.

This justification phase originates from the definition of knowledge adopted by Nonaka and Takeuchi. Indeed, knowledge in the organisational knowledge creation theory is defined as a “justified true belief” following the concept originally developed by Plato. New concepts as well as their crystallisation should satisfy the justification phase to be shared at higher levels. For instance, the research work should be confirmed through scientific validation and the developed methods should be successfully applied in a company's department to reach individuals outside the project framework. It is interesting to note that in the context of collaborative research projects, the justification phase implies inter-organisational transfer, toward the private partner as well as toward the academic community. As an example, academic outcomes such as publications are justified through peer review performed by external scientists as a materialisation of the scientific norm of scepticism. As a result, interactions with the external world, the partner as well as other academic researchers, are much more present than in the original model of organisational knowledge creation. In conclusion, this knowledge process should enable individual knowledge to be enlarged and finally transferred to the parent university, the private partner and the academic community by using the four knowledge conversion modes depicted in the above section. This can be seen in Figure 2.

![Figure 2](https://www.ejkm.com)

Figure 2 : The knowledge creation process in collaborative research projects, adapted from (Nonaka and Takeuchi 1995; Nonaka 1994)
Please note that although the knowledge creation process is presented sequentially, phases rather occur in a concurrent way. For instance, justifying concepts goes along with cross levelling of knowledge, sometimes by-passing the organisational level if the research laboratory acts in an autonomous way with its partner.

We found several project’s attributes affecting this process. First of all, we found that the origin of the research idea will have an impact on the way the individuals will develop competences. As the idea comes from the lab, individual researchers will deepen their knowledge, building up on existing competences. As the origin of the research idea comes from the company, individual researchers may be involved in a process, which required the creation of new competences, enlarging their individual knowledge as well as the one of their laboratory. In the first phase, actors share tacit knowledge in order to create the collaborative field. The dominant knowledge conversion mode is obviously socialisation, which allows for the building of trust and shared perspectives about the collaboration and its end, the research work and its deliverables. This vision leads to the creation of common concepts through dialogue and collective reflection. Tacit sharing is thus critical throughout the project concurrently with report presentations and daily progress. We found that tacit sharing within the project framework was fostered by several attributes. Firstly, effective membership of individuals from both sides of the collaboration has a positive impact on tacit sharing, enabling individuals to develop personal contacts and reflective dialogues. Secondly, written confidential agreement also has a positive effect at least when property right rules have been set correctly, allowing for more freely sharing of knowledge about key process and other problems affecting their activities. As one respondent pointed out:

“As a matter of fact, we know that there is information transfer flowing from one to another, but it is partly the objective. (...) It is not a problem if the agreements are well done, people are in a well defined framework, and consequently there is no problem, they can talk.” [5]

Another respondent also expressed that without satisfying agreements; companies may be reluctant to give information about daily process. Precisely:

“If the relationship is not clear and if the contracts are not clear from the beginning, I refuse to disclose our problems, not even solutions, I refuse to talk about our problems. To ask the interesting questions.” [6]

In fact, knowledge transfer in “unclear” relationships may lead to the valorisation of knowledge mediating artefacts at the cost of one side of the collaboration that maybe brought basic ideas and problems. A third attributes positively affecting this phase is thus the financial involvement of the firm. From that moment, a return is required and the firm can negotiate for appropriate agreements, which should back return on investments and create incentives for knowledge sharing.

The crystallisation of the common vision developed through tacit sharing into written agreement highly depends on socialisation and externalisation modes: informal discussions, observations and adequate formalisation. This phase may be very complex as actors involved in socialisation may not be the same as in the externalisation. Especially in Belgian universities, research agreements are partly prepared by members of the Technology Transfer Office (TTO), which is an administrative department and defends university’s interests. From the moment those members are not sufficiently integrated into the socialisation process, it may lead to institutional conflicts between the TTO and the law department of the company who do not share the common vision about the collaboration, its goals and means to achieve them. As a matter of fact, it is very important to integrate all actors in the process in order to share this vision about what is really wanted from the collaboration. To help this convergence, a very positive factor is the existence of a long-term partnership between the company and the science institution because individuals know each other’s and have a more clear idea about respective requirement. Besides, this kind of framework involves institutions’ commitment from the beginning of the relationship. Shared concepts about deliverables are also crystallised in tangible and intangible research outcomes such as new models, methods and theories, patents and licenses, products and processes, even if this materialisation of created knowledge may occur after the project’s deadline.

As one respondent pointed out:

“There are some research results which allow for having something in one or two years but we are not informed.” [7]

“In general, after that the University has stopped working, it takes at least one year to say, “I have finished”. There is still one year of inside work.” [8]

This can be explained by the proposition of Grant and Baden-Fuller (2004), which states that “knowledge creation requires specialisation, while knowledge application requires diversity of knowledge”, the collaborative project being one
particular source. In fact, knowledge transfer in the justification phase may suffer from being conducted outside the project framework as individuals are not informed of what is going on about scientific progress but also about production and scaling problems. Once again, the existence of long-term partnership has a fostering effect on the process as partners are getting in touch despite the end of discrete projects. From the academic point of view, the justification may be impeded by patent opportunities as well as confidential agreements and other IP agreements which impose delays and some level of secrecy. In fact, patent opportunity also has an impact on knowledge sharing with academic peers, in and outside the involved laboratory. Furthermore, we saw evidence indicating that specific IP agreements with the partner hamper the research collaboration with other labs, which are not under the same IP regime. Nevertheless, this manager and other respondents also recognised that even if reconciliation wasn’t a straight process, the balance between difficulties and benefits gained from the U-I collaborations was definitely positive, arguing for the preservation of such activities.

7. Discussion

Our first concern has to do the implementation of the Nonaka and Takeuchi’s theory in a research context. Indeed, one could suggest that knowledge management tools are not concerned with academic scientific research but day-to-day company business. Nevertheless, the literature has emphasised the role of knowledge management and learning in innovation management. As collaborative research projects are firstly dedicated to knowledge advancement and as scientific progress is per definition a social process, we eventually used the knowledge spiral to approach this area and found a match between empirical evidence and patterns expected from the literature. As a result, we used a theoretical tool usually oriented toward internal organisational learning in a study about inter-organisational projects. We think that the knowledge creation theory of Nonaka and Takeuchi is appropriate to study U-I joint projects, as organisational learning is one of the main issues of this theme. In fact, we think it is a powerful tool as it offers a framework for studying knowledge mechanisms at both the individual and higher levels.

Empirical findings support the existence of a knowledge spiral as a dynamic for the whole U-I collaborative projects and present three main attributes influencing the knowledge process: the financial involvement of the firm, the existence of long term partnership and patent opportunities. But their exploratory nature also raises further interrogations. In fact, individuals are daily involved in some knowledge conversion processes through direct interactions. Tangible knowledge outcomes such as reports and formal presentations are grounds for speculation and informal discussions at an individual level but we still do not know which type of interactions is the most beneficial for daily research progress and knowledge transfer within the organisations. We are aware that this shortcut is mainly due to our research design. Indeed, discrete interviews are useful for gathering data about how the participant perceives the projects and their underlying knowledge flows. But it is a less powerful instrument when it comes to describe the actual knowledge process, as we did not actually observe it. Furthermore, respondents were mainly senior professors and RandD managers. As a result, front-line researchers are not sufficiently represented in our analysis that may suffer from this pitfall.

Some indications nevertheless suggest how individual researchers interact with peers to enable organisational learning as the project is in line with the laboratory competences. Some obstacles to organisational learning were also found such as the loss of human capital as the financial support dries up. Besides, interviews highlight that knowledge diffusion outside the project framework may suffer from appropriation issues. For instance, impediments to organisational learning were perceived in one U-I project involving patent opportunity coupled with a long-term individual relationship between the researcher in charge of the project and the company involved. Once again, one should remind of possible bias from our data collection method; people involved in U-I collaborations with serious patent prospect may identify the industry involvement as the secrecy originator whereas the patent prospect may be itself sufficient for creating restriction on knowledge diffusion. But even in this case, evidence indicates that perfect appropriation is unlikely in the context of scientific research due to concerns toward interests’ reconciliation and respect of open science norms such as scepticism and communalism. In fact, it remains true that: “the impact of industrial partnerships on knowledge diffusion and circulation is one of the more controversial issues in economic and sociological literature on university-industry collaborations” (Cassier 2002).

In conclusion, this study is a first attempt to understand the knowledge flows underlying the research work performed through collaborative research projects. It highlights knowledge-based limits to the reconciliation process, leading to limited research diffusion and organisational
learning, but it also confirms the importance of the third role of university, namely participation to economic development. In other words, this survey validates the feasibility of reconciliation when engaging in technology efforts (Van Looy et al. 2006) while it also shows that the knowledge process may suffer from it. As a result, a deeper insight about this process would help companies as well as academic researchers to manage the reconciliation’s impact more efficiently and perform more proficient partnerships. In our future research work, we intend to engage in in-depth case studies of collaborative research projects in order to capture all relevant knowledge flows. A deeper analysis of the process should be performed, disclosing the role of metaphors and analogies in the externalisation mode and looking at enabling conditions such as intention, autonomy, fluctuation, redundancy and requisite variety (Nonaka 2000), flexible learning, absence of performance myopia and leadership commitment (Inkpen 1996), etc. This last condition should be particularly interesting as the project leader will be in charge of at least two important communication channels: from one side of the collaboration to another, and from senior RandD managers and professors to front-line researchers. By achieving this research, we aim to contribute to the understanding of knowledge creation and sharing practices through U-I knowledge interactions. Besides, we hope it will bring some insights about the role of university as a knowledge supplier in the overall innovation process and as an active participant to regional and global economic development.

8. Notes

[1] "Ils appor tent peu de fonds mais ils ont apporté les idées de base de la recherche, ils ont apporté beaucoup de choses de ce côté."

[2] "On est souvent dans des réunions où les gens n’ont pas eu le temps de lire le rapport technique. Les meilleurs moyens de renseigner l’avancée ce sont les réunions, avec discussions, mais le rapport doit être, reste nécessaire pour garder une trace de ce qui a été effectué."

[3] "Il y a parfois des problèmes pour publier à cause des contraintes de confidentialité, on est parfois un peu mal pris, parce qu’on fait des développements fondamentaux qu’on veut pouvoir communiquer à la communauté scientifique et puis il y a plein de données qu’on ne peut pas mentionner, donc ça n’a plus autant de valeur. C’est pas la priorité des industriels de voir les résultats des recherches publiés. "

[4] "On s’est dit aussi qu’une façon de le mesurer est de voir les collaborations effectives entre industrie et recherche. Ce n’est pas un critère d’éligibilité, c’est une validation. Quand on est au courant, ça nous permet de dire oui, effectivement, cette entreprise là elle est classée profil technologique innovante”

[5] "Fatalement on sait qu’il y a du transfert d’information qui passe de l’un vers l’autre mais c’est un peu le but. Vu qu’on est balisé généralement par des accords de confidentialité ou des accords de propriétés intellectuelles cela ne pose pas de problème. A partir du moment où les accords sont bien faits, les gens sont dans un cadre de propriété intellectuelle bien défini, et par conséquent il n’y a pas de problèmes ils peuvent parler. "

[6] "Et donc moi, si les relations ne sont pas claires et si les contrats ne sont pas clairs au départ, je refuse de donner nos problèmes, même pas la solution, je refuse de donner le problème. De poser les questions qui sont intéressantes. “

[7] "Il y a des résultats de recherche qui permettent en un ou deux ans ensuite d’avoir quelque chose mais on n’est pas tenu au courant."


References


Notions of Knowledge Management Systems: A Gap Analysis

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Abstract: Knowledge management, now a distinct domain of research and practice, has roots in many disciplines. As a result, a wide variety of philosophies, theories, and definitions of knowledge management are used in the literature, and in practice. This has led to many models and methodologies being used in developing knowledge management systems, but without sufficient cross-pollination of ideas from the various influences and adopted philosophies. We argue that this has led to significant gaps in the understanding of what is needed for knowledge management systems and to divergent and inadequate models and methodologies. These problems are hindering both research and practice. Fieldwork in knowledge management systems development for organisations has been supplemented by an in-depth analysis of the literature, which has revealed particular gaps in knowledge management systems research. The notions that should underpin knowledge management systems development are confused and incomplete. This paper summarises the most salient of these and challenges several of the published notions of knowledge, knowledge management, and models of knowledge management. In particular we challenge the apparently accepted dichotomies and propose how different facets can be considered within a matrix of KM models.

Keywords: Knowledge, knowledge management, knowledge management systems, knowledge management systems development

1. Introduction

Knowledge Management (KM) owes much to disciplines such as philosophy, psychology, social sciences, management sciences, economics and computing. Indeed, researchers rely on the variety disciplines to advance concepts and models for KM, while practitioners use them to progress methods for developing Knowledge Management Systems (KMS). However, neither researchers nor practitioners seem to look beyond their influences to others relevant to KM and KMS, and indeed often full proposed by fellow KM scholars. As a result, a wide variety of ideas – philosophies, theories, concepts, models etc. – are used to conceptualise KM (Earl, 2001; Kakabadse et al., 2003). The unnecessarily self-limiting language of discourse has led to a wide range of what we view as impoverished models and methods in what should be a broad, rich discipline. Our work on how to improve the development of KMS in organisations has exposed significant gaps due to the narrow perspective of many contributors. We start from the conviction that Information System Development (ISD) is fundamentally the wrong point for starting Knowledge Management System Development (KMSD) in organisations. We believe rooting KMSD in ISD is damaging, because ISD focuses on consensual or imposed, single meanings whereas we argue KMSD needs to support individualistic, multiple interpretations. Partly, the use of ISD concepts and methodologies for KMSD is due to history. Partly, it is to do with the divergent and inadequate models and methodologies in the literature (Gebert et al., 2003; Herder et al., 2003; Moffett et al., 2003). By examining what is needed for KMSD we will show that ISD methodologies are not adequate for KMSD; they do not address or reflect the nature and locus of knowledge in KMS (Hahn and Subramani, 2000). At very least KMSD requires the identification of what constitutes the ‘knowledge’ to be managed, why it needs to be managed, and how it is to be managed. The paper is organised according to the dependencies among areas contributing to the question of how to develop knowledge management systems. Hence, we begin to examine notions needed for KMSD by starting with a critical analysis of KM models (and theories that underpin them). KM models depend on reasonable, practical ideas of the practice of KM, variously described in the literature as frameworks and lifecycles. These are discussed next. These depend on the notion of knowledge itself, clearly a crucial aspect of KMS and their development. So, the paper continues by exposing the issues to do with knowledge, information and data. We conclude with a summary of the gaps that must be filled to be methodological about KMSD and recommend areas that might fill those gaps.

2. Models of knowledge management

A multitude of KM models with a wide range of approaches are apparent in the literature and praxis. Recently, there have been different attempts to classify them. Whereas some scholars (e.g. Earl, 2001; Kakabadse et al., 2003) provide a classification of KM models into different schools and approaches according to their ‘orientation’, others (e.g. Gebert et al., 2003, Herder et al., 2003) perceive different dichotomies in KM models. We will focus on dichotomies in
criticising KM models because they expose limitations vis-à-vis KMSD.

2.1 Dichotomies in KM models

Two main dichotomies prevail in the literature:
- Analysis dichotomy: scholars (e.g. Gebert et al., 2003) classify KM models based on the modeller’s approach to analysing knowledge;
- Working dichotomy: scholars (e.g. Herder et al., 2003) classify KM models based on the modeller’s approach to working with knowledge.

2.1.1 Analysis dichotomy

Based on the modeller’s approach to analysing knowledge Gebert et al. (2003) argue that almost all KM models can be traced back to two basic types of models:
- Epistemological models – focus on the nature of knowledge independent of its context;
- Ontological models – focus on the relationship between knowledge and its environment regardless of its nature.

Thus, epistemological modellers perceive knowledge as an entity with defined (or at least definable) characteristics, overlooking interconnections among knowledge entities and with their environment. The main differentiating characteristic of knowledge, from the epistemological perspective, is the difficulty of its articulation: knowledge that can be easily articulated is labelled explicit knowledge, while knowledge that is difficult to articulate, and therefore difficult to communicate to others, is labelled tacit knowledge (Polanyi, 1966). Famously, Nonaka and Takeuchi (1995) address this differentiation in their SECI model, which focuses on the arrangement and regeneration of knowledge through continuous conversions between explicit and tacit knowledge. In contrast, ontological modellers perceive knowledge in terms of its relationships with its environment regardless of its inherent characteristics. They view knowledge as taxonomy of interconnected entities that exist in a bounded environment, overlooking the nature of these knowledge elements. The main differentiating feature of knowledge, from the ontological perspective, is the relationships that link them.

2.1.2 Working dichotomy

On the other hand, based on the modeller’s approach for working with knowledge Gloet and Berrell (2003), Herder et al. (2003) and Moffett et al. (2003) perceive different binary KM models:
- Analytical models;
- Actor models.

Analytical models focus on the codification of knowledge for IT systems. Herder et al. (2003) argue that these models emphasise the importance of explicit knowledge and the technological infrastructure to share it such as an intranet. Conversely, actor models are people- and (business) process- oriented. Herder et al. (2003) argue that these emphasise the importance of tacit knowledge and the social infrastructure required to share it, for example, through communities of practice.

2.2 KMS modelling matrix

We propose that KMS models be considered to generally fall into one of the four domains according to the focus and locus of knowledge. These are depicted in the matrix of Figure 1.
Personal KMS models (Epistemology-Actor) focus on knowledge of the individual, in particular tacit knowledge. In this domain modellers attempt at representing KMS as cognitive maps of each individual’s knowledge – who knows what? There is no particular technology that is used for this domain, but it is rather based on cognition;

Social KMS models (Ontology-Actor), e.g. Wenger (1998), focus on knowledge of the group as a society, in particular knowledge flow and relationships. In this domain modellers merely refer to communities of practice as the representation of KMS. It has limited use in this domain and the main technique used for KM is story telling;

Codified KMS models (Epistemology-Analytical) e.g. Nonaka and Takeuchi (1995), focus on knowledge of the individual, in particular explicit knowledge or knowledge that could be codified. In this domain modellers attempt at representing KMS as expert systems. It has a wide usage in this domain especially artificial intelligence;

Taxonomy KMS models (Ontology-Analytical) e.g. Wiig (1997), focus on knowledge of the group as a hierarchy, in particular knowledge taxonomies. In this domain modellers refer to Intranets as an adequate representation of KMS. It has a wide usage in this domain such as with neural networks.

2.3 Implications of KM models for KMSD

In terms of value to organisations, adopting either a solely epistemological or a solely ontological approach to KM models is insufficient and cannot be used for management decision-making. Hence considering them mutually exclusive hinders KMSD. The business value of undiluted epistemological models is limited in a business context Gebert et al. (2003), especially in situations that require the evaluation of knowledge as a business resource. Here, all epistemological models have the common weakness of only contributing to an assessment of value through internal qualities, which are independent of the context of use. The business value of ontological models alone is also limited, especially on the operational level, because they disregard inherent characteristics of knowledge. For example, budgetary decisions on identifying, disseminating, and using knowledge depend on whether its manifestation is mainly tacit or mainly explicit. For KMS, and hence for their development, it is essential to have KM models that incorporate both the nature and relationships (the process and the practice) of knowledge in organisations. Gebert et al. (2003) suggest a balanced, hybrid paradigm, with the potential of considerable synergy. A fully balanced model is yet to be created with only few attempts of balancing both in the literature. Nonaka and Konno (1998) have tried to integrate an ontological dimension to the epistemological approach in their spiral-like model, and Demarest (1997) tried to analyse different types of knowledge in his process-oriented model.

Adopting either solely an analytical approach or an actor approach in KM models is also insufficient in terms of value to organisations. Again, choosing just one or the other would diminish a KMS and so has no part in a KMSD. Analytical models overlook the role of tacit knowledge and cultural aspects in KM. Technology alone will not lead to a KM culture (Davenport and Prusak, 1998). Similarly, the value of actor models alone is limited because they do not acknowledge the full potential of technology and systematic processes to managing knowledge. An unbalanced approach to implementing KM in organisations hinders its success. Moffett et al., (2003) assert that tensions are often found between knowledge-orientated applications and the progress of organisational change in implementing KM programmes. Therefore, more systematic empirical research addressing the relationship between cultural and technological aspects of KM is required. We conclude that focusing on epistemology or ontology in KM models limits the value to organisations. Similarly, emphasising either analytical or actor aspects in KM models hinders the success of organisational KMS. Understanding and addressing these issues either practically or theoretically is currently being held back by a paucity of systematic empirical research, addressing the relationship between the organisational, human and technological aspects of KM. Current KM models lack a holistic representation of KMS in organisations. Malhotra (2005) argues that the gap is widening between technology inputs, knowledge processes, and business performance. This is leading to failures of KM technology implementations. Accordingly, a balanced approach is needed for KMSD to deliver a balanced KM model. It is essential to be able to encompass organisational, human, and technological aspects by including:

- People (actor),
- Tools (analytical), and
- Processes (actor and analytical).

This leads us to investigate what KM means in the context of KMS and how KMSD should address it.

3. KM frameworks and lifecycles

Knowledge has been implicitly managed, as long as work has been performed. Recent publications point at a continual relationship among economic, industrial, social, and cultural transformations and evolution in managing knowledge (Wiig, 1997;
Drucker, 2002) Knowledge is now the cause rather than the effect of such transformations, particularly when it is systematically organised to be purposeful. Since many argue that the more developed world is evolving into a knowledge-based economy (e.g. Beijerse, 1999; Drucker 2002: Wiig 1997), the new application of knowledge today is to knowledge itself, i.e. meta-knowledge (Laszlo and Laszlo, 2002). Hence the essence of KM is to manage knowledge about knowledge. This section summarises attempts to clearly define KM and frameworks and lifecycles for KM by analysing what the most cited scholars have said. Ultimately we are concerned with KMSD so we need to be clear about what KM itself is.

3.1 Abstractions of knowledge management

We start by examining a variety of what have been variously called ‘frameworks’ and ‘lifecycles’, also known as ‘processes’ (without necessarily being provided with differentiating definitions). We take these to be generalisations without explicit mechanisms for instantiation or phasing. Nonaka and Takeuchi (1995) focus on informal and tacit knowledge in their KM lifecycle. Rather than ‘knowledge management’ they identify the main processes in a KM lifecycle as knowledge creation, dissemination, and embodiment. Moreover, they emphasise knowledge exploration for creating new knowledge, over exploitation of existing knowledge. On the other hand Wiig (1997) focuses on procedural and explicit knowledge more than informal and tacit knowledge in his definition:

KM is to understand, focus on, and manage systematic, explicit, and deliberate knowledge building, renewal, and application – that is, manage effective knowledge processes.

Wiig identifies main processes in a KM lifecycle as knowledge building, renewal, and application and stresses a more methodical approach to KM by associating processes with the terms systematic, explicit, and deliberate knowledge. These indicate that knowledge can be articulated and that it has a specific purpose and, presumably, value. Also, it gives an indication that he views managing knowledge to be guided by procedures and techniques.

Davenport and Prusak (1998) provide a pragmatic approach to describing processes in a KM lifecycle. Despite the lack of an explicit definition of KM, they describe the main processes knowledge generation, codification and coordination, and transfer. Beijerse (1999) has a more analytical approach to KM lifecycles. For example, he breaks down the term ‘knowledge management’ and analyses different definitions of each component to derive his own resulting in the following:

Knowledge management is achieving organisational goals through the strategy-driven motivation and facilitation of (knowledge-) workers to develop, enhance and use their capability to interpret data and information (by using available sources of information, experience, skills, culture, character, personality, feelings, etc.) through a process of giving meaning to these data and information.

Beijerse identifies main processes in a KM lifecycle as knowledge developing, enhancing and using. In line with Nonaka and Takeuchi (1995), he emphasises the role tacit knowledge, viewing it as the added value to these processes. Note the explicit responsibility given to workers to interpret and hence give individual meaning to knowledge. Ignoring this crucial facet of KM has left a huge gap for KMSD. Instead, of an explicit definition of KM, Bhatt (2000) selects processes from the KM lifecycles from others: knowledge creation (from Nonaka, 1991), knowledge adoption (from Adler et al., 1999) knowledge distribution (from Prahalad and Hamel, 1990), and knowledge review and revision (from Crossan et al., 1999). However, Bhatt describes his own KM lifecycle in the following definition, which stresses procedural KM by emphasising processes like Wiig (1997):

The knowledge management process can be categorised into knowledge creation, knowledge validation, knowledge presentation, knowledge distribution, and knowledge application activities.

We conclude that KM definitions, both explicit ones and those implicit in frameworks and lifecycles, in the literature do not describe a coherent account of what is knowledge management, because they are mainly prescriptive. Rubenstein-Montano et al. (2000) argue that the majority of KM definitions and frameworks merely provide “direction on the types of procedures without providing specific details”. Hence, we argue that more descriptive KM frameworks are required to provide insight into what knowledge to manage, why, and how. Many scholars posit that the key flaw of KM is the focus on KM activities without addressing why knowledge should be managed (Malhotra, 2005). We propose that the ‘why?’ can should be provided by an organisation’s strategy.

3.2 Implications of notions of KM for KMSD

A richer interpretation of what KM is required to guide KMSD for organisations. We need to define what knowledge to manage, why, and how. Furthermore, it is important for business value to be able to guide KMSD towards what an organisation intends for its business. We propose a working definition of KM, that relates to business value and
which incorporates most of the processes in KM lifecycles described earlier as the set of processes of (i) creation and acquisition, (ii) representation and dissemination, and (iii) validation, utilisation and renewal of purposeful knowledge:  
- that is needed by knowledge workers and aligned with an organisation’s business goals and strategies;  
- that addresses a problem or an opportunity for the organisation;  
- that is provided to the right person, at the right place and time
This preliminary definition provides a general direction for developing KM theory, to allow us to consider what knowledge means for KMSD, as we discuss next.

### 4. Knowledge in knowledge management systems

Deficiencies in the models of KM lead inexorably to the question of what ‘knowledge’ is for KMSD. Frankly, the literature is distracted by what we assert is an irrelevant discussion of the meanings of and relationships among ‘knowledge’, ‘information’ and ‘data’. Knowledge, in the context of KMS, needs to be represented in a way not previously addressed in other systems such as Management and Executive Information Systems (Alavi and Leidner, 1999). Yet, arguments still continue regarding the nature of knowledge how it is formed and held and its relationship to notions of information and data.

#### 4.1 Knowledge, information and data

The literature frequently discusses de facto differences between knowledge and information, and information and data. Whereas the terms are perceived to represent concepts that are significantly different in nature, there is a lack of clear distinction. In fact, the three terms are often used interchangeably in both research and practice (Alavi and Leidner, 1999; Stenmark, 2002; Vouros, 2003). Often the relationship among these concepts is taken to be linear and mutually exclusive: something is added to data to make it information, and something is added to information to make it knowledge. However, there is nothing that indicates such linearity or justifies such separation (Holsapple, 2005). Whereas transformations are perceived to happen from data to information to knowledge, the literature fails to explain these transformations. One widely accepted view in the literature is that data, information, and knowledge are radically different (Lang, 2001; Yahya and Goh, 2002). However, this assumption has come under criticism recently, especially with a lack of definitions that clearly distinguish the terms one from another (Stenmark, 2002). The following questions are frequently addressed:
- What is knowledge in comparison with information and data?  
- What is the relationship among knowledge, information and data?  
- What transformations occur among knowledge, information and data?  

The terms are often defined in relation to each other. Data is usually defined distinctively as ‘facts’:
- Raw facts (Bhatt, 2001; Pe’rez et al., 2002; Beveren, 2002; BSI, 2003), or  
- Discrete facts (Davenport and Prusak, 1998; Herder et al., 2003).

However, information is usually defined in relation to data:
- Processed data (Bollinger and Smith 2001),  
- Organised data (Bhatt, 2001; Pe’rez et al., 2002),  
- Collected data (BSI, 2003), or  

Similarly, knowledge is usually defined in terms of information:
- Meaningful information (Bhatt, 2001; Herder et al., 2003; Pe’rez et al., 2002), or  
- Commitments and beliefs created from messages (Nonaka and Takeuchi, 1995).  

A widely accepted assumption in the literature is the unidirectional nature of transformations from data to information to knowledge, and not in the other direction. This asymmetrical situation has come under criticism recently as being incorrect, since knowledge is required for the creation of information and data, just as the creation of knowledge often requires information or data (see Beveren, 2002; Stenmark, 2002). The above definitions and rule would allow the deduction that knowledge might be ‘meaningful, processed discrete facts.’ However, we should not infer what data is needed to represent messages that embody a belief. How does this help KMSD? Alavi and Leidner (1999) state the view that “knowledge is not a radically different concept than information”. They assert that the key distinguishing factor between knowledge and information is “not found in the content, structure, accuracy, or utility of the supposed information or knowledge”, but “rather, knowledge is information possessed in the mind of an individual”. Holsapple (2005) takes the view that the terms should not be casually equated, but echoes Alavi and Leidner, stating that while knowledge is not equated to information, there is no barrier built between them. Information is data represented in a different format due to an action performed on it: processing, organising, collecting, etc. Similarly, knowledge is information represented
in a different format due to an action on it: producing meaning, commitments or beliefs. Likewise, data is information or knowledge represented in different format: unprocessed, discrete, or abstracted. We argue that the entire discourse on knowledge, information and data is ill-founded, irrelevant and distracting. They are labels for essentially the same thing. If they have any usefulness it is to indirectly signal different contexts or values, e.g. ‘knowledge’ is what an individual will claim to have, and be of value, whereas ‘information’ is from somebody else, and therefore its value has not yet been assessed by an individual.

4.2 Implications of notions of knowledge for KMSD

All disciplines that update the meaning of their vocabulary suffer from the persistence of old meanings or ideas. We believe that the evolution of the terms ‘knowledge’, ‘information’ and ‘data’ are a case in point and argue that the confused perspectives we have discussed lead to position. However, the literature has shown some tentative moves in the direction we propose. Alavi and Leidner (1999) see knowledge as “personalised or subjective information related to facts, procedures, concepts, interpretations, ideas, observations and judgments (which may or may not be unique, useful, accurate, or structurable)”. For us this introduces the personal assessment of the value of ‘knowledge’ to an organisation, which means that whatever a KMS might store cannot have a fixed meaning for all users of that ‘knowledge’. The value or purpose of knowledge is a crucial aspect that must be represented in a KMS. Despite the argument of the importance of knowledge to organisations (Drucker, 2002; Koskinen, 2003), it is vital to direct KMSD towards knowledge of value, so as to develop and implement an effective KMS. However, directing KMSD towards knowledge of value does not mean limiting access to pre-specified entities. KMSD should maintain a balance between directing development towards knowledge of value, and allowing enough flexibility for natural emergence and interaction among interpretations of knowledge.

5. Discussion and conclusion

In this paper we addressed a need for development methods for KMS through a critical analysis of the literature of knowledge management. This analysis showed a lack of credible knowledge management models for KMS, inconsistencies and obfuscating variations regarding KM definitions, and confusion about what is knowledge itself.

In our review of KM models, we concluded that focusing on epistemology alone or ontology alone limits the value to organisations. A KM approach based only on epistemological ideas will lack the representation of relationships that would expose clear business value. Such looseness would suit few modern organisations. A KM model based only on ontological notions would be so process-focussed that only a single, inflexible worldview could be supported. Such rigidity has proved unsuccessful in many organisations. Similarly, emphasising either analytical or actor aspects in KM models hinders the success of KMS in organisations. Understanding of these issues in KM models, both practically and theoretically, is currently hindered by a paucity of systematic empirical research that addresses the relationship between the organisational, human and technological aspects of KM. Therefore, KMSD should embody both epistemological and ontological aspects of knowledge, and encompass organisational, human, and technological aspects in KM. We presented a matrix of non-mutually exclusive facets of KM models that need to be considered in the development of any KMS. Having encountered many issues in models of KM we reviewed notions of KM processes, lifecycles and frameworks. These showed insufficient accounts of what KM actually is – and even whether knowledge could really be ‘managed’. Our analysis leads us to argue that a richer notion of KM is required to provide insight into (a) what knowledge to manage, (b) why to manage knowledge, and (c) how to manage knowledge. We have proposed a suitably descriptive definition of KM, which addresses these and also incorporates all of the KM processes posited by a range of scholars. We found the discussions comparing knowledge with information and data sterile and unhelpful – obscuring the important ideas that there need to be multiple interpretations of knowledge and flexibility to extend, blend and change interpretations. Through our analysis, we have shown divergence in KM philosophies, definitions, theories, and models has left gaps that is hindering KMSD in organisations. While some might argue the suitability of such variation, we argue the requirement for a common basis for KMSD. A common basis is required to:

- Facilitate communication between practitioners, especially with different perspectives and roles;
- Enable interoperability of different KMS of different departments within an organisation or between different organisations.

Ultimately we need to be clear about what, in terms of IT, is an ‘information system’ as opposed to a ‘knowledge management system’. In the context of our work an ‘information system’ is one in which static relationships between entities (in the accepted database sense) dominate the system’s architecture and design. Typically an information system could be developed according an accepted approach, such as embodied by Zachmann (1987). Crucially, there will be a single meaning ascribed to
all entities in an information system and to the relationships between them. By contrast, a ‘knowledge management system’ is not dominated by static relationships but needs to support the ad hoc, dynamic creation of and changing relationships among entities – the type that no a priori analysis would reveal. A KMS should accommodate the dynamic and inherently unpredictable nature of knowledge. Crucially, a KMS must support multiple meanings for stored entities and must support interactions between interpretations, not just stored entities.

References

BSI (British Standards Institution) (2003), “Knowledge Management Vocabulary”, PD 7500. UK: BSI.
Polanyi M. (1966), The Tacit Dimension, USA: Doubleday.


The Power in Visualising Affects in the Organisational Learning Process

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Abstract: This paper presents a study about the idea of structurally managing individuals’ affections, i.e. affects, in relation to the organisational learning process. The instrument under investigation has been TABLe MATRIX – ‘The Affect Based Learning Matrix’; a structured tool, based on the cognitive therapeutic process, to be used to identify affects and thus aiding in making analyses in relation to an organisational occurrence or change (coming or already existing), a subject, or a problem. In order to evaluate the approach, we have interviewed thirteen management representatives from Human Resources and/or Operational Development within following branches: Medicine, Finance, Education, Retail Fast Moving Consumer Goods, Manufacturing, Travel and Transportation, Construction, and the Public Sector and Religious Communities. The evaluation shows a great interest among the respondents in visualising affects in relation to learning.

Keywords: Organisational Learning, Knowledge Management, Emotions, Affects

1. Introduction

In order to achieve sustainable development within organisations they need at a larger extent to change their fundamental view upon learning: i.e. 1) humans prerequisites for learning, 2) how to effectively reduce the human barriers in relation to learning, and 3) the importance of having a structured learning (and problem-solving) process, not primarily focused upon the ‘solution’, but which also considers humans more subjective fundamental aspects, such as automatic thoughts and feelings. Today, it is important to observe and strengthen the individual within the organisation and his or her situation then for example more and more of those seeking help within primary care have underlying psychosocial problems (Undén and Elofsson 2001). Even work-related problems due to ill health have been doubled since 1997 in Sweden. This conveys large costs for organisations and society. Nevertheless, Mimmi Engestang, manager for competence development and coach for the customers at the Nordic temporary staffing company Proffice, says that managers today are educated according to the traditional leader model; to delegate, steer and control work (Svenska Dagbladet 2004). This widespread thinking has been shaped by the rationalistic tradition traced back at least to Plato (Winograd and Flores 1986). For the rationalist, people that are steered by their emotions are seen as non-rational. Feelings such as; love, hate, guilt, regret, frustration, and embarrassment obscure the strategists’ understanding of a problem-situation and possible solutions (de Wit and Meyer 1999). However, it is the ability to express a feeling that creates our personality (Adler and Adler 2006) and if the human’s nature is neglected this will lead to increased stress, resignation, mental ill health, etc.

With an organisational perspective derived from the rationalistic tradition, there is a tendency to regard learning activities at an organisational level as equal to learning on an individual level – i.e. specific diagnostic and evaluative methodological tools are used to secure ongoing learning processes instead of observing and analysing processes related to the individual (see for example Easterby-Smith and Araujo 1999). This implies less focus upon the specific knowledge-worker and useful knowledge for practitioners will not be provided in the learning process. Unlike the rationalist, the generative thinker interprets, reflects, visions, experiments and acts upon different impressions. The generative thinker agrees that logic is important, but stresses that logical reasoning is often more a hindrance than a help. Instead of defining the solution of the problem from the beginning it is important to be equipped with a broader field of vision in order to be able to think ‘out of the box’. This paper will next present the cognitive-based learning support tool TABLe MATRIX – ‘The Affect Based Learning Matrix’, and its structure. Thereafter, we present the interviews we made with thirteen management representatives from Human Resources and/or Operational Development from different large organisations in order to evaluate the tool. The feedback has been positive and the respondents thought that TABLe MATRIX touches upon a pressing issue within organisations today. Finally, a summary and some concluding remarks are outlined.

2. TABLe MATRIX – ‘The affect based learning matrix’

The issue of cognition becomes highly central in relation to the generative thinking perspective since much of the responsibility to act and operate is being laid upon the individual. TABLe MATRIX
‘The Affect Based Learning Matrix’ is a structured tool, based on the cognitive therapeutic process (see Figure 1 below) for identifying affects and making analyses in relation to an organisational occurrence or change (coming or already existing), a subject, or a problem (the underlying theory for this cognitive approach has earlier been described in Olsson Neve 2002; 2003a; 2003b; 2003c; 2005a; 2005b). In the cognitive process below, the issue of feeling has been given a particular place. Instead of just defining a problem and work up a solution, one should implement two steps where associated feelings and underlying automatic thoughts in relation to the situation are identified and dealt with.

Figure 1. The Cognitive Therapeutic Process

TABLe MATRIX includes both an organisational problem-solving perspective and a preventing perspective. Moreover, it can be used either in a paper-based version or in a Web-based version where the following phases are dealt with (see Figure 2 below); (1) ‘SETTING OFF’ (Define issue/problem), (2) ‘THE PULSE METER’ (Set feeling(s) into focus), (3) ‘SUBMERGING’ (Identify automatic thoughts), (4) ‘THE CONSEQUENCE’ (Clarify behaviour(s)), (5) ‘CROSS BREEDING’ (Investigate alternative scenario(s)), (6) ‘THINKING AFRESH’ (Define desired output), (7) ‘SETTING THE GOALS’ (Assess new behaviour), and (8) ‘THE BONUS’.

These phases are supported by a culture of critical thinking, different interview techniques originating from the cognitive therapeutic area dealing with issues such as how to ask questions in a cognitive manner and in what sequence (the logical aspects), and the importance of emotional response in the dialogue. The purpose in using TABLe MATRIX is for improving the quality of the organisational learning process by more structurally emphasising the significance of individuals’ affections in relation to it.

Figure 2. Phases within TABLe MATRIX

When using TABLe MATRIX within the organisational context, an overall graphical image concerning existing climate (emotions, questions, opinions, behaviours, desires, thoughts, etc.) for a group in relation to a specific issue is supplied. This graphical image functions both as basic data for various discussions among the employees and also as a strategic steering-tool for the management function.

The process in Figure 2 is outlined in the following way:
- ‘SETTING OFF’ – The process starts with identifying the problem situation/the issue to be explored. Collect as many perceptions of the subject as possible from a wide range of people. Here could for example the Rich Picture technique be used (see Checkland 1993).
- ‘THE PULSE METER’ – Collect as many feelings as possible in relation to the subject.
The identification and the awareness of existing feelings within a group make it possible to analyse these feelings and to understand what behaviour they might result in within the organisational context. Consequently, they should be acknowledged but taken care of. Silvan S Tomkins (1995) description of the nine basic affects should be used here in order to identify associated feelings. Affects are feelings so called “memory” more of a biological and physiological nature. They appear in the limbic system of the brain, i.e. the brains most primitive parts, and signal the body’s current state. Affects are important to recognise and understand in order to become aware of ones need for a specific situation. The nine basic affects are presented in Table 1 below.

Table 1. Categorisation of the Nine Basic Affects

<table>
<thead>
<tr>
<th>Positive</th>
<th>Neutral</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Joy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Interest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Surprise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Anger</td>
<td>5. Fear</td>
<td></td>
</tr>
</tbody>
</table>

These nine affects are further grouped into the following three categories: Positive, Negative and Neutral. The basic affects joy and interest are attached to positive. Surprise belongs to neutral and anger, fear, sorrow, disgrace, boredom and detestation to negative. In the early childhood affects are living separated. Gradually they are becoming more and more complex and finally they form unique patterns of emotional reactions by humans. This is what shapes our personalities. Every affect has its own time profile and influence and engage the whole body. Studies have shown that ‘interest’, ‘anger’, ‘detestation’, and ‘surprise’ can be observed very early at infants. ‘Shame’ (i.e. disgrace), on the other hand, is not appearing until the end of the first living year. This affect is attached to our ability to feel ashamed who assume a certain cognitive and emotional maturity in order to appear. (Adler and Adler 2006, authors’ translation)

- ‘SUBMERGING’ – Consider automatic thoughts that appear in relation to the subject. Here the question should be answered: “What types of spontaneous thoughts are related to the subject?” This question should grasp the ‘identity’ of the subject. For example Kim (1993) says that a shared understanding of the organisation’s key assumptions and interrelationships emerges through a process where each employee is participating in surfacing and testing each other’s mental models. However, here the automatic thought will be tested individually. The technique of questioning categorical formulations can be used in order to help individuals to express themselves in a more nuanced way by understanding the expression literally or drawing it to its extreme (see for example Freeman et al. 1990).

- ‘THE CONSEQUENCE’ – Clarify the behaviour phase 2 and phase 3 may result in. In this phase symptoms such as: stress, monotonously work, less engagement, and less initiative, should be identified.

- ‘CROSS BREEDING’ – Consider the subject from another point of view. In this phase one should investigate alternative ways, i.e. improved working procedures, of dealing with the subject. The technique of developing alternative scenarios may be used (ibid), and a good starting question is for example: “In what other ways may one look at the situation?”

- ‘THINKING AFRESH’ – Redefine the output. Here one should specify the new desired output the improved working procedure should receive.

- ‘SETTING THE GOALS’ – Define the new desirable behaviour. Explain and specify how the organisation should implement the improved working method(s). It also might be useful to iterate the process from phase 2 and discuss and reflect upon the obtained results.

- ‘THE BONUS’ – Express other spontaneous thoughts that occupy your mind.

When developing TABLe MATRIX, the time aspect for using it and the ability to manage the experiences and the knowledge it generates have been of essential significance then most organisations are having problems with lack of resources. The value of using the tool for the organisational member concerns: (1) an increased feeling of involvement and a forum for reflection, (2) a possibility to experience and practice a certain type of methodology for solving problems and for learning, and (3) an overall understanding for how others think and feel. At the same time, the managing level is given the possibility to receive an increased understanding of how the employees feel and think in a specific situation. This makes it easier to guide the organisation and come to a decision. In general terms, TABLe MATRIX should be used in order to motivate the organisational members to continuously rethink their actions and their implicit assumptions.
3. Interviewing management representatives about TABLE MATRIX

During the period of September 2005 to Mars 2006 we made interviews with thirteen management representatives from Human Resources and/or Operational Development from organisations within the following branches: Medicine, Finance, Education, Retail and Transportation, Construction, and Religious Communities (see below). The respondents contributed with: (1) information about their organisation’s view upon learning and efforts for becoming a learning organisation, (2) their relation to the issue of ‘emotion’, and (3) feedback of TABLE MATRIX. In general, three major questions were asked:

- What is your relation to operational development within the organisation?
- Are you in some way working with the employees’ feelings?
- By your opinion, would TABLE MATRIX be a useful tool for your organisation?

However, in the first two interviews this structure was not that clear. It was much more informal and of a talkative nature. Also, the format of TABLE MATRIX was updated and changed during the interviews: the first version consisted of seven A4-pages with two columns at each page, and the final version was more graphical with colours and figures in the size of an A3.

Participants

**Medicine**

Pfizer Health AB, which produces semi-manufactured articles within medicine by growth hormone. Respondent: The Human Resource Manager.

**Finance**

The SEB Group – a North European financial group for corporate customers, institutions and private individuals with ten home markets in the Nordic and Baltic countries, Germany, Poland and the Ukraine.

Respondent: The Head of Leadership Development.

**Education**

Kärrtorp Upper Secondary School – a highly ranked upper secondary school in Sweden oriented towards IT, media, natural and social science.

Respondents: The principal and one of the teachers involved in quality issues.

**Retail FMCG**

COOP – a leading FMCG Operator, which runs stores and hypermarkets within the Nordic Region. Respondent: The Specialist for Human Resources for the Stockholm region.

ICA AB - a leading FMCG Operator that runs stores and hypermarkets within the Nordic Region. Respondent: One of the Human Resource Consultants.

Statoil Retail AB, which embraces more than 2 000 service stations in nine north European nations offering automotive fuels, car accessories and vehicle servicing, as well as convenience products such as hot food and groceries. Respondent: The Human Resource Manager.

**Manufacturing**

Scania Sverige AB, which develops, manufactures and sells trucks with a gross vehicle weight of more than 16 tonnes (Class 8). Respondent: The Human Resource Manager.

Volvo Powertrain, which mainly manufactures gearboxes for heavy trucks and buses within the Volvo group. Respondent: The Manager for Human Resources and Communication.

**Travel and Transportation**

Posten AB – one of Sweden’s largest companies, which on a daily basis performs postal services to 4.5 million households and 800 000 companies. Respondent: The Vice President for Corporate Competence.

**Construction**

Skanska Sweden AB – a global construction services group which offers a broad range of services from project development to construction. Respondent: The Manager for Competence Development.

**The Public Sector**


The Swedish Association of Local Authorities and the Federation of Swedish County Councils (SKL), which represent the governmental, professional and employer related interests of Sweden’s 290 local authorities, 18 county councils and two regions. Respondent: The Quality Assuror.
4. Field results

A majority of the organisations in the study are in a process of change and confront new challenges such as; increased competition, fast changing environments, more employees within the organisation than what is required by the business tasks, as well as a need for new employees with a fresh thinking; increased focus upon the human capital; and ‘demanding’ and self-confident employees/potential employees that are aware of their value. This in turn leads to an increased focus on practicing the ability of confronting new situations, such as how to strengthen the individual’s own perspective and how to take other perspectives into account, as well as an increased focus upon the human in the process, i.e. how to deliver things, instead of just focusing upon strategic goals. One respondent was talking about leaving “the gold watch culture” where commitment, capability and sustainability are rewarded and instead prepare for a culture more open to change and fresh thinking. In Table 2 below, we present a summary of the organisations relation to feelings and also their feedback on TABLE MATRIX.

Table 2: Results from the interviews with management representatives (sorted by date for when the interview was carried out)

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Relation to feelings</th>
<th>Feedback on TABLE MATRIX</th>
</tr>
</thead>
<tbody>
<tr>
<td>COOP</td>
<td>(Not discussed)</td>
<td>“It is too well developed”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“This is interesting”</td>
</tr>
<tr>
<td>Kärrtorp Upper Secondary School</td>
<td>(Not discussed)</td>
<td>“We are already working with these kind of questions, but not as structured”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“We are really interested in this approach”</td>
</tr>
<tr>
<td>SKL</td>
<td>Not in a structured way</td>
<td>“We are already working like this, but not as structured”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other comments (with background to the respondent’s own experiences):</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“It takes time”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“The employees don’t want to fill in text into questionnaires. They are getting frustrated”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“The employees want directives instead of thinking by them selves”</td>
</tr>
<tr>
<td>Scania Sverige AB</td>
<td>No special relation</td>
<td>“If we had known what the employees felt for the new system before we implemented it, the process would not have taken so much time”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other comments:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“The format is not appealing”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“We don’t want a new method”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“TABLE MATRIX could be useful for special occasions, such as kick-offs or when starting a project”</td>
</tr>
<tr>
<td>Apoteket AB</td>
<td>Feelings have been discussed in relation to the new organisational structure</td>
<td>“This seems very interesting”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other comments:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“In general, this will work”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Step 5, Crossbreeding, is difficult”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“TABLE MATRIX could be useful for special occasions”</td>
</tr>
<tr>
<td>ICA AB</td>
<td>No special relation</td>
<td>“This seems very interesting”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“You are definitely on the right track”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other comments:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Good that everyone is doing this anonymously”</td>
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<tr>
<td></td>
<td></td>
<td>“Most people will probably answer these questions”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“The time for doing this is a disadvantage”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“If you are afraid you will have problems with answering the questions, particularly within a group”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Good that everyone is doing this under the same conditions”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Good with questions on a paper – an interviewer may not always be that professional”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Some questions might be augmented unnecessarily”</td>
</tr>
</tbody>
</table>

At this point, we changed the “questionnaire” format of TABLE MATRIX to one paper in the size of an A4
used to show feelings and the respondent explained that it is not unusual that someone cries at a meeting.

“In front of changes your personnel must be with you”
“You must be allowed to make mistakes”

<table>
<thead>
<tr>
<th>Pfizer Health AB</th>
<th>No special relation</th>
<th>“This could work”, “You are definitely on the right track”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Other comments:</td>
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<tr>
<td></td>
<td></td>
<td>“To set the goals are important – how will it look afterwards?”</td>
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<tr>
<td></td>
<td></td>
<td>“This is a tool for having the employees to understand their situation”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“The tool is not better than the people who are using it”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SEB</th>
<th>No special relation</th>
<th>“You are definitely on the right track”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>“This could be useful when entering a new project”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Skanska Sweden AB</th>
<th>No special relation</th>
<th>“This is how we want to work!”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>“This seems really interesting, we would like to test it”</td>
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<tr>
<td></td>
<td></td>
<td>Other comments:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• “An “agent” should be doing this – a neutral part”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• “It is important to inform the participant about: 1) why are we doing this? and 2) what happens afterwards?”</td>
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<tr>
<td></td>
<td></td>
<td>• “The anonymity makes people more secure”</td>
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<tr>
<td></td>
<td></td>
<td>• “TABLe MATRIX is simple and understandable”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• “Feedback must be given shortly afterwards”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• “Have an text example in the tool”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Volvo Powertrain</th>
<th>No special relation</th>
<th>“This is how we try to work”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>“We are interested in testing this approach”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other comments:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• “Step 5 is difficult, but it is important for the individual to be initiative”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• “This is how we try to work, but not as structured”</td>
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<tr>
<td></td>
<td></td>
<td>• “There exists no forum here within the organisation to show anger – TABLe MATRIX could be useful here”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• “Feedback must be given immediately”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• “This instrument will promote a culture where you take care of the emotional parts”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Posten AB</th>
<th>No special relation</th>
<th>“This approach is in line with our next step in our current change process”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Other comments:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• “This instrument demands good leaders”</td>
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<tr>
<td></td>
<td></td>
<td>• “It is important to clarify why they should use it, the purpose and the goal with it”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• “This is a steering tool”</td>
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<tr>
<td></td>
<td></td>
<td>• “You must be aware of the consequences when using the instrument”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• “You must be patient – it takes time”</td>
</tr>
</tbody>
</table>

At this point, we changed the A4-format of TABLe MATRIX into A3. Also, Step 5 had been divided into Step 5A and Step 5B
Statoil Retail AB

Feelings have been discussed in relation to the new organisational structure

“If this could work? Yes, why not?”

Other comments:
- “There is a danger of fuzziness. One must be able to measure the results – where are we going?”
- “How should the participants be motivated?”
- “The first step is extremely important – how can you overhear the real underlying issue?”
- “This instrument creates a lot of expectations of the initiators because the user communicates private thoughts and feelings.”
- “TABLe MATRIX would have been useful in the current change process.”
- “The presentation of the material, i.e. the analysis and the visualisation of it, is the most powerful aspect of TABLe MATRIX; this without not loosing the subjective aspects of the content. Organisations consist of stressed employees with little time for doing “the extra”; such as analysing complex situations.”

The following four significant issues can be commented and analysed in relation to the collected material:

- When presenting the first version of TABLe MATRIX for The Specialist for Human Resources at COOP, she spontaneously exclaimed: “It is too well developed”. This we found as a surprising and interesting comment and started to think if it was possible to make it more “undeveloped” without loosing the original vision. At that time we spontaneously thought at the “strict” format but kept its current design for the two next interviews. However, when changing the “questionnaire” format from mainly four text based pages to one paper in the size of an A4 with figures, arrows and colours, the respondents’ attitude and interest changed dramatically.

- The respondent at Scania told us that: “We don’t want a new method”. How could the TABLe MATRIX approach be seen as a natural element in the organisational work and not as a new method? When using TABLe MATRIX, the user is, for example, given the possibility to experience and practice a certain type of methodology (which is also based on some philosophical view) for solving problems, which could be useful in many different ways, both in the private life and in the professional life. As with conceptual models – a theoretical construct that represents physical, biological or social processes, TABLe MATRIX could be validated or justified in terms of logic, and not by mapping on to the real world (Checkland, 1993). This means that the purpose should be to let the user to experience his or her thoughts and feeling in relation to learning by following his or her own logical process for reasoning. Individuals within organisations need tools for generating knowledge that “corresponds to their natural behaviour”, i.e. tools that provides human shortage for not always acting “correctly”.

- The respondent at SKL told us that: “We are already working like this, but not as structured”. According to Friedman et al. (2001), the existence of organisational structures in which the learning process can be carried out is a necessary, but not sufficient, condition for systematically promoting organisational learning. In Olsson Neve (2003c) we are presenting a framework for supporting input and output processes in order to identify individuals who should carry out the learning activities, individuals perceiving errors and anomalies, individuals as bearers of knowledge, and input and output processes for collecting, storing, and disseminating that knowledge for (re)use. The process goes as follows: (1) identification of important knowledge in relation to organisational goals; (2) identification of important knowledge key actors; (3) knowledge assimilation activities, i.e. transformation of knowledge into action on an individual level, (such as using TABLe MATRIX); (4) integration of knowledge, not necessarily into (existing) systems; and (5) transformation of knowledge into an organisational level. Also Pawlowsky (2001) presents a framework for supporting organisational learning. However, in his model, transformation of knowledge into action (i.e. on the individual level) constitutes the last step in the process. We believe it is important to point out in that transformation of knowledge into action on an individual level should be taken earlier in the process. When developing TABLe MATRIX, the aspect of structurally managing employees’ thoughts and feelings seemed highly relevant. However, as with Checkland’s (1993) Soft Systems Methodology (SSM), TABLe
MATRIX is not a technique which, even properly applied, can guarantee a particular kind of result since it leaves room for personal interpretation and problem-solving.

- The respondent at SKL also told us that: “The employees want directives”. Senge (1995) tells us, that when there (really) is a strong-shared vision within the organisation, people are developing (there is a huge difference between a genuine vision and vision statement). Unfortunately, the visions are too often dependent upon one manager’s charisma or of a temporary crisis that unifies the individuals (ibid). This means that organisations need tools, or guidelines, for transforming one individual’s vision into a shared vision. Senge continues; “In order to control the discipline of building shared visions, it is important to visualise those “conceptions of the future” that engage people and are shared by most of them” (p. 22, authors’ translation and italics). Consequently, TABLe MATRIX could be a useful tool for visualising these conceptions since it addresses the fears that exist within the organisation, current interest and considerations.

To conclude, several respondents also commented Step 5, ‘Crossbreeding’, as hard to understand. Step 5 is built upon systems thinking, i.e. to think about the world outside ourselves (Checkland, 1993), and improves the individual’s capability to understand and influence the situation/environment in which he or she is a part. The difficulties in understanding this phase may be derived from how we early in life in school “are told how to think”, i.e. to be a rational thinker. Nevertheless, the actual question was changed several times. In the latest version of TABLe MATRIX, Step 5 was also divided into two different steps; Step 5A and Step 5B, depending on if the user had marked a positive, a neutral or a negative feeling in Step 2.

5. Summary and concluding remarks

In conclusion, with background to the experiences from the study we have come to the following realisation:
- People involved in operational development within organisations seem interested in visualising and managing feelings in relation to the organisational work.
- The issue of visualising and analysing affections seems not restricted to a specific type of organisation, but possible within any type.
- However, as one of the respondents expressed it; ‘the tool will not be better than the people that are using it’. This puts great demands upon the management function, which must inform the participants of 1) why they are doing this, 2) what is beneficial for them, and 3) how to manage the results.
- A real strength in TABLe MATRIX lies upon the possibility in doing IT based analyses and reports effectively; this without altering the original descriptions.

Our ambition with the study has been to investigate how individuals can increase the motivation and awareness for contributing with their knowledge and experiences in relation to the organisational work. That individual’s become motivated by appreciation, attention and confirmation were already established by the psychologist Abraham Maslow in his Hierarchy of Needs (1970). However, it becomes harder for today’s changeable and exposed organisations to give the employees the attention and confirmation, to not to say safety, they need. By constructing TABLe MATRIX with its focus upon the structured method and the cognitive culture, i.e. asking the right questions according to a specific structure (see for example Olsson Neve 2002), our ambition has been to contribute to today’s knowledge debate regarding unmotivated employees and not using the organisational competence sufficient enough, as well as supporting the increasing trend of mental illness. We also find it as highly relevant for the systematic aspect and the ability to analyse and compile data quantities to have the product Web-based, this because specialised software: improves availability; offers measures to adapt the mode of access to knowledge and its presentation to individual preferences; allows the deployment of specialised software that operates on digitalised knowledge; (Frank 2002) and offer human beings and organisations much faster, cheaper and broader sources of data and means for communication for enabling them to generate and share knowledge (Walsham 2001).

References


Organisational Knowledge Transfer: Turning Research into Action through a Learning History

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Abstract: Organisational learning and knowledge management experts are searching for more appropriate research tools to tackle the difficult concepts of organisational learning and knowledge. This paper provides an overview of the learning history methodology, first proposed by Kleiner and Roth, in studying knowledge transfer activities. The learning history methodology, typically used within an action research environment, is designed to allow recognition of what has been learned in the past to guide stakeholders in the dialogical generation of a new future. It is a qualitative measurement tool of what has been learned, and remains sensitive to contextual factors, since it is based on the perceptions of the organisation’s actors and the theoretical sensitivity of the researcher. This paper surveys the learning history literature to determine the roots, benefits and challenges of this research method. We will then demonstrate the advantages of using this approach to studying organisational knowledge transfer by presenting a case study where it is being used within participatory action research logic. Finally, we will provide lessons learned from our ongoing research and draw on implications for practice and future theorising.

Keywords: knowledge transfer, learning history, organisational learning

1. Introduction

Organisations of all types are struggling to learn how to survive in a dynamic environment of increasing complexity. This requires that organisations employ mechanisms to reflect collectively on their experience, make sense of it and assess their investment in learning efforts (Roth and Kleiner 1998). When asked what topic will have the greatest impact in the future of organisational learning (OL) and knowledge management (KM), a panel of experts nominated “research methods and measures of OL/KM” (Easterby-Smith and Lyles 2003). These experts are searching for more appropriate tools to address learning and knowledge concepts, both difficult to tackle. Some suggest a greater utilisation of empirical research designs and qualitative research methods that are sensitive to contextual factors, such as narrative methods, to better understand processes related to organisational learning and knowledge management (Scholl et al. 2004; Easterby-Smith and Lyles 2003). Until now, few ideas have been presented on how to improve learning from experience and how to capture and disseminate knowledge in organisations. Many efforts at helping organisations learn have failed because the skills necessary to make effective OL/KM interventions, such as reflection and dialogue, are difficult to master and do not always provide organisations with effective solutions to promote learning and solve their business problems (Cross and Rieley 1999). Employee surveys, best-practice reports, traditional case studies and the use of consultants are all tools that fall short in helping organisations reflect collectively on past experience in a way that helps them to prepare for future actions (Farr 2000). Meanwhile, the use of stories for helping organisations learn and transfer tacit knowledge is gaining widespread favour among both practitioners and academics (Cortese 2005; Sole and Wilson 2002; Royrvik and Bygdas 2002). Narration is increasingly seen as the privileged form for constructing and expressing one’s personal stories, and organisations are viewed as narrative artefacts (Cortese 2005; Klein 2005).

The learning history methodology, typically used within an action research environment and designed to allow recognition of what has been learned in the past to guide stakeholders in the dialogical generation of a new future (Bradbury and Mainemelis 2001), seems to address the needs of the OL/KM experts cited earlier. However, few authors have demonstrated the potential of this qualitative research methodology in studying knowledge management, and more particularly, knowledge transfer activities. This paper discusses the use of this new action methodology, the learning history, to study knowledge transfer initiatives. It is intended for both scholars and practitioners who want to explore new ways to study knowledge and learning concepts. First, we present an overview of the learning history literature to determine the roots, benefits and challenges of this research tool. We then demonstrate the advantages of using learning histories to study knowledge transfer by presenting a case study where it is being used within participatory action research.

Reference this paper as:
logic. Finally, we provide lessons learned from our ongoing case studies and draw out implications for practice and future theory.

2. Overview of the learning history methodology

First designed to help pilot projects transfer their learning to other parts of an organisation, the learning history is a qualitative research methodology that considers human perceptions, actions, opinions and evaluations (Cortese 2005). It was created in 1994 at MIT’s Center for Organisational Learning in response to the needs of organisations to engage in collective reflection. Some see this narrative method as a qualitative measure of knowledge (Greco 1999) or as a knowledge management tool, especially effective for managing personal and context-specific tacit knowledge (Milam 2005). The learning history also qualifies as inductive research, since researchers are not trying to prove or disprove starting hypotheses. The naturalistic/constructivist perspective is used to capture and construct stories by collecting data from a wide group of people (Milam 2005).

Inspired by Van Maanen’s (1988) ethnography tool, called the jointly told tale, the learning history document is a 20- to 100-page narrative of an organisation’s recent critical episodes, presented in an engaging two-column format (Bradbury and Mainemelis 2001; Kleiner and Roth 1997a). The right-hand column presents an emotionally rich story of relevant events through the interwoven quotations of people who took part in them, including champions and sceptics, people who were affected by them, or people who observed them up close. The left-hand column contains the learning historians’ analysis, which identifies recurrent themes in the narrative, asks questions about its assumptions and raises “undiscussable” issues. The content of the left side of the document is based on recognised research in the areas of systems thinking, organisational effectiveness and organisational behaviours (Cross and Rieley 1999). Once written, the learning history document is disseminated through group discussions with people who were involved in the change effort and others who might learn from it. Thus, a learning history is as much a process as it is a product (Roth and Kleiner 1995a). It brings tacit knowledge to the surface, codifies it and turns it into an actionable knowledge base (Kleiner and Roth 1996). More generally, the learning history “is inspired by belief that legitimate or valid knowledge results from an emancipatory process, one that emerges as people strive toward conscious and reflexive emancipation, speaking, reasoning, and coordinating action together, unconstrained by coercion” (Bradbury and Mainemelis, 2001, 352).

2.1 Disciplinary roots of the learning history methodology

Roth and Kleiner (1995a) state that the learning history draws upon theory and techniques from ethnography (to understand the realities of organisation members from their points of view), journalism (to present the story in an accessible and compelling way), action research (to guide new actions through reflection and assessment of learning efforts), oral histories (to describe history with narratives) and theatre (to disseminate narratives that are often emotionally charged). Taking a systems view of organisations, the learning history methodology starts with a premise that all individuals are actively trying to do their best and that feedback to compare what was accomplished to what was expected is necessary to sustain any improvement process (Roth 2000). However, the learning history process differs from most evaluation approaches, where the only feedback people get is from an expert’s assessment (Roth and Senge 1996).

The learning history can also be viewed as an intervention methodology, positioned in the field of action research at the organisational level of analysis (Coghlan 2002), and more precisely along the lines of participatory action research, since the research is co-designed and co-developed (Bradbury and Mainemelis 2001). The learning history methodology builds upon organisational culture research by using insider/outside teams who take on the role of learning historians (Roth 2000). Insider/outside research is particularly useful when the research goal is to generate rich appreciation of immediate or unfolding situations grounded in participants’ experiences, or to convey the beliefs and assumptions held by participants (Louis and Bartunek 1992). In contrast to a traditional research approach where researchers collect and analyse data without the participation of people in the organisation, insider/outside research encourages ongoing dialogue and heterogeneous interpretations, which can result in more robust theorising (Louis and Bartunek 1992). While the outsider searches for knowledge that can be generalised to many situations, the insider wants to develop knowledge for practical use. In that sense, insiders and outsiders complement each other and foster a better understanding of the ways that organisational members make sense of their world (Louis and Bartunek 1992). Furthermore, the insider/outside team links expert evaluation to the organisation’s own learning efforts (Roth and Kleiner 1995a).
2.2 Benefits of the learning history methodology

For researchers, the learning history methodology helps make their work available to the larger community of scholars and practitioners (Bradbury and Mainemelis 2001) and contributes to the body of generalisable knowledge about what works and what doesn’t in management (Kleiner and Roth 1997a). Learning histories also generate a lot of information on an organisation’s way of learning, which acts as an ongoing resource, spinning off other documents, training programs and learning tools (Roth and Kleiner 1995b) and facilitating future research (Jacques 1997). For participants, the learning history is a collective and inclusive process (Farr 2000) which produces positive social change (Bradbury and Lichtenstein 2000). The group discussions favour collective reflection and help people openly express their fears, concerns and assumptions, which builds trust and a sense of community because people feel they are not alone in their efforts to improve the organisation (Kleiner and Roth 1997a). It also shows them that their views count (Farr 2000). For example, in one organisation, the learning history forced senior managers to recognise their teams’ stress levels and accept their recommendations concerning the staffing process for future project organisation (Cross and Rieley 1999). Another positive element for participants can be the narrative interviews, where they recall the learning experience and often find that they have “learnt again” through the process (Cortese 2005).

The learning history is also a new qualitative way of measuring organisational improvement efforts without killing their learning value (Kleiner and Roth 1997b), since it allows people to tell their story without fear of being evaluated (Roth and Kleiner 1995a). The process is regarded as safe by participants (Farr 2000) and opinions are made discussible in a concrete way because they refer to observable data (Bradbury and Mainemelis 2001). According to Argyris (1990), these conditions facilitate reasoning, which in turn favours learning. For example, Kleinsmann and Valkenburg (2005) used the learning history methodology for their case study on learning through collaborative new product development and found that it is a means of identifying learning opportunities as well as a structured and transparent way of analysing case study data.

2.3 Challenges of the learning history methodology

Bringing this type of tool into organisations can be a revolutionary enterprise. The learning history dissolves hierarchical privileges and favours conversations that create meaning and common objectives to guide future organisational actions (Roth 2000). In this context, researchers do not always get the necessary support from the organisation. Even if organisations agree on the importance of organisational learning, they may not be willing to invest the time, courage and honesty it requires (Roth and Kleiner 1998). For example, some executives are reluctant to undertake a learning history because of its cost, both in employee time and consulting/research fees (Parnell et al. 2005). Also, building an insider/outside collaboration may require some time, since insiders often lack the necessary research skills and require training (Louis and Bartunek 1992). Furthermore, in a business culture where action is glorified, managers often find it difficult to take the time to reflect (Roth and Kleiner 1998) under the pressures of delivering results, serving a political agenda, identifying problems and finding solutions (Milam 2005). In this context, to get the most out of the learning history process, the organisational climate has to welcome contradictions, uncertainty and conflict as learning opportunities (Milam 2005). If the organisational context does not favour a transformational learning approach, the learning history can set off flames that burn up the organisation’s good will and resources (Roth and Kleiner 1995a).

Participants’ responses to learning history documents are not always positive. Managers and consultants who promote learning efforts are often disturbed by what the learning history actually uncovers (Kleiner and Roth 1996). Dissatisfaction is more visible when people learn and become aware of the gaps between their aspirations and their corporate reality (Kleiner and Roth 1997b). However, that is exactly where learning histories have their value: in their capacity to bring out multiple perspectives that make visible to an organisation what is collectively hidden (Roth 2000), such as psychological and emotional problems faced during a transformation effort (Milam 2005). In that sense, learning histories are like mirrors to organisations. They raise issues that people want to talk about but have been afraid to discuss openly (Kleiner and Roth 1997a). The learning history text also brings forth contradictions between suppressed and better known voices, as well as between the way things are supposed to be done and actual practices (Bradbury and Mainemelis 2001). To deal with these challenges, learning historians have to find the right way to bring out the issues of the story without blaming anyone (Kleiner and Roth 1996). Indeed, the process of collectively reflecting and assessing the learning history sometimes goes against people’s expectations that senior
management should tell them what to do (Roth 2000). Researchers have to continually negotiate practitioners’ involvement in the learning history (Bradbury and Mainemelis 2001).

Conflicts about the meaning and causes of organisational events can also arise within the insider/outsider research team (Louis and Bartunek 1992). The team must be able to discuss these conflicts openly and not rely on compromises, which would result in poor research or even the dissolusion of the team. It is also crucial to ensure that no particular perspective is over-represented in the insider/outsider team. Another challenge of the learning history methodology is related to its two-column format, which must be formatted carefully to avoid reader confusion (Coghlan 2001). For researchers, who are not used to telling the story through the voices of other people, the format can be difficult to master. Researchers are also faced with the challenge of creating an engaging text for a range of people with different learning styles (Bradbury and Mainemelis 2001). For their part, managers would like a more prescriptive document, one that includes more synthesis, analysis and recommendations (Kleiner and Roth 1996). All in all, the two-column format needs further testing, because experience with it is limited. The next section of this paper will demonstrate the relevance of using learning histories to study knowledge transfer activities by presenting a case study of a project developed by the Knowledge Transfer Research Laboratory at the University of Sherbrooke, where the learning history was used within a participatory action research logic.

3. Case study: Using a learning history methodology

The team for this knowledge transfer project came together in 2003 and included researchers and administrators in workplace health and safety from a rural Anglophone province, administrators in workplace health and safety research from a combined urban and rural Francophone province, and a team of business school researchers in workplace design and knowledge transfer from the same Francophone province. This multi-disciplinary team included expertise in sociology, psychology, systems thinking, political science, ergonomics, health and safety. The team's activities focused on interdisciplinary research and knowledge transfer (KT) in workplace health and safety (WHS). The project pivoted around a partnership between three founding organisations.

- The Community Research Alliance for Marine and Coastal Workplace Health and Safety in Atlantic Canada (SafetyNet), funded by CIHR, based at Memorial University in St. John’s Newfoundland and linked to partner organisations and researchers in Newfoundland and Labrador, other parts of Atlantic Canada, Québec, Ontario, the United States and Europe.
- The Institut de recherché Robert-Sauvé en santé et en sécurité du travail (IRSSST) in Montreal, the largest independent WHS research institute in Canada. And
- The Chaire d’étude en organisation du travail (CÉOT) in the Faculty of Business Administration at the Université de Sherbrooke, in Sherbrooke Québec.

The role of the project was to enhance interdisciplinary research and KT capacity related to workplace injury research. In using a learning history methodology, the team aimed to tell the story of the project in a case study that was true to the experience and perspectives of all participants. They also intended to use the learning history to track the project milestones for reporting purposes. Finally, and perhaps most importantly, they wanted to stimulate and inform conversation on what actually happened, why it happened and how the team could learn from what had happened. In other words, they hoped to do as Houshower (1999, iv) suggests and “go far beyond a post audit review of a project, digging more deeply into the motivation and passion of those involved in the endeavour.” The team began by framing the project within a participatory action research logic. In participatory action research, people in the organisation or community actively participate with the researchers throughout the research process, from initial design to the final presentation of results and discussion of their implications. They thus engage actively in the quest for information and ideas to guide their future actions. Participatory action research is usually described as cyclical, with action and critical reflection taking place in turn. The reflection is used to review the previous action and plan the next one. Participatory action research is very useful when used across different organisations, with participants who come from varying environments and are involved in diverse activities.

3.1 Bridging theory and practice

Traditionally, theory is an attempt to answer the question of why a specific phenomenon occurs (Sutton and Staw 1995). Why do people get involved in one project and not another, why do people become influenced, why does conflict happen and get resolved. But a theory that tells us why a phenomenon occurs, does not really tell us how it occurs or even more importantly, how we can create, develop or deter that phenomenon. According to Friedlander (2001), to turn theory
into practice, we must ask how. To make practice into theory, we must ask why. The practitioner tends to ask how; the researcher tends to ask why. But it is the integration of the how and the why which will result in a holistic, systemically enriched and useful practice-theory. For example, to understand how we can reduce conflict adds to our knowledge of why conflict gets reduced; and to understand why conflict is reduced contributes to our knowledge of how we can reduce it. The learning history methodology provided the vehicle for the team to capture in the participants’ own words what took place, why it took place and how they perceived what took place. The learning historian’s role was assumed by a research professional with the KT Laboratory. The learning historian with the use of a learning history protocol covering the basic topics to be addressed conducted the retrospective interviews. The actual interview process for the learning history began early in the second year of the five-year project.

In all, six senior members from the partner organisations participated in the first phase of the learning history. These participants represented a multitude of different backgrounds in terms of language, culture, geographic location, education level, responsibilities, needs and objectives. These differences proved to be at times complementary and at other times conflicting and were brought to the forefront by the learning history. For example, some members of the group were focused on knowledge transfer, others on health and safety, others on financing to ensure survival of their group, etc. The fact that the partners occupied different positions on their organisational life cycles also added to the diversity of perspectives present within the project. To capture the differences in these backgrounds, we needed to develop a good understanding of the differences between theory and practice. The participatory action research logic allowed us as a group to begin to address the issues of how and why certain conflicts happened during the project. The focus of the team was solely on the project-related activities of the participants, which are distinct from regular operations because they involve “doing something which has not been done before and which is, therefore unique” (Project Management Institute 1996, 5). By focusing in on the unique nature of the project, we could separate the participants’ regular work from the exploration work associated with a new project (March 1991).

From the outset, some of the project’s participants only partially bought into the learning history. For example, everyone saw it as an appropriate vehicle for tracking the “hard” facts and project events for reporting purposes. But the “softer” opportunities of stimulating and informing conversations on what happened, why it happened and how future action could be improved were less obvious to some of the team members. Nonetheless, the team decided to continue with the learning history.

### 3.2 Outcomes of the learning history

The method of analysis used for this learning history was to examine, categorise and tabulate the data gathered in order to identify project milestones, including learning milestones. In general, such an analysis consists of developing a descriptive structure of the project on the basis of the theoretical propositions guiding the study (Yin 1997). The objective is attained when we have an adequate narration of the facts and circumstances surrounding the project. As the project got underway and interviews took place, the learning historian began to suspect significant differences in perspectives from the three partner organisations. As the initial learning history document began circulating amongst participants, it became clear that project objectives and the needs of the three partner organisations varied considerably. These differences surfaced in two separate ways. The first was when the director of the KT Laboratory at the Université de Sherbrooke used the learning history to help develop a case report on the progress of the project and submitted it to the six partners persons interviewed, asking them to look at it and become co-authors. At the request of the funding agency, the case contained activities that had gone well (success stories), others that had not gone as well (horror stories) and still others that were more neutral in their impact (non-events). The reaction by the co-authors from one of the partner organisations was rapid and decisive and clearly reflected different opinions about what had taken place thus far, including different ontological predispositions to theory development, network development, knowledge transfer and the development of capacity for action. The conflicting interests were significant enough to delay the decision to move ahead with the proposed case until the authors could meet in person to discuss the project’s progress.

The second indication that the project was experiencing difficulties came at the third annual project meeting where the differences between the groups began to generate tension. One group felt that they were being blamed for project misfires, and accused the other two groups of not pulling their weight on the project. It was obvious to all those involved that more time had to be devoted to addressing the differences raised in the learning history. At that meeting, there was a realisation that the entire group was confronting
the difficulty of achieving “hard” results (transferring high quality research results and programs from one Canadian province to another) through an emphasis on concepts that many people termed “soft” (good communication, openness, honesty and trust, networking, relationship building). After two days of, at times constructive, and at times conflicting conversations, the team concluded the meeting with a more aligned understanding of what everyone was trying to accomplish. They also agreed to go ahead with an improved version of the case. Had the group not had the learning history to bring these tensions to the fore, it is not unrealistic to assume that they would have remained dormant until much later into the project, when in all likelihood it would have been too late to deal with them. The learning history was also very useful in developing the mid-term project report required by the project sponsors.

4. Lessons learned

Some of the most significant learning’s to come out of this experience include:

- The need to obtain clear and early buy-in by all participants of a learning history methodology;
- The usefulness of the “hard” aspects of a learning history for project reporting purposes;
- The contributions of the “softer” aspects in stimulating and informing conversations on what happened, why it happened and how future action can be improved;
- The ability of the learning history to raise significant issues that need to be addressed for the project to deliver the expected results.

For this project, the learning history helped focus attention on differences within the groups which then had to be addressed using participatory action techniques. Since the learning history was part of participatory action research logic, the group had a good combination of tools and techniques to help them resolve issues and adjust the project focus. The factors that helped the project team get realigned included the fact that the project was sponsored by an independent group or community and was directed toward the discovery of information about an issue of community concern. The process was also aided by a facilitator, resulting in empowerment of the community of people involved. This project is now in the second half of the five-year commitment and the combination of learning history and participatory action research have contributed significantly to improving how the team functions. Many obstacles still remain to be overcome but participants now feel they have the appropriate knowledge, trust and tools to continue to develop and improve the way they work together. Some of those obstacles include the time commitment required by both the learning historian and the project participants. They found that a learning history requires considerable time and effort to develop and keep up to date. They also found that the closer to real time the history is developed and shared, the more opportunities it provides for the group to change and improve performance before the end of a project. While considerable, the time investment in a learning history is far outweighed by the value of the knowledge it generates.

Because of the perceived value of the learning history and participatory action research methodology in this first knowledge transfer project, the team decided to repeat its use in another project with a different set of partners. The general objectives are similar to those of the first project, but in addition, this project involves the transfer and adaptation of a highly successful management philosophy developed in the US health care industry, called "Putting Patients First", to a healthcare setting in Quebec, the Centre de Réadaptation de l’Estrie (CRE). This learning history is an open-ended story about one organisation’s (CRE) journey toward proactive humanisation of patient care and management practices. It is also intended to provide additional lessons about project learning and improvement for readers in the organisation and for others wishing to undertake a similar journey. The Government of Quebec and the CSN, the labour union representing CRE employees, sponsor this pilot project. Although this project is in its early stages, the researchers have already begun to apply some of the learning’s from the first learning history project. For example, they have been careful to make certain that everyone involved buys into the methodology; that a list of “noticeable results” or “hard” facts are included in the interview protocol to link interviewee’s interpretations to observable data; and that the interviewing and dissemination phases are close together in time to allow the learning history to have the best impact possible. They are also more prepared for difficult issues that may surface during the learning history process. The experience with the first project has strengthened our commitment to the value of conversations as a resource to help resolve conflicts among project members.

5. Conclusion

This paper has provided an extensive overview of the learning history methodology. We presented the roots of this new approach, its benefits and the challenges related to its use. This overview will help researchers and practitioners that are
new to the learning history methodology become acquainted with its origins, goals, advantages, limits and appropriate contexts while learning what conditions are necessary to ensure its success and validity. This paper has also contributed to empirical research by presenting a case study where the learning history methodology is being used to study knowledge transfer activities within participatory action research logic. This project conveys many lessons. The first lesson learned is the need to obtain clear and early buy-in by all participants of a learning history methodology (through information sessions or other means). Second, “hard” aspects of a learning history can be very useful for project reporting purposes, while the “softer” aspects serve as opportunities to capture participants’ perspectives and stimulate conversations on what happened, why it happened and how future action can be improved. Third, the closer to real time the history is developed and shared the more opportunities it provides for the group to change and improve performance before the end of a project. Even though a learning history requires considerable time and effort to develop and keep up to date, the time and energy invested are far outweighed by the value of the knowledge generated. Although the learning history provides a fresh and effective way to study learning and knowledge concepts, it is still at an experimental stage. The potential of this new methodology in studying knowledge transfer activities has not been fully explored. The limitations are primarily those associated with the amount of work involved in a developing a learning history. More empirical research is necessary to demonstrate its effectiveness in studying collective learning processes and knowledge transfer initiatives.

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7. References


Why do Managers from Different Firms Exchange Information? A Case Study from a Knowledge-intensive Industry

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Abstract: This paper explores the motivation for information exchange between firms within a knowledge-intensive industry. The qualitative empirical data is gathered from the Finnish games industry. The industry is seen as a complex system that changes through an evolutionary process. There are three main explanations for such collective efforts. First, the firms want to help each other in order to create critical mass at the national scale. Second, selection operates more strongly at the group level between industries than within the industry. Third, information exchange makes their search functions more effective allowing collective search.

Keywords: Information exchange, knowledge-intensive industry, critical mass, group selection, collective search

1. Introduction

This paper explores the motivation of information exchange between firms within a knowledge-intensive industry. The main objective is to find out why the managers engage in such activities and what it means in the light of the dynamics of the industry. This question has emerged during a case study of the Finnish games industry and its development mechanisms. Within the case study the representatives (CEO, CFO or equivalent) of eight firms were interviewed. The Finnish games industry is here defined to comprise firms that engage in the development and/or publishing of PC, console, mobile and/or online games. The Finnish games industry includes about 100 firms of which the first ones were founded in mid 1990s and the majority after the year 2000. They range in size from one to hundreds of employees and all operate in the global market. As a generalisation one can say that the number of firms with more than one hundred employees is less than ten and the number of firms with less than ten employees is about one hundred. Of these only a fraction concentrates solely on games. The question of the motivation of inter-firm communication within such an industry is approached with evolutionary and complexity theories. The industry is seen as a complex system that changes through an evolutionary process. This is because with these theories it is possible to capture the dynamics that follow from decentralised decision-making and interconnectedness within such a population. The paper starts with a short overview of evolutionary and complexity thinking related to the topic of the paper. This is followed by a description of the information exchange and why it has an impact on the development of the industry. Subsequently, the motivation for the information exchange is analysed with three concepts, namely critical mass, group selection and collective search. Finally, some conclusions are given.

2. Evolution and complexity within the industry

2.1 Evolutionary change and intra-industry interactions

Economic evolution is defined as a process whereby the variation comprising different kinds of firms and their outputs undergoes market selection. As a result, variety is reduced, which gives both the incentives and the opportunities to create new variety in the form of new firms and new kinds of output. Thus, economic evolution incorporates the interplay of competition and innovation. (see e.g. Foster and Metcalfe 2001) Nelson and Winter (1982, p. 4) state that their evolutionary theory of economic change emphasises “the tendency of the most profitable firms to drive the less profitable ones out of business”. This means that performance is a relative measure and those firms are favoured that are better suited to the prevailing circumstances, which translates into better profitability. The evolutionary framework rests on the assumption that an economic system has the tendency to create variation, but only part of that variation can be sustained even in the short run. Thus, it is a matter of trial and error where the main forms of interaction among the firms are either competition or market transactions. But how do the firms decide what kind of variation they will create? This question has been answered in several ways. One is the concept of entrepreneur, the visionary who turns new ideas into business. Another is the tendency for firms to do things that are closely related to what they have been doing in the past. Yet another is that firms do not change what they do unless the present activities present a problem.
In this paper it is argued that, besides competition and market transactions, firms interact by exchanging information and knowledge. This has an effect on what the firms do and that in turn has an effect on how the industry evolves or changes. However, information and knowledge exchange as a mechanism of economic change has been mentioned in only a few publications in the field of evolutionary economics. In a recent article by Muller and Pénin (2006) it is stated that disclosing knowledge is a way of increasing a firm’s reputation in the eyes of potential RandD partners. This way the firm appears competent and can, in the long run, access external sources of knowledge more easily (p. 85). Muller and Pénin also emphasise that knowledge is “a collective good, a club good in the sense that it flows only within the communities or networks that produced it and is transferred through complex interactions among the members of those networks” (p. 88). According to this view, knowledge creation is a community effort that results from knowledge transfer, and a firm must show its competence to be included.

In a review of the current challenges in the study of industry evolution Malerba (2006, p. 10) mentions the revealing of information inside a community which is encouraged by five factors, namely improvements by others, achieving of a standard, low rivalry, future reciprocity and knowledge that the particular firm or some other knowledge-intensive industry can, in the long run, access external sources of knowledge more easily (p. 85). Muller and Pénin also emphasise that knowledge is “a collective good, a club good in the sense that it flows only within the communities or networks that produced it and is transferred through complex interactions among the members of those networks” (p. 88). According to this view, knowledge creation is a community effort that results from knowledge transfer, and a firm must show its competence to be included.

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2.2 Complexity thinking in understanding information exchange

Following the definition of W.R. Ashby, complexity is “the quantity of information required to describe a system” (Delorme 2001, p. 83). Delorme (2001, p. 83) criticises this definition for being vague since it is not stated what a satisfactory description would be. However, this definition helps us in defining in what way an industry is a complex system. To describe an industry one would need to describe the variation in the parts of the system, i.e. firms within the industry, and the variation in their connections, i.e. market transactions and other interactions. Wollin (2001, p. 110) adopts the Webster’s Dictionary definition of complexity which is the following: “a group of obviously related units of which the degree and nature of the relationship is imperfectly known”. Wollin (2001, p. 110) adds that the missing information is either not known or not knowable, but not random. In the case study of this paper this would essentially mean the knowledge of the interaction between the firms. Fundamentally, these interactions take place between people. One does not have to go deep into human cognition to accept that knowing and understanding such a network of interactions, their motivations and effects, is a very hard task and perhaps some aspects of it are unknowable. However, acknowledging the complexity of such a network can help in understanding its dynamics. There is no general consensus regarding the relationship of evolutionary and complexity theories. Some see evolution as a feature of complexity and others see complexity as a feature of evolution. The following is an example of the former view. “The process of evolution is an important integrative theme for the sciences of complexity, because it is the generative force behind most complex systems.” (Ray 1999, p. 161) Basically, it does not matter much whether one says that evolutionary systems are complex or that complex systems are evolutionary. In the present paper evolutionary and complexity theories are seen as complementary ways to analyse an industry.

According to Metcalfe and Foster (2004, p. ix), a complex system is a network structure that contains elements and connections. According to their interpretation the connections consist of knowledge and understanding and for this reason knowledge is pivotal to economic systems and a source of economic value. Secondly, they take the view that selection mechanisms can be seen from a complexity perspective and then selection will not lead to an equilibrium or regression to the mean. Selection mechanisms highlight the fact that the variety on which they operate is of prior importance in economic systems and arises from forms of knowledge that are much less prevalent in the biological domain. (Metcalfe and Foster 2004, p. ix) Any knowledge-intensive industry can be regarded as a knowledge-based system. Competitive advantage is built on knowledge. Opportunities and threats arise based on the knowledge that the particular firm or some other
firm may have. Basically there are two types of relevant information or knowledge from the viewpoint of a firm. Firstly, there is knowledge concerning the activities of the firms in question. Secondly, there is knowledge concerning the activities of other firms. Within the decision-making process of a firm these two types of knowledge interact. The industry here in question, the Finnish games industry, is an interconnected system, where information exchanges is an important factor creating the connections between the firms. This means that the firms do not find out of each others’ actions merely through the market processes by winning or losing a bidding contest or seeing each others’ products on the shop shelf. The firms consciously seek for more information and also disseminate it.

As interconnectedness is a core feature of complexity, the phenomena following from it have been the topic of many conceptual analyses. Two phenomena that have received a lot of attention are self-organisation and emergence. Anderson (1999, p. 221) states that self-organisation is a process where “pattern and regularity emerge without the intervention of a central controller.” Self-organisation is not, however, something that complexity scientists and economists have come up with during the twenty years. Schumpeter already described this kind of behaviour in The Theory of Economic Development. “By "development" therefore, we shall understand only such changes in economic life as are not forced upon it from without but arise by its own initiative, from within.” (Schumpeter 1951, p. 63) According to Smith and Stacey (1997, p. 83) emergence “means that the links between individual agent actions and the long-term systemic outcome are unpredictable”. According to Phan (2004), the Santa Fe Institute sees emergence as “a property of a complex adaptive system that is not contained in the property of its parts”. However, these definitions of self-organisation and emergence are quite broad in the sense that based on this it would be very hard to claim that some phenomenon is one but not the other. Formal approaches to economy as a complex system have acknowledged the existence of information exchange as an important factor shaping the behaviour and decision-making of economic agents. However, from the viewpoint of this paper, such work has had two limitations. Firstly, the emphasis has been on information exchange between consumers, not firms, affecting the decision as to which products to buy (for example, Lane 1997). Secondly, when information exchange between firms is considered more extensively than mere price information, then it is information about technology and relating to the decision-making on which technology to adopt and not on what to do with that technology (for example, Kirman 1997). Nevertheless, complexity thinking offers several ways to conceptualise the phenomena arising from interconnectedness. In terms of defining such connections and such phenomena in an industry context there is, however, a lack of approaches going beyond describing or citing examples.

3. Information exchange within the Finnish games industry

During the interviews with the representatives of eight Finnish game firms it became apparent that there is a lot of information and knowledge exchange going on between the firms. Table 1 presents some basic information of the firms along with a summary of their views on knowledge and information exchange. The real names of the firms are not revealed and thus they are identified with Greek letters from Alpha to Theta. A prevalent feature of the information and knowledge exchange between these firms is that it is done in a very informal way and thus published information such as press releases are not regarded as useful. Thus it is a matter of informal relations and interactions. The interviewees reported that they call each other and talk about what they have been doing lately and what they are thinking of doing. There are also meetings where the people from one firm can get feedback from the people of other firms regarding their game project. The social aspect of it all is also very important.

<table>
<thead>
<tr>
<th>Firm</th>
<th>Founded</th>
<th>Employees</th>
<th>Platform</th>
<th>Subcontractor</th>
<th>Developer</th>
<th>Publisher</th>
<th>Attitude towards information exchange</th>
<th>Main reasons for exchanging information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha</td>
<td>2004</td>
<td>35</td>
<td>Mobile</td>
<td>X</td>
<td>X</td>
<td></td>
<td>We want to help others.</td>
<td>Critical mass to improve recruiting situation. To gain knowledge about the market.</td>
</tr>
<tr>
<td>Beta</td>
<td>2002</td>
<td>27</td>
<td>Mobile</td>
<td>X</td>
<td>X</td>
<td></td>
<td>Everything is easier when you have a network of contacts.</td>
<td>To do marketing. To get inputs for our creative process.</td>
</tr>
</tbody>
</table>
The following quotes illustrate how the firms communicate and what their views on the effects of such communication are like.

“Our seller does informal cooperation as he meets others. He tells them that we have entered some market and it seems quite good and it is worthwhile to go there. That doesn’t take anything away from us. It is based heavily on the personal relationships between people.” (Alpha)

“I guess this is typical for a young industry that personal relationships are very important. For example today I am going to go for a beer with a competitor. We are going to talk about what is happening in the market and whether something new is emerging.” (Alpha)

“Information exchange is clearly a case of win-win because you can always learn from others and it does not take anything away from you. And a large part of it is simply about having fun.” (Delta)

“From our point of view the most important information is what our competitors are doing and we always know that before the press releases come out because word gets around.” (Alpha)

“It is also a part of marketing. You should not spend five days a week inside a cubicle. You don’t see or hear anything [new or interesting] there.” (Beta)

“For example there is one case in which an [graphics] artist had sent a job application and included works that other people had done in his portfolio. It didn’t take more than three days that everyone within the industry knew about it. The guy committed a professional suicide. One can only be amazed at how stupid people can be.” (Alpha)

Information exchange seems to be heavily based on personal relationships. People within the industry know each other and enjoy discussing industry-related matters with each other. The underlying assumption is that it is not harmful for anyone to engage in such interactions. When asked why they participate in active communication most of the representatives of the firms stated that there is no reason or that they do it for altruistic reasons. Helping others is seen as a norm within the industry and its benefits to oneself are not considered. However, this cannot be the full explanation since after all it is a tough branch of business and things just cannot be that cosy. As the interviewer persisted in asking on motivation for information exchange some other reasons were also mentioned, as is shown in Table 1.

4. Explanations for collective efforts

4.1 Critical mass

There is quite a good consensus over the benefits of critical mass of firms within the Finnish games industry. The firms do not see each other as threats but as vital creators of critical mass at the
that as competitive selection between populations or sectors is fiercer than that within a population or sector, the conditions are optimal for the creation of variety. Additionally, variation generation is seen as a prerequisite for economic growth and progress. The findings from the Finnish games industry support this line of thinking since the firms do not compete with each other, but find niches where they can protect themselves from fierce rivalry. This is evident in one comment.

“We just operate in a niche within the ecosystem that is different from those on many other firms.” (Beta)

By finding these niches they create variety, which enables them to continue to specialise. This means that the surface on the space of potential content and technology that the population covers is continuously spreading. Group selection is in conflict with selfish maximisation (Bergstrom 2002). However, this line of thinking has both a short-run and a long-run aspect. In the short run the firms could not care less about the survival of other firms, but they concentrate solely on putting off acute fires, such as finding the money to pay the monthly wages. In the long run the firms see the benefits of group thinking. They see that there is selection pressure at the group level as the industry has to compete with other forms of spending free time. At the national scale an important driver for group selection is the institutional setting within which all the games firms have to operate and which they try to collectively change. One example of such lobbying successes is the recently started game development education programme at the secondary level.

4.3 Collective search

Each firm has a search function according to which it explores new possibilities and alternatives to be applied in the future. According to Cyert and March (1992) such search is problematic. This means that firms would not continually search for better ways to do things or new things to do, but they will start the search only once the old way presents a problem. Thus, search is triggered by encountered problems and not by some inner motivation for continuous bettering. However, as it was stated earlier, in a knowledge-based creative industry the creation of new variety is fundamental. It is the inevitable problems that would follow from failing to find novelty to be included in the products in the future, that make search an every day activity. Information exchange means that the firms are not forced to execute a purely trial-and-error type of a search function. The search functions of the games companies are linked to each other because of
the ongoing information exchange between the people of different games companies. This kind of communication allows the firms, first of all, not to make the same mistakes that someone has already made, but also to find potential directions towards which to head. This kind of communication also enables efficient exploitation of existing niches and also the avoidance of fierce rivalry. Communication among the firms allows the evaluation of more alternatives since more of those are known. Also, communication may allow the identification of attributes and aspects that might not be considered if they would not have been discussed with others that have different backgrounds and experiences. The following two comments illustrate the nature of information exchange that leads to collective search.

“A very large part of very good ideas emerge in such discussions.” (Gamma)

“And a large part is contemplating. We puzzle over what is happening next.” (Epsilon)

Although it is often thought that such an active information exchange would lead to the concentration of the population, it is not the case here. Naturally, there is also such me-too type of decisions, but the overall picture is more characterised by finding out what the others are doing in order to avoid doing the same thing.

5. Conclusions

When asked why they exchange information the managers stated that they do it for altruistic reasons. However, that cannot be the only reason. Another reason could be that this way they can build their personal reputation within the industry and also get personal satisfaction by being able to share their knowledge. This is supported by the interviewees’ eagerness to tell about this business to the interviewer. However, the reasons cannot be just at the personal level since the information exchange is often done within working hours. Thus, there must be some kind of motivation also at the firm level. By finding out what the others are doing they can avoid highly competitive areas and find uninhabited niches. However, the motivation of telling what they are doing is a trickier matter. One explanation is that getting the word out on what they are doing might help in getting a good publishing deal. Another one is that in order for the others to play along you also have to pass the ball. This means that sharing information that you have is a ticket to getting the information that others have.

Collective efforts may also arise from the idea that the industry in question is seen as a group abroad. This then means that competitive advantage has group characteristics. By acting as a group in attracting skilled employees and investors as well as in searching for new possibilities the firms may achieve more that by flying solo. This also applies to changing the institutional setting under which they have to operate. The main conclusion is that information and knowledge exchange within an industry exists and may have a great impact on the evolution of the industry, especially within a knowledge-intensive industry where search is continuous. Even if only market transactions are taken into account, an economy is a complex system because of the interconnectedness occasioned by such transactions. However, taking informal information and knowledge exchange into account adds to that view. As a means of communication market transactions transfer only information, whereas informal exchange of views among the firms allows the transfer of both information and knowledge. From a complexity perspective this means that the dynamics that follow from interconnectedness and decentralised decision-making may have quite meaningful outcomes. Decisions are not taken solely on the basis of market data and intuition, but of knowledge about what others are doing and their intuition is also utilised. This can be thought of as self-organisation, because the firms themselves decide to engage in such communication and the outcome is based on such interactions and decisions made by the firms. The outcome is fundamentally change in the industry structure. This can also be thought of as emergence, and in this sense the analytical difference between the concepts ‘self-organisation’ and ‘emergence’ is not so clear.

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References


Actors and Factors: Virtual Communities for Social Innovation

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Abstract: Virtual communities of practice (COPs) are fast becoming a basic work unit in a networked world. The relationship between COPs, Knowledge Management, and the Learning Organisation is a question of priority for social sector leaders, researchers, policy makers, and practitioners as they seek to establish ways to maintain relevance and effectiveness in the volatile environments in which they work (Thomas et al, 2005). When well executed, virtual COPs produce results because the knowledge is stewarded: organised for learning, poised for action, and planned for sustainability. In this paper, we document and analyse the actors and factors that, in our experience, contribute to success: Enlightened Leadership, Compelling Work, Appropriate Technology and Knowledge Sustainability. Over the last two years we have worked with new virtual COPs in both the public and non-profit sectors. The outsized successes prove the power of this approach to work. The under-performers help define the parameters for more effective implementations. Perhaps surprisingly, the critical success factors for a high-performing virtual COP have absolutely nothing to do with technological aptitude. The two key determinants of community success harken back to Business Management 101: the strategic clarity and capacity for collaborative leadership in the organisation, and the specificity and practicality of the community mission.

Keywords: Communities of Practice, Innovation, Knowledge Management, Virtual Communities, Non-profit Management, Public Administration

1. Actors and factors: An introduction

In 1990 Charles Savage (1990) was one of the first to define the “networked infrastructures” required by the emerging “knowledge era.” He articulated the transitions required to move from the industrial era to the knowledge era, from “confusingly complex to elegantly simple enterprises”:
- "Chain of Command" to "Networked and Networking"
- "Command and Control" to "Focus and Coordinate"
- "Authority of Position" to "Authority of Knowledge"
- "Sequential Activities" to "Simultaneous Activities"
- "Vertical Communication" to "Horizontal Communication"
- "Distrust and Compliance" to "Trust and Integrity"

In our view, virtual Communities of Practice for Social Innovation – those communities working within organisations whose mission it is to advance the public good – are such structures. Virtual COPs are tools for effective organisational leadership in the digital age, or at least an early and promising entry into this arena. As such, they need to be consciously planned, intelligently introduced, actively supported and, over time, firmly and creatively pushed to do more for the organisation’s mission. In other words, they require stewardship.

1.1 What is a virtual community of practice?

Wenger has written widely on communities of practice, which he defines as: “groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly.” We accept this definition and further posit that VIRTUAL communities of practice involve a dispersed group of people who work together in a virtual environment (primarily but not exclusively) to achieve a specific objective within a defined time frame. It is an organisational structure for getting work done whose advantages are at once practical and transformational. Because work in a virtual space can be largely asynchronous, it affords participants not only scheduling flexibility but also saves them the time and cost of travel, conference calls etc. Because of the reach of the Internet, the circle of resources, both human and documentational, that can be tapped as inputs to decision-making expands exponentially, thereby dramatically shifting a team’s analytic framework. Because discussion is the central work element of a virtual community, a record of each exchange is subject to after-the-fact analysis, which serves to highlight issues and clarify needs and opportunities. In the hands of an able leader these inputs allow for accelerated reaction and resolution, leading ultimately to faster, deeper work that, owing to its collaborative origins, holds high potential for adoption and implementation. Last but not least, in the realm of the transformational, the organised and analysed output of virtual communities becomes highly accessible knowledge for an on-
going organisation; at last a means of effectively capturing the experience of practitioners as a resource for new staff and for the field at large.

1.2 The four requirements for effective Virtual COPs

We have discerned through our work that virtual communities are organisational structures; that is to say, they make possible, and even easy, collaborative work that was heretofore challenging. However, as structures, they support but do not guaranty outcomes. Dysfunctional offline communities, if anything are more dysfunctional virtual communities. Indeed there are four requirements for a productive virtual community and none is more critical than enlightened leadership. There are several kinds of community leadership, but the most essential is sponsorship by someone who is clearly identified as leading or helping to lead the organisation. The leader explicitly ties the CoP to the organisation’s mission and overall strategic plan. The criticality of senior leadership to the success of a virtual COP cannot be overestimated and is, in part, a function of the “newness” of the medium. Senior leadership’s endorsement and modelling through personal engagement is key to shifting the groups or organisation’s thought and work habits. The second requirement for success is compelling work. We have learned that this extends beyond the criticality of the work to be accomplished, to encompass the group’s investment in getting the work done (the program developed, the policy defined, the decision made, etc.). This investment turns in part on the group’s perception of the value the leader places on the outcome. However, we have found that each person’s perception of the benefit of the work done in the community to their own work is equally important. Our engagement with a variety of professionals has lead us to believe there is a strong correlation between a person’s commitment to the social imperative of their organisation and their willingness to alter long established ways of working, learning, and contributing to the work of others. The third requirement is appropriate technology. It goes without saying that it is impossible to have a virtual COP without the basic supporting technology: electricity, a computer, access to the Internet and software that enables a specific set of activities. However, the best technology on its own fails to produce effective COPs – and thus is not the most important requirement for success. That said, there do exist minimum technological requirements – and many “nice to haves” – that ease and support virtual COP work, including functions that allow participants to contribute resources and access those of others, to, search the community and locate items easily, to be assured of the integrity of community security, etc. Today’s virtual COP software market has many choices. So far, everything works and nothing works perfectly – meaning that all available software allows individuals with limited technological skill to participate easily in virtual work, but no single option for creating virtual COPs includes every design feature and function that would make it as easy as possible to collaboratively solve problems and make decisions online. Increased user demand and experience hopefully will drive software designers to improve their online COP products. The fourth requirement for an effective virtual COP is active knowledge stewardship, which we divide into three components. Knowledge Creation is the support for initial engagement and the facilitation of work in the community. Organising a work plan, implementing it, caring for the community and organising its knowledge objects are all needed for members to engage productively together. A second element of stewardship is harnessing Knowledge for Action. This involves managing the information that emerges as the community works and capitalising on it to help the community achieve its goals. While meetings in the “real world” are often messy exchanges of views and ideas, replete with digressions and irrelevant contributions, meetings that occur online create their own record – a “digital paper trail” that facilitates the creation of “minutes” that exclude the messiness and summarise the work while allowing the original commentary to serve as an unmediated account. The record that emerges when the discussion is read and analysed as a whole has consistently proven to be invaluable to the community and to management. Again and again, we have found that several important organisational phenomena are embedded in such exchanges, including implied and explicit areas of confusion, opportunities for clarification or decision, suggestions of tension or other organisational blockages that are impeding goal achievement, and nuggets of knowledge critical to achieving immediate and overall organizational goals. The digital paper trail creates an opportunity to identify and address such issues rapidly. This resource is the single most important contribution that virtual communities make to accelerating the pace of organisational work. The third component of knowledge stewardship is capturing Sustainable Knowledge for the community, the organisation and potentially for the field. Resources, records and summaries of discussions, process descriptions and the like all accumulate in the course of a virtual community doing its work. However, as these accrue over time they are available to be searched and retrieved and reapplied and repurposed as new members join the community, for unrelated
organisational purposes, and to share with others focused on similar issues. Good software and good technology support make this rich trove available with no additional burden on practitioners. Employing computer technology generates these resources; thus we consider virtual COPs to be organisational structures made possible by the digital age. But the organisation must be primed to respond. Working online can immediately enable faster – and possibly better – decision-making, particularly if the technology is used to widen the participatory circle to those who would have been excluded without it. But only when the messy inputs of the work are analysed, synthesised and organised do we create organisational knowledge, fulfilling the long promise of Knowledge Management to transform work.

2. A great success and a failure in virtual communities of practice – what can we learn?

2.1 Success: Enlightened leadership and compelling work

Client A: State of Virginia Department of Education Outcome: Adult Education Accelerated model development and roll out at scale, with wholesale change in strategic focus and culture

2.1.1 The context

In the fall of 2003, Virginia Governor Mark Warner established the goal of doubling the number of recipients of the General Equivalency Diploma (the equivalent of a high school degree in the U.S. educational system) from an average of 10,000 to 20,000 Virginians annually within 18 months. Dr. Yvonne Thayer, Virginia’s Director of Adult Education and Literacy, saw this daunting mandate as an opportunity. She recognised that this “crisis” could facilitate implementation of a radically new model of General Equivalency Diploma (GED) programming incorporating active student recruitment and new teaching techniques that could propel a cultural shift away from the traditional adult education worldview of “literacy as empowerment” to one providing “practical skills for workplace advancement.” Dr. Thayer realised that if she could successfully develop and implement this new GED model with a small pilot group, she would have leverage to transform the programmatic approach and mindset of every adult education director in Virginia.

2.1.2 From 0 to 100: Statewide rollout in 12 months

November 2003

Dr. Thayer convenes a small team within the Department of Education to set out the key dimensions of the new program. Together they establish initial criteria and milestones, mandating a six-week program and suggesting eligibility criteria for prospective students.

January 2004

Dr. Thayer convenes five program managers from sites across Virginia, selected for population diversity (urban/rural), receptivity to change, and willingness to work collaboratively. The group begins to develop a “Fast Track” program built around the parameters established by the state. At Dr. Thayer’s urging they rapidly prepare pilot programs in order to learn by doing. The first Fast Track class begins in February 2004.

March 2004

Dr. Thayer invites Knowledge in the Public Interest (KPI) to meet in person with the five pilot program managers, whom she asks to form a virtual community of practice, or Polilogue, to share their implementation experiences and accelerate the adoption of emerging “better practices.” A three-hour strategy meeting with KPI leads to the establishment of the Fast Track Virtual Community. Its focus reflects the interests and needs of the program managers: marketing and recruitment, curriculum and staff development, budgeting, funding and partnerships with state workforce organisations and the business sector, and reporting.

April to July 2004

Pilot program managers participate in several “Jams” – asynchronous discussions in the Polilogue during which experiences and ideas are exchanged and materials are shared. These early Jams are facilitated by KPI. Dr. Thayer follows the discussions closely, leading off each one with a posting on her ambitions for the work. At the outset of the program, the managers focused intensely on marketing the new program in order to fill classes, using radio ads, bus posters and the like. An important first Jam on marketing addresses the principle of market segmentation. The staff's experience in the field informs initial profiles of people most likely to be interested in the accelerated GED program and capable of passing the tests after only six weeks of preparation. Discussion enables the community to link these findings to basic marketing concepts of message and medium, and each director is able to rapidly adapt her/his “pitch” and refine expenditures to target best prospects more effectively. KPI organises, summarises and analyses the work of each Jam in three ways: as an easy reference for the participants, a source of knowledge for the future, and an input for Dr. Thayer.
Thayer as she guided the pilots. Market segmentation became an important insight for the Dept. of Education as it prepares to expand the programs beyond the pilot phase.

August 2004

The five pilot sites establish the efficacy of the program model. At the annual statewide GED conference Dr. Thayer asks pilot program managers to share their experiences with the full group. Each manager speaks to a different dimension of the pilot program – basically each of the Polilogue topic areas – as opposed to speaking only to her/his own program experience. Dr. Thayer then invites 10 additional program managers to join “Fast Track” and the Polilogue. She sees advantages in relying on the virtual COP to facilitate the program’s expansion: the new managers can learn from the pilot staff on an as-needed basis, and learn effectively, without leaving their sites. And the peer-to-peer collaborative nature of the community helps the new managers to see themselves as fellow program builders and adapters, rather than as recipients of a fixed model. This averts the resistance so common when a leader establishes a challenging goal. The result is rapid build-up to launch. One Jam concerns relationships with local Workforce Investment Boards (WIBs), which are constructive and supportive in some regions and antagonistic and unproductive in others. Managers share tactics, presentations, and data. In analysing the exchange, KPI highlights the apparent confusion among program managers over the WIB’s funding obligation for adult education. Dr. Thayer acknowledges the confusion and enlists the Virginia Department of Labour in clarifying its mandate in this regard, securing an expression of support from the Department that paves the way for WIB/Adult Education cooperation. She models the approach for the program managers, who begin to emulate it in the field.

October 2004

Dr. Thayer feels the model has been sufficiently developed and vetted and is indeed producing strong GED pass rates in the six-week timeframe. She expands the program to scale, bringing in all 50 adult education GED sites across Virginia. The entire program rollout takes place over two days via the Polilogue with a succession of Jams held on each major program element, moderated by the 15 experienced program managers. The Polilogue provides a twofold benefit. The first is in cost- and timesavings, as new managers are introduced to the program elements without having to leave their work sites. The second could be characterised as psychological: a peer-to-peer inculcation with the explicit message that new program managers are being offered the benefit of the experience of predecessors, which they can consider and adapt to their own environments.

2.1.3 What has happened since? 2006 status update

In the virtual community of practice:

- The overall Virginia GED community of practice has grown to exceed 200 members in five discrete sub-communities. At the suggestion of program managers, a community of instructors has been formed in the Polilogue. This group has collaborated on issues including summer school planning and technology-based self-instructional aids for GED preparation. This included bringing various vendors into the Jams to answer questions and offer advice.
- GED Examiners are now collaborating on best practices in the sphere of testing.
- A community has been created for newly appointed Program Managers to aide the adjustment of these new players in the system. The State Department of Education uses the virtual community to orient new leaders and to respond with support for specifically expressed needs. The State anticipates that the analysis of the orientation discussions in this community will enable it to codify an approach to launching new Program Managers that will enable them to be more effective earlier in their roles.
- At Dr. Thayer’s initial instigation a parallel project to develop Content Standards for both GED and ESOL (English for Speakers of Other Languages) was undertaken via an virtual community. Virtual and face-to-face work was combined to rapidly accelerate the development of draft standards by and for the field. The process mirrored the Fast Track development process; beginning with a relatively small planning group, expanding to a larger development team, and rippling further out to involve all leaders and instructors of GED and ESOL in the adoption and adaptation of new Content Standards to their instructional and testing work.

In adult education in Virginia:

- 90 percent of those enrolled in a GED “Fast Track” preparation program received GED certification. Gov. Warner’s goal of 20,000 recipients by July 2005 was achieved.
- All GED preparation courses in Virginia are adopting and adapting “Fast Track” pedagogical and motivational techniques, including the establishment of relationships with local employers to create a tight link
facilitating their speedy resolution.

- Virginia placed itself among the ranks of those State leaders who have developed and actively applied Content Standards to their instruction in GED and ESOL.

### 2.1.4 What can we learn?

In almost any sector, whether public, private or non-profit, it is admirable to create an effective programmatic response to a challenging and arbitrary mandate, such as doubling the number of GED recipients in 18 months. To take this program to scale in this timeframe – that is, to expand it state-wide – is unheard of. While the virtual COP was only one element in this process, it was a critical one for two reasons. First, the virtual COP facilitated and indeed encouraged the preparation in the State of Virginia.

### 2.2 Failure: Strategic focus but a void in leadership


#### 2.2.1 The context

Client B, which describes itself as “up and coming” because it is a relatively new player in the public policy arena, wished to coordinate the community of attorneys working on and writing about state-by-state implementation of voting rights legislation during the 2004 U.S. election season. In the aftermath of the 2000 presidential election – with its ballot confusion and allegations of unfair denial of access to the voting booth – Congress had passed the Help America Vote Act (HAVA). HAVA enforcement depended largely on the relevant state official’s interpretation of the law. Public policy groups such as Client B worried that citizens would not know their voting rights and that this would lead to illegal denials or wasted votes on Election Day. Client B was working hard to address relevant issues of public policy, and was both supporting and contributing to available materials on state interpretations of HAVA.

#### 2.2.2 Two months until election day

Client B observed in September – less than two months before Election Day – that there was little communication among the lawyers and organisations writing on HAVA, risking duplication of work on some states while missing others completely. Client B decided to create a virtual COP for attorneys preparing state-by-state HAVA information. Unable (or perceiving itself to be unable) to get the attention of key people in relevant organisations, Client B decided to form a stealth community and load on a multitude of documents, hoping that the relevant actors would see the value of this virtual resource and join in. This approach inevitably put the technology cart before the HAVA-coverage-for-every-state horse. When Client B sponsored a conference call to present the possibilities offered by the virtual COP, few attended; those who did perceived the new technology as a daunting and time-consuming distraction from their important work. Ultimately the HAVA activists never addressed the issues of overlaps and gaps fully. They were not inspired to recognise that their individual yearnings for public recognition of their efforts were secondary to the civic value of getting voting rights information to citizens in every state.

#### 2.2.3 What went wrong?

The critical missing ingredient was leadership, but perhaps not in the traditional sense of the word. Client B accurately diagnosed a problem: there were too many independent practitioners...
potentially working at cross-purposes. It selected an effective means to solve the problem: a virtual COP. However, Client B perceived that it lacked the stature within the public policy arena to lead others in the sector. Consequently, it could not scale the imperative of gaining consensus on the problem first. Technology alone rarely compels a change in behaviour. Only a shared challenge or goal stimulates collaboration. Technology that serves this end, if both supported and in some sense enforced, may then be embraced.

2.2.4 What can we learn?

We cannot emphasise strongly enough that technology comes last in launching a virtual community of practice for social innovation. Many organisations succumb to the wonder and practicality of enabling many people to save and share documents. But people do not return regularly to a community because there is “stuff” there. They come because they need to accomplish work. The promise of the HAVA virtual COP was to allow those working on state-by-state analyses to critique one another’s work, to capitalise on completed work to accelerate adaptation for uncovered states where feasible, to highlight inconsistencies, and to increase overall visibility and accountability for state legal conduct in the build up to the election. Over and over again we see that the challenge and opportunity today is for a leader to set the community objective and to harness the technology that will facilitate achieving the goal.

3. The work comes first – but technology matters

That said, there are important factors to consider in choosing virtual COP technology that can contribute substantially to a community’s eventual success.

3.1 Critical features of virtual COP software

As we have noted, the most important benefits to emerge from virtual communities result from virtual discussion. Consequently we would look first for the technology features supporting discussion. For example, the ease with which a discussion can be featured so participants know where to go, the simplicity with which they can add a post, and perhaps a relevant resource, to the exchange, the automatic connection of a participant’s picture and post, options for rethreading a discussion by person or subject, etc. In addition, however, underlying effective COP technology overall are three distinct capabilities: security and the integrity of membership, self-governance and community management, and robust site search.

3.1.1 Security and the integrity of membership – creating spaces for opportunity

Virtual COP systems should enable the spaces of opportunity that help an organisation realise the potential to work differently (and better) and do new work, some of which may result in new ways to extract greater value from organisational intelligence. There are three such spaces:

- **Private Space**: participants must be community members; activities defined by and for members.
- **Privileged Space**: Accessible by a subset of members, under conditions and terms defined by the community.
- **Public Space**: content available to all, potentially activities open to the public.

There are two ideas at play here. The first is that the security of the software must easily and reliably allow the assignment and identification of group members. Participants will often be members of multiple groups. Confidence in the process of working virtual rests on feeling that everyone knows who does and does not have access to a group’s deliberations. The second idea is that an actively managed community will generate data/information/knowledge that is easily subject to multiple applications. Thus there is a benefit to being able to offer “the public” access to some resources with little technological effort.

3.1.2 Self-governance and community management - enabling the community to govern itself

Communities need to be able to self-govern. Virtual COP technology should give them the power to:

- Assign leadership roles such as editor, facilitator, moderator, and community manager.
- Create communities and sub-communities.
- Control member privileges to read, write, delete, edit, post, etc., as well as add and delete members and provide access to guests.
- Organise and reorganise content, including attributing one resource to several communities.
- Create contextual ontologies
- Here we are speaking of the ease of use of the technology for non-technologists. We advocate that those leading and participating in the community’s work, who will generally be
policy and program professionals, be easily able to use the software to initiate, conduct and organise work.

3.1.3 Robust site search - supporting diverse knowledge objects and finding resources easily

The technology should allow knowledge object diversity:

- Support multimedia knowledge objects (e.g. text, pictures, audio, video and graphics) in any variety of combinations.
- Enable knowledge objects to be in many places at the same time without having to put them in each place manually.
- Provide means to both "push" information out to the community via email groups, announcements, or similar, and for members to "pull" information in via “subscription.”
- Not require burdensome registration/keyword tasks to enable search
- The arc of productive virtual communities, in our experience, is to begin small with a narrow focus and to expand in both tasks and membership. Over time inevitably the sheer volume of discussions, analyses, knowledge objects etc becomes overwhelming, while participant expectations for locating information easily rise. The better the software is at helping participants find things in multiple ways the more valuable it is.

4. Sustainable knowledge

Organisations deploy virtual communities for varied reasons. For KPI clients, they include among others: program development and "replication" or roll out, policy development, professional development and distance learning, technical assistance, program support, and capacity building. We approach our work assuming that these efforts are not only about achieving a specific objective but are also about knowledge sustainability: stewarding knowledge and accelerating learning.

4.1 Community engagement

Knowledge is created as a function of doing work in an virtual community. The old days of KM required people to put knowledge into a system after work was done, an added-on, time-eating task which people resisted, and which ultimately failed. Knowledge creation for social innovation occurs when knowledge is created through the very process of accomplishing work. In order to generate actionable knowledge through an virtual work experience a group of people must be induced to engage and their attention captured. Virtual engagement techniques mirror offline team building and are well documented by Nancy White, for example.

4.2 Community facilitation

Once engagement is accomplished, our experience is that only facilitated communities remain productive. Community facilitation is a skilled task that takes time and energy, and its centrality to success should not be underestimated. People engaged in virtual communities for social innovation want to participate in the work that is occurring virtual, not be distracted by managing the COP as an organisational structure. We draw a distinction between community moderation and community facilitation. Both are critical. The moderator is the individual from within the community who has legitimate authority to push and prod the community to set its priorities and conduct its work. The facilitator supports the moderator and the community's agenda by assuring that all of the technical and support functions are in order.

4.3 Analysis and codification

Once the community is engaged and well facilitated, it organically produces vast and varied data. No one really wants to read all the discussions, or hunt around for particular knowledge objects. So the work must be analysed and codified in such a way that it can be easily used for decision-making and problem solving – the reasons that people engage in virtual COPs. Analysis and codification creates the actionable knowledge that we view as the goal of social innovation. Until analysis and codification occurs, the community may have a lot of information, but not necessarily much knowledge. As the UK Advanced Knowledge Technologies Interdisciplinary Research Collaboration points out (EPSRC Interdisciplinary Research Collaboration)

“…whilst accessing and storing data and information is technically cheap and relatively straightforward, interpreting it requires intellectual investment: attention, time, expertise and experience are now the commodities in highest demand and shortest supply. Veterans and other experts are so valued because they make sense of information, seeing patterns, implications and connotations that others miss….

KPI has developed a unique approach to interpreting virtual community work in a way that converts information into actionable knowledge. We begin analysis and codification within a week of community activity, and report three views of the data: verbatim quotes selected to represent key points as well as the tone and texture of
activity; a summary of the activity, using en vivo categories and including a list of the knowledge objects posted, with data instantaneously “triangulated” by posting the “reports” in the community to create the opportunity for any member to challenge the “findings” and/or verify their veracity; and, periodic online surveys to ascertain if and how community members benefited from their participation. These surveys also probe for actions taken as a result of the learning that occurred.

5. Why COPs produce results

Much has been made of the concept of the Learning Organisation, popularised by Peter Senge (1995) in The 5th Discipline. It is defined by Watkins et al. (1993) as an organisation that “…learns continually and transforms itself, “one in which “[L]earning is a continuous, strategically used process” that is integrated with work and augments the organisation’s “capacity for innovation and growth.” In an analysis of the learning organisation literature at the time, Woolis and Ziegler (1992) found that they called for “a complete rethinking of the concept of organisations, the function of management, the meaning of work, and the role of the individual in the workplace.” The relationships between organisational learning, innovation and adaptive capacity to organisational survival and growth have been well documented. Learning we hold as “the organisation’s ability to cause: data to be transformed into knowledge, knowledge to be translated into action; and action encoded and decoded into patterns which in turn create data. Our thesis is that only now, with the advent and ubiquity of networked systems, can the potential be realised for creating mature learning organisations. Virtual COPs produce results because they are the optimal structure for a world characterised by a networked, knowledge driven economy and populated by “microworkers”—distributed individuals or communities who group, regroup, and repurpose as the context demands.

What makes virtual COPs an optimal organisational structure? They are Organised for Learning: like the best learning environments, they feature diverse content and have many points of entry. They are interactive, democratic, contextualised, and self-paced, and permit working on one’s own or in groups of infinite combinations. And for the most part, all without requiring the worker to move from the comfort of their own best thinking space. Most importantly, virtual COPs are Poised for Action: at a click, community members can know who is, who can, who has, who knows, and who will. Supporting documentation, weblinks, newsfeeds, and more are available, and members can deploy powerful communication tools to distribute intelligence and leadership where and when knowledge is needed, as well as readily reframe it as necessary – a kind of knowledge recycling. Such efficient and waste-free use of irreplaceable resources is a hallmark of places Planned for Sustainability – making COPs vital to a Learning Organisation. The government of the United Kingdom defines a sustainable community as “…Places where people want to live and work, now and in the future. They meet the diverse needs of existing and future residents, are sensitive to their environment, and contribute to a high quality of life. They are safe and inclusive, well planned, built and run, and offer equality of opportunity and good services for all.”[UK Government, 2005]

The same can be said of virtual COPs for social innovation.

References

Norris, D., Mason, J., Robson, R., Lefrere, P., and Collier, G. (September/October 2003) A “Revolution In Knowledge Sharing” EDUCAUSE review, 14
Advanced Knowledge Technologies, EPSRC Interdisciplinary Research Collaboration (undated) “Manifesto” p.1
United Kingdom Government, Department for Communities and Local Government. (2005) "What is a sustainable community?", [online], http://www.odpm.gov.uk/index.asp?id=1139866
Journalists, the Makers and Breakers of Relational Capital

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Abstract: The aim of this paper is twofold. First, to call attention to why storytelling is a pivotal building block of Relational Capital and second, to provide an understanding of how stories receive media coverage, in essence explain how PR professionals seek to influence the business press into telling stories about their client companies and how journalists in turn react to the story material sent to them by PR departments. This paper approaches this issue through gatekeeping theory and presents an example of the various gatekeepers affecting the media coverage of corporate stories. Although the paper includes theoretical reflection, it chiefly attempts to bring new insights to the topic by providing empirical research results. The paper reports findings from a qualitative analysis of semi-structured, in-depth interviews conducted with six journalists from the Finnish business press and six Finnish PR Professionals. The article shows three types of stories that PR professionals use to lure the business press into writing news about their client companies. These are: 1) an idea of a story 2) a hidden story and 3) a ready-made story. The article concludes in showing that an idea of a story will be appealing to business journalists, especially if the story is not obviously helping a commercial enterprise improve their image. It shows that a hidden story, however, can be appealing to business journalists even if the story would clearly improve a commercial enterprise’s image. The ready-made story, though, is found to be appealing to journalists chiefly as background information that might trigger a later story.

Keywords: storytelling, gatekeeper theory, media coverage, relational capital

1. Introduction

The perception that the public holds of a company has many names. Some scholars call it reputation or image (e.g. Preston 2004); marketing practitioners often call it a brand (Knudsen and Jones, 2000). New insightful literature calls it celebrity and speaks of celebrity firms (Rindova, Pollock and Hayward, 2006). Call it what you may, everyone is essentially speaking of the same thing: “What does the rest of the world think about us” as an intangible asset. During the past decade, the notion of utilizing storytelling as a method of communication has raised considerable interest in the KM field (e.g. Snowden 1999, Denning 2000). While KM literature recognizes the power that storytelling has as a method of knowledge sharing and internal organizational communication, little attention has been paid to how storytelling creates Relational Capital. The aim of this paper is twofold. First, to call attention to why storytelling is a pivotal building block of Relational Capital and second, to provide an understanding of how stories receive media coverage, in essence explain how PR professionals seek to influence the business press into telling stories about their client companies and how journalists in turn react to the story material sent to them by PR departments.

This paper approaches this issue through gatekeeping theory and presents an example of the various gatekeepers affecting the media coverage of corporate stories. Although this paper includes theoretical reflection, it chiefly attempts to bring new insights to the topic by providing empirical research results. The paper reports findings from a qualitative analysis of semi-structured, in-depth interviews conducted with 6 journalists from the Finnish business press and 6 Finnish PR Professionals, and includes a number of quotes from the interviewees. The article concludes in suggestions on how companies could attain more control over the stories that journalists create for the larger public. Finally, before plunging into the thick of this research, it is necessary to provide readers with two key definitions: that of storytelling and Relational Capital. Stories and storytelling have numerous definitions. In this research, a story is understood broadly, as a verbal or written description of true or fictional events, structured by a plot. A plot is understood as defined in Aristotle’s Poetica: the arrangement of incidents that (ideally) each follow plausibly from the other. Storytelling refers to the verbal or written communicating of these stories. Likewise, Relational Capital enjoys a multitude of differing and often contradictory definitions. In this research, Relational Capital refers to an organization’s relationships with the outside world. It includes both reputation and image at a large and all individual stakeholder relationships.

2. How storytelling creates relational capital

This article argues that storytelling is a primary creator of Relational Capital, whether organizations utilize it knowingly or not. Many arguments can be made to support this view. Various examples from the dot.com years proved the power of storytelling and its links to Relational Capital. For instance Vendelø (1998) showed that companies could build and enhance their
reputation by producing and presenting stories of future performance, and that the production of such stories could happen quickly and be rather inexpensive. It is easy to see, why stories created such great excitement during the dot.com years. Stories have always appealed to the human mind. After all, storytelling has been a major form of human communication throughout history (e.g. Orr 1990, Swap et.al. 2001). Great tales of hunt and heroic ancestors, as well as simple campfire lore, have entertained, taught, and in the absence of writing, been our primary method of moving wisdom from one generation to the next (Simmons 2000). Many argue that we are, by our very nature, storytellers (e.g. Fisher 1984, Polkinghore 1988).

Sveiby and Skuthorpe (2006) illustrate the power and longevity of storytelling as a chief knowledge-sharing device in their studies of the Australian Aboriginal Nhunggabarra, a non-literary society that built and retained knowledge through storytelling and created the longest continuous record of actual historic events and spirituality known to humankind. In this research, they show how lifelong learning through the deduction of multiple meanings from stories was central to the Nhunggabarra education system. The Nhunggabarra stories include vivid facts of events that archaeological evidence supports, dating back as far as 40-60,000 years ago. As Sveiby and Skuthorpe explain, no written record or database could plausibly survive the test of time that stories prevail. The understanding we have of story and storytelling today is based on a foundation of multidisciplinary research coming from fields such as cognitive science, organizational studies, sociology, anthropology and folklore. Most research looks upon storytelling as both a social and a cultural phenomenon, which people actively use to make sense of their life, the organization they work in and the world they live in (Boyce 1996). A central aspect to recognize whilst looking at storytelling, as a building block of Relational Capital is a point brought forward by Harris (1994). Quoting Kintsch (1977), he explains how a very general script or schema exists for stories in the media. Media viewers and readers learn this narrative script implicitly during their early years, by hearing stories from their parents and teachers. Harris explains that both television and print media draw on this narrative script to make their stories readily understandable. For instance children’s cartoons follow the script very explicitly, as do most TV shows, and even advertisements. Finally, Harris quotes Meadowcroft and Reeves (1989) who found that children obtain well-developed story schema skills by the age of 7 and that these skills led to a better memory of central story content, a reduction in processing effort and a greater flexibility of attention-allocation strategies.

It is evident that stories have an inherent appeal to human beings. The research quoted above describes a rich variety of usages for stories and storytelling that we find in our everyday lives. Schank and Abelson (1995) put forth an argument, which may well explain the universal appeal of storytelling. In their title Knowledge and memory: the Real Story, they maintain that 1) Virtually all human knowledge is based on stories constructed around past experiences; 2) New experiences are interpreted in terms of old stories and 3) The content of story memories depends on whether and how they are told to others, and these reconstituted memories form the basis of the individual’s remembered "self". In summary, stories are capable of carrying multiple meanings and communicating in a comprehensible, memorable way. The strength of storytelling lies in its ability to give meaning to the individual through the story. From an organizations viewpoint, this suggests that storytelling allows organizations to express their values and image to the larger public in an accessible and vivid manner (Knudsen and Jones, 2000).

3. Journalists as gatekeepers

The impact of storytelling as a powerful, memorable form of communication is apparent. It seems that in order to gain Relational Capital through storytelling, organizations can rely on three major channels: marketing, word of mouth and public relations. The latter of these three is the focal point of this study. It is a longstanding claim that the public believes issues in the news far more than statements made by companies themselves in advertising or other forms of stakeholder communication. Thus it is arguable, that business journalists have a vital gatekeeper role in creating and upholding any given company’s Relational Capital. The ideals in journalism are of considerably high standard. According to McQuail, “The normal standard of impartiality calls for balance in the choice and use of sources, so as to reflect different points of view, and also neutrality in the presentation of news – separating facts from opinion, avoiding value judgments or emotive language or pictures” (McQuail 1994). As McQuail himself clarifies, reality is often quite different. Journalists are rarely able to be unbiased, as whether realizing it or not, journalists select, reject, and interpret both material sent to them and their own accounts on events taking place, hence making the news in its final form highly subjective.
Attaining media coverage for stories lies heavily on the organizations ability to influence journalists and produce stories that are appealing to them. Hence, the theoretical background chosen for this research is gatekeeper theory. Although the theory does not by any means provide a complete overview of news selection process, it serves the purposes of this study by focusing on the position of individual journalists and how they choose amongst a multitude of messages sent to their disposal. Gatekeeper theory argues that information travels through channels, and information encounters forces that determine its flow, i.e. gatekeepers. Shoemaker (1991) defines gatekeeping as the process

“By which billions of messages that are available in the world get cut down and transformed into the hundreds of messages that reach a given person on a given day” (Beard and Olsen, 1999).

White introduced Gatekeeping to the communications field in 1950. He studied the decision making of one wire editor, looking at why he chose to run certain stories while disregarding others. White had his chosen wire editor, “Mr. Gates”, keep a record of all the stories available to him from three wire services during one week. Mr. Gates recorded his reasons for not publishing the rejected stories. White concluded that in most cases Mr. Gates’ decisions on which stories to run were “highly subjective” and based on his “own set of experiences, attitudes and expectations” of what is news. The study has been duplicated several times. Snider replicated the study 16 years later, in a study where he looked into both the reasoning for rejecting certain stories and why some news items were chosen for publication. He discovered that the chosen stories represented a better balance among story topics, but that the news judgments were based on personal values, just as the original study showed. Bleske replicated the study in 1992, and although the profile of the gatekeeper has changed somewhat and the latest study shows "Ms. Gates" using a computer to edit copy, the result and conclusion was basically the same as White’s (Allen, 1994, Kratzer and Kratzer 2003).

The idea of gatekeepers in mass communication has naturally evolved throughout the years. Later studies have found certain patterns in the judging behaviour of media gatekeepers. For instance Buckalew conducted a gatekeeper study on news editors at television stations, and found that news editors' judging patterns are characterized by five news facets: normalcy; significance; proximity; timeliness and availability of visual elements (Allen 1994). In addition, several authorities have pointed out that there are multiple gatekeepers, the first one being the source from which the story emanates. The last is the reader herself, who chooses which news items to follow. Gatekeepers in the media are not only selectors of news stories, but also cover a wide range of media occupational roles (Hirsch, 1977, Dailey, Demo and Spillman 2003). Hence, although business journalists can plausibly be considered pivotal gatekeepers in the creation of Relational Capital, it is important to note that they are simply one key link in a process. A single gatekeeper is rarely responsible for final decisions. A good example of this comes from Berkowitz who studied a network-affiliated television station and discovered that a group of people and not an individual producer decided which news stories should air (Kratzer and Kratzer 2003). Nevertheless, the gatekeepers in the media arguably have a central role and a significantly strong influence on other gatekeepers. This was found by for instance McCombs and Shaw (1976), who looked at the effects of gatekeepers' decisions. They found the audience learns how much importance to attach to a news item from the emphasis the media place on it (Allen 1994).

4. Research design

The paper reports findings from a qualitative analysis of semi-structured, in-depth interviews conducted with six journalists from the Finnish business press and six Finnish PR Professionals. The interviews were conducted during the latter half of 2005, with initial data analysis taking place alongside data collection to allow questions to be refined and new avenues of inquiry to develop simultaneously with the gathering of material. The interviewees were derived from two sources: key informants and snowball sampling, where key informants was asked to identify other knowledgeable individuals to interview. Snowball sampling was chosen as it is appropriate when a study is primarily explorative, qualitative and descriptive (Atkinson and Flint, 2001). The respondents from the business press (two females, four males) represent three major Finnish Media: Kauppalehti, Taloussanomat and Yleisradio financial news. Kauppalehti is Finland’s leading business magazine, with six weekly issues and a monthly supplement, Optio. Taloussanomat is Kauppalehti’s main competitor, with a very similar publishing structure and readership demographics. Yleisradio is Finland’s national broadcasting company and produces financial news used in a variety of media, including their Internet, television and radio news. In addition, one respondent had held several years of experience with Ekonomi, the trade magazine of Finnish economists, and had recently moved to work as a financial reporter for a large
5. Creating stories for the business press

Today, storytelling is a rather common tool in public relations, providing a valuable method of communication that is recognized by journalists and PR professionals alike:

“It became wildly common during the IT boom that everyone had a story to tell, a well rehearsed story...they started to appear sometime in 98-99, everyone had something. Although they were young guys, boys, usually... who hadn't really done much anything in their lives, but they brought up such interesting stuff about their pasts in a great way... Stories were in the air already before this but this is when it really started... A story is, after all our basic building block, that's what its all about, a good piece of news is a good story...I think business people have realized this too...you get your message through much easier if you can tell a story” (Male, 21 years in journalism)

Storytelling has in fact, became such a common phenomena, that journalists claim to easily distinguish when they are being approached with a story instead of staple PR material. They also could pick out trends in business storytelling:

“The heroic stories that everyone was pushing five years ago are not around anymore. It's not about great leaders anymore. Now everyone is pushing these stories on the collective firm and their phenomenal group work and spirit and whatnots...What PR firms have completely forgotten is the grass root people, I'd love to see more of them. The nerd with the bad skin working in his lonely cubicle... The normal people behind the business and the success... I strongly feel that the readers of the business press want to read about people they can relate to and understand.” (Male, 14 years in journalism, 2 years in PR)

5.1 Ready-made stories

According to Gans (1979) journalists are in constant search for new ideas and often pressed for time. Pressures of time, immediacy, and deadlines require reporters to make direct and indirect use of prepared information. Hence it is reasonable to assume that PR professionals would at least at times attempt to pitch ready-made stories to the media. When asked about ready-made stories, many of the PR professionals and business journalists stated that although they are useful in some situations, they often decided against using them:

“You should never ever send material that is too ready made. You have to leave the journalists with room for ideas.” (Female 9 years in PR)

Both PR professionals and journalists commonly stated, that ready-made stories often feel too overtly positive for them to be used directly. Finnish business journalists are notorious for their negative outlook on “advertising” any commercial organization. It is considered unethical. Thus journalists typically shun away from news that seems like it would be highly beneficial for a company to get media coverage on:

“The stories have to be written skillfully, so the journalist doesn’t immediately think that ok, now they’re just advertising themselves

regional newspaper, and spoke of experience from both of these media.

The PR professionals (one male, five females) represent two middle size Finnish PR firms, which are both specialized in business related Public Relations, and one PR Manager of a large adult training institute with substantial experience of dealing with the business press. The interviews were transcribed and then analysed using Weft QDA, a freely available software tool designed for qualitative analysis. The data was first divided into larger categories, such as nature of work or attitude towards ready-made stories. Subsequently, they were grouped into sub categories such as creativity of journalism or time pressure at work. The aim was to identify and analyse different aspects, which affect how PR professionals choose to pitch stories and business journalists choose to either utilize them or disregard them. The categories and sub categories created based on this analyses were thereafter re-read and categorized into four main groups of findings: first, how PR professionals use, and business journalists react to: 1) ready made stories 2) ideas of stories and 3) hidden stories, and second, answers identifying and weighing the importance of the gatekeepers who are involved in the process of stories attaining media coverage. The findings of the analysis are presented below, with the discussion presented alongside relevant quotes from the interviewees. In the quotes, the respondents are identified by gender and years of experience, for instance: Female, 7 years in PR. Some of the respondents held work experience from both journalism and PR. In these cases they are identified by gender, followed by work experience from their current position as either journalist or in PR, followed by their years of experience in their former field, for example: Female, 10 years in PR, 2 years in journalism.
again...it has to be written so that you feel that you could get the same kind of answers if you made an interview on the topic yourself." (Female, 6 years in journalism)

One of the most prominent features that the interviewees in both PR and journalism spoke about could be called the NIH (Not Invented Here) syndrome. If journalists are approached with material that is considered too ready-made, they will often disregard it even if the issue is considered newsworthy:

“If something is written in a really fascinating manner… I notice that hey, this same stuff has been sent to everyone. I realize that I can’t use this, as it is it’s sort of stealing my job. I’m useless if all I do is copy paste.” (Male, 6 years in journalism, 1 year in PR)

The NIH syndrome is plausibly caused by how journalists view their occupation. They see journalism as being inherently a very creative job that they take pride in. Most of the interviewees stressed that they never merely reflect the outside world and tell things as they occur. Their work involves a great deal of interpretation and decision-making:

“It reminds me a lot of an artistic process, when we start thinking about what we will do and how will we introduce and develop the story…” (Male 24 years in journalism)

However, many respondents claimed that it is useful to send ready-made stories, for they are utilized often enough, especially as background information:

“I read them. If they are well written I’ll read them. I’ll certainly not use the material itself at all if I run a story, but it might lead to me getting a kind of a ‘ah, I get it’ reaction and then if I run something related in a few weeks I’ll contact the people that were mentioned in the ready text, because they already told one version and parody is always easy to make” (Male, 14 years in journalism, 2 years in PR)

Some of the PR professionals emphasized the importance of sending out ready made stories, due to the increasing pressure journalists face in meeting deadlines and producing news quickly. Lack of time (or using it as an excuse) makes ready stories appealing for some journalists:

“This quarterly capitalism has driven us into such a state that we are pushing out more and more pseudo news...”(Male, 14 years in journalism, 2 years in PR)

“It’s a bit overstated to say we have a lack of time... Many have all the time in the world and its just a sort of laziness because we are forced to write something new every day and if your lazy it’s of course easier to do something with information that is ready made and filtered...easier for us journalists to make a living” (Male 21 years in journalism)

In addition, some of the journalists felt that negative aspects are often hidden in business jargon, whereas sending a clear story indicates openness and the will to communicate:

“Listed firms have all these legal obligations to communicate...Quite often they’ll just send out the plain facts if it’s bad news... they don’t want to sort of imply or hint that there’s a bigger picture here and so they don’t put it in any kind of frames.” (Male, 21 years in journalism.)

It seems that ready-made stories do not hold a great appeal to business journalists, but they may be used as background information or occasionally used fully. Many of the journalists noted that their reaction to ready made stories is due to their being in business news, and stated that other fields of media may well be more appreciative of ready material. This also was apparent from the interviews conducted with PR professionals, who noted that journalists working in areas such as entertainment (movie’s, record releases etc.) seems much more enthusiastic toward ready-made stories and quite often print them as such.

5.2 Ideas of stories

Many of the PR professionals saw ideas of stories, which they also referred to as hints or even bates, as their preferred method of attaining media coverage for their story. The ideas of stories were often fully thought out stories that the PR professionals deliberately left bits and pieces out of:

“I always approach journalists first with a story suggestion. It has a clear idea of a story in it but it has some loose ends so they can tie it up in a fashion they like... I have this gut feeling I should let the journalist have the joy of finding” (Female, 10 years in PR, 2 years in journalism)

Many of the journalists shared this view, stating that they appreciate material that is thought out to an extent, but leaves them room for creativity:

“Of course its easier for us if the stuff we are sent is slightly ready chewed …”(Male, 21 years in journalism.)

Avoiding an excessively positive tone or “advertising” was a key issue that interviewees often referred to when discussing how they use ideas of stories. Many PR professionals stated...
that they generally choose topics that can be linked to a current discussion in the media or spoke of trends in the industry:

“I’d say some of the best PR successes our firm has had have been when we take an issue that is not straightforwardly tooting our clients horn… I’d say it’s best if you just hint to a journalists about a story like that.” (Male 12 years in PR)

Often enough, when recognizing a phenomenon that they felt could make a story, PR professionals will simply pitch this to a picked journalist who they consider would be interested in the matter, without developing the full story. Hence the appeal of ideas of stories to PR professionals may also lie in the fact that they take less effort to create:

“It can be kind of an idea, like this company is unique because it offers such flexible working hours to its personnel. Stuff we could write up as a full story, but it’s easier to for instance arrange for our client and some journalist to… just sort of… discuss this topic. They often like it better anyway when they (the journalists) can figure out for themselves how they want to write the story.” (Female 9 years in PR)

5.3 Hidden stories

Many of the journalists spoke enthusiastically about stories that can best described as “hidden”. By this they meant a story that is not brought up straightforwardly, but that they can themselves find for instance amongst “PR jargon”:

“This PR firm send us a usual press release on this large private hospital chain…about how they had expanded… and then just casually mentioned that here in the private sector, anyone can rise to become a manager… it had a small example of this 33 year old occupational health nurse… how she was running four medical stations and was the boss of all these doctors… just a few short lines in the midst of the text… Not hard to guess that our management pages called them right away to run a feature on it.” (Male, 14 years in journalism, 2 years in PR)

Likewise, stories that the journalists did not anticipate receiving during an interview can also be defined as “hidden”. Although they can be clear, ready-made stories, the fact that the journalist did not anticipate hearing it seems to make them and the subject matter at hand appealing:

“I’ve had my share of jargon-puffing CEO’s…Even if their topic would be newsworthy, there may be nothing to use as meat on the bones… Sometimes they save the day with a story…when I hear the words: there’s actually a funny story about how we started our company, or why we came up with this idea… I immediately perk up in my chair…”(Male 21 years in journalism)

One journalists speaking of these hidden stories explained that he assumed PR professionals were “slightly hiding the beef” on purpose, to get journalists excited about finding it, but that he still found the hidden stories appealing:

“Well, smart PR people understand this and know how to pitch stories for journalists in a sly manner…they don’t pop upright away, so we get like, this is my story, I invented this! They get us believing that we found the story ourselves.” (Male, 21 years in journalism)

Interestingly, it appears that journalists were more willing to cover stories that plausibly would be directly beneficial to a company’s image if the story was hidden. It seems that when journalists find the story themselves, concerns of “advertising” disappear:

“If say, a company says that they have recruited this and this many people, then we take the bate when we see it and realize that hey, they must be doing very well… Then we make it into our own thing.” (Male, 6 years in journalism, 1 year in PR)

5.4 Gatekeepers involved in attaining media coverage for stories

In accordance to suggestions of later gatekeeper theory, this analysis shows that that business journalists are only one significant gatekeeper in the process of attaining media coverage for stories. Numerous gatekeepers can exist, but not necessarily:

“It’s quite… well surprisingly lonely, actually. I make my own decisions. I guess you just learn to rely on yourself so much… mostly the only communicating I do is with the editors in chief, if even them.” (Male, 24 years in journalism)

“We typically find the story… something we can tell about our clients that fits the bigger picture. Of course we get info straight from our clients as well, but in good partnerships, we do the actual choosing of what to pitch, our clients trust our expertise…Customers of course give the final ok, shall we advance on this idea” (Male 12 years in PR)

It seems that the gatekeepers can vary in different situations. At a minimum, the journalist finding a story and deciding to cover it will be the sole gatekeeper. This is the case in for instance many
online news desks. Providing that any readers come across this story in the press, they will naturally also act as a gatekeeper, choosing what they want to read. In addition, there typically is an editor in chief or other decision-making body within the media who chooses the final news mix for the day. When a story is offered to a journalist through a PR agency or department, a few more gatekeepers can be added to the chain: the PR professional, who finds and creates stories and decides how and to which media they will pitch the stories to, and also the customer organization who approves of the stories or news that will be presented to the media. An illustration of typical gatekeepers involved in the process of a story receiving media coverage is illustrated in Figure 1.

Figure 1: An Example of gatekeepers affecting the media coverage of corporate stories

<table>
<thead>
<tr>
<th>Gate 1 the PR professional:</th>
<th>Finding and creating stories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gate 2 the customer organization:</td>
<td>Approving stories that will be pitched</td>
</tr>
<tr>
<td>Gate 3 the PR professional:</td>
<td>Choosing media and approach of story pitching</td>
</tr>
<tr>
<td>Gate 4 the journalist:</td>
<td>Choosing if the story is newsworthy and suitable for the media, and in most cases creating their interpretation of it</td>
</tr>
<tr>
<td>Gate 4 the chief editor:</td>
<td>Deciding if the story is suitable and fits the news mix of the day</td>
</tr>
<tr>
<td>Gate 5 the reader:</td>
<td>Choosing which stories they will take interest in</td>
</tr>
</tbody>
</table>

Although the gatekeepers in the media can be considered pivotal, the gatekeeper role of the PR professionals is highly influential as well, as they commonly either contact a small number of media with a certain story or tailor make it in a manner that they feel will fit different media needs:

“The biggest challenge at the moment is that every media house has such diverse needs… packaging the same story in different forms for all these different receivers… that’s what makes the successful PR people. (Male 14 years in journalism, 2 years in PR)

6. Conclusions: Luring the business press into covering stories

Previous research has shown that journalists often base their decisions on which news to cover on instincts rather than textbook news values (Kratzer and Kratzer 2003). This research confirms this view to some extent. In the course of the interviews, both journalists and PR professionals gave some textbook examples on what makes stories newsworthy, such as the size of a company or the monetary value of a deal. However, both groups of interviewees also affirmed that the manner in which a story is delivered has an impact on an issues appeal to journalists. Ideas of stories or hidden stories are much more appealing to business journalist than ready-made stories. When questioned about how journalists react to story material sent to them, their reasoning for finding material appealing and newsworthy typically centred around being able to discover news themselves and present the public their interpretation of it. Consequently, discovery and interpretation seem to be key issues that commercial organizations should take into account when attempting to lure the business press into covering their story. Finally, business journalists are seemingly more willing to tell positive stories of commercial organizations when finding the story themselves or when presented an idea of a story that gives them the chance to be creative and fit in the missing pieces. The argument is illustrated in table 1.
### Table 1. Different story types’ appeal to journalists

<table>
<thead>
<tr>
<th>Story type</th>
<th>Appeal to journalists</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indication of a story</td>
<td>Appealing to business journalists, especially if not obviously helping a commercial enterprise improve its image</td>
</tr>
<tr>
<td>Hidden story</td>
<td>Appealing to business journalists even if the story would clearly improve a commercial enterprise’s image</td>
</tr>
<tr>
<td>Ready-made story</td>
<td>Appealing to journalists as background information that might trigger a later story. Sometimes used as such for instance when pressed for time.</td>
</tr>
</tbody>
</table>

### References


Hirsch, P.M. (1977) "Occupational, organizational, and institutional models in mass media research: Toward an integrated framework", in Hirsch, P.M., Miller, P.V., Kline, F.G. (Eds), Strategies for Communication Research, Sage, Beverly Hills, CA.


Sveiby, K. E., and Risling, A. (1986) "Kunskapsfäretaget - Seklets viktigaste ledarutmaning?” Liber


Exploring Knowledge Processes in User-Centred Design

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Abstract: This research focuses on analysing knowledge processes of the design process, especially the early phases of the design process that can be called concept design. It aims at developing a body of knowledge that builds on the relevant issues toward user-centred design in a form of a framework. This is intended to apply, organise and synthesise processes, theories and concepts from the separate but linked disciplines of knowledge management and human-computer interaction, hence addressing one of the most essential topics and goals of system design, i.e. how to define what is needed in the system and how the system should mediate human activities—for the purposes of this research, in the context of interest-based communities and mobile technology. The framework is based on the following propositions: (1) The participants of design process include designers and users as actors, both of which are seen to possess knowledge needed toward successful design; (2) this knowledge is proposed to be context-specific, hence being specific for certain users using certain technology; (3) for the user as well as for the design professional there are some things that are known but have not been articulated; and (4) the knowledge processes transforming tacit knowledge into explicit knowledge by users and designers are linked and need to be combined, finally (5) toward knowledge embedded into concepts, products, or services. Overall, the research highlights how knowledge processes enable user involvement and capturing tacit (and novel) user knowledge toward successful concept design/design.

Keywords: user-centred design, concept design, knowledge process, tacit knowledge

1. Introduction

This research focuses on one of the most essential topics and goals of system design, i.e. how to define what is needed in the system and how the system should mediate human activities. In doing so, it embraces the principle of user-centric design. In the background of this research is research conducted between 2002-2005 toward designing mobile communication devices for interest-based communities (presented in Still et al. 2002, Jäätä et al. 2003; Isomursu et al. 2004; Still et al. 2004; and Still et al. 2005). These communities are formed by individuals with a shared interest, expertise, and passion in a focused area that can be just anything (Wellman 1988; Rothaermel and Sugiyama 2001; Preece, 2000; Preece and Maloney-Krichmar 2003), and are technologically mediated, usually with web-based technology, but also with mobile technology, for example as described by Rheingold (2002). "Today's mobile phone business is not about selling the uniform black brick to everybody, but just the opposite—designing and delivering the right product for specific kinds of use" (Kiljander and Järnström, 2003: 16) describes the requirements for design of this research. During an extensive literature review it became clear that the “popularity” of focus of design needs has contributed toward the following: (1) it is discussed and analysed within many disciplines, usually with an interdisciplinary approach (2) therefore the amount of relevant literature is vast, (3) therefore there is a multitude of relevant theories, approaches and methods, both academic and professional, and (4) the concepts have seldom universal definitions that are agreed by all. In addition, (5) the context of organisations tends to dominate current research, and (6) few design studies concentrate on needs of an interest-based group or community. Also, (7) the interdisciplinary research team exploring the mobile communication of interest-based communities was accustomed to operating within the scope of organisations.

To address the above-mentioned challenges, this research aims at developing a body of knowledge that builds on the relevant concepts and approaches toward user-centred design in the form of a framework. The framework synthesises terminology and concepts from human-computer interaction, HCI, (user, usability, technology, context/use-context, user involvement, designer, product concept) as well as from knowledge management, KM, (knowledge process, tacit knowledge, explicit knowledge, embedded knowledge). KM is regarded appropriate for this study, as it concentrates on the collective process of knowledge creation (for example in Nonaka and Takeuchi 1995) and the need to embed the achieved knowledge in concepts, products and services. It further emphasises the complexity of knowledge (McInterny 2002, Nätti 2005), overall trying to answer how to better create, use and manage knowledge in organisations (or groups)—relevant for the interest-based communities sharing and creating knowledge. For addressing the design for technology for mediating human activities, HCI as a discipline was selected for its focus on users: when exploring the human understanding, (residing first and foremost, in the practices in which the human participates (Taylor...
1993) it has developed procedures, methods and tools that facilitate the design of more effective interfaces and devices better adapted to users and user groups. Hence, HCI was utilised to go beyond a single user (Bannon 1992) to address technology supporting interest-based communities for the special context of this research, and it was further refined with concept design process/user-information based concepting, and interaction design as they are considered applicable approaches for designing mobile technology (Jones and Marsden 2006).

2. Design as knowledge activity

Design is said to a cognitive activity, thought work (Beyer and Holzblatt 1998). Several researchers have described new product development as a knowledge intensive activity (for example Nonaka and Takeuchi in 1995 with one of the earliest applications for the knowledge creation process, the new product development of a bread machine) and have used the knowledge-based view of the firm and the RandD process (Davenport and Prusak 1998, Kessler 2003). Recent research has furthermore emphasised the role of data/information/knowledge in new product development and innovation. For example, Zahay et al. (2004) were looking at sources, uses and forms of data in new product development, centring on reducing uncertainties related to “what do they want” (referring to users); Adamides and Karacapilidis (2006) were “seeing knowledge and information flows as key determinants of successful innovation and new product development process”; and concept design is described as an “information-intensive process” (Takala et al. 2006, p.62).

2.1 Need for context-specific knowledge

As in processes in general, design process is seen to transform certain inputs into desired outputs. Based on the knowledge-view, these inputs and outputs are considered to be knowledge. People involved in the concept design, design process (or in new product development) are seen to be knowledge workers engaged in knowledge processes. These knowledge processes are high added value processes in which the achievement of goals is highly dependent on the skills, knowledge and experience of the people carrying them out. In design process, knowledge workers are seen to operate by taking into account multiple inputs (generally a wide set of unstructured data and information) to perform difficult tasks and make complex decisions among multiple possible ways of doing the work, each one implying different levels of risk and possible benefits (Cervera 2006).

Still, even (or maybe especially) in knowledge management literature, there is no single agreed upon definition of knowledge. Knowledge is seen to be something more that information, something that adds value to information—it has been conceived as “information put to productive use” (Kakabadse et al. 2003). Overall, words such as meaning, application, use, integration, action, and know-how have been used to explain it and its value. Hence, it is seen to be directly linked to information and (Nonaka and Takeuchi 1995), with a traditionally linear process of data-information knowledge that has been challenged by Davenport and Prusak (1998) who state that non-manageable amounts of knowledge become data. The key attribute for knowledge is that it exists and resides in the heads of people—“Humans possess knowledge” stated Bollinger and Smith (2001:8). Hence, it is problematic to separate the process of knowing and its resulting knowledge (Orlikowski 2002). This furthermore implies that (1) committing explicit knowledge to a medium (such as paper) changes it into information (2) people have different interpretations on the knowledge and information based on their expertise, values etc., (3) information that artefacts contain is not the same as the knowledge required to use them, all of which can influence the design process.

One encompassing definition for knowledge is:

“A fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organisations, it often becomes embedded not only in documents and repositories but also in organisational routines, processes, practices and forms.” (Davenport and Prusak 1998: 5)

For the purpose of this thesis, the definition above has been used to formulate a working definition of knowledge needed for/during design process:

“A fluid mix of framed experience, values and contextual information of users, combined with framed experience, values and contextual information of professionals and their expert insight that provides a framework for evaluating and incorporating new experiences and information into concepts, models and artefacts. It originates and is applied in the minds of users and design professionals. In design process, its sources include documents and repositories, routines, processes, practices and forms, but those can also be products of the process itself.”
The above-presented definition for knowledge needed in the design process included the component “contextual information”. Context is central to all explanations of social science and though it has been said to be something that “everyone knows it is there, but nobody is sure where- or what- it is” (Keith 1994:230). It is generally studied as equivalent to the situation, in which an individual is immersed—for example as people, places and things that surround the user—but also as contingency, with specifying key situational factors which impact the context, as well as with frameworks that provide individuals with a situated context for action, filtering out some stimuli (Johnson 2003). Hence, it is seen that a person’s behaviour is influenced and mediated through the context (Jones and Marsden, 2006: 136). In the HCI arena, the term use-context (also called context-of-use), is at the interface between user and technology (also other than computer, its hardware or software), and means users, tasks, equipment, and physical and social environment in which a product is. Contextuality of knowledge highlights the specificity of the knowledge. In other words, the fact that the knowledge created during the design process is specific to that user (users or user group), using that specific technology, at a specific time. Therefore, the requirement for context-specific knowledge translates into need of thorough and deep understanding of user(s). With this, usability, which is now widely recognised as critical to success of an interactive system or product (Maguire 2001) can be reached. It is generally agreed that usability (referring to how to support users in their tasks) is achieved through the involvement of potential users in system design (Karat 1997).

2.2 Need for user and designer knowledge

Toward the success and ultimate survival of the company, understanding the needs that people have regarding a certain product or situation has become essential. Organisations have realised that they cannot rely on designers, developers, or specialists (or the technology originators of Gibson and Smilor 1991) to know how to design products and services to meet customer needs. The people that need to be included can be called customers (who order and/or pay the product), users (who interact with the product), or consumers (who use the product). User-centred research, which can be said to be the guiding principle for most design processes nowadays, centres on the user. The term for user’s interaction with this principle is called user involvement. User involvement usually describes direct contact with users, and it is considered to mean participation, involvement, or integration of users in the design, evaluation and implementation of new products. A clear definition of user involvement is lacking in the system design world. The concept has been used synonymously with “including users in the design process” (Nesset and Large 2004) and with “focus on users” “contacting with system users”, “consulting end-users” and “participation of users” (Kujala 2002). Involvement is encouraged at all phases of the design process, but it is oftentimes seen to be most efficient and influential in the early stages of system development (Ehrlich and Rohm 1994). It is nowadays considered essential and valuable in understanding user needs and achieving successful, usable products, and it has been seen to provide the needed knowledge about the user for design activities. Users and designers are seen to have distinct roles and separate contributions that they can make to the design process. The increasingly active roles of users in user-centred design—performing one or multiple roles of users, testers, informants, co-designers or design partners (Nesset and Large 2004)—are consequently seen to lessen the distinction between users and designers, and supporting better understanding and cooperation. Even though the presence of designer (and his/her knowledge) is traditionally omitted from the explanations of user involvement, it is clear that the designers are expected to be “contacting with system users” or “consulting end-users”, generally focusing on users. Recently, the relationship between users and designers has been explained with metaphorical terms such as engineer designer and component user; doctor designer and patient user; student designer and master user; coach designer and athlete user (Jääskö and Keinonen 2006), at least partly answering the accountability and responsibility issues of users and designers.

Still, the reality remains problematic: “It is widely accepted that users should be involved in developing interactive systems and that involving the users—even indirectly—has proved to be very challenging in practice, especially in the product development context” (“livari 2006: 636). Even more problematic it comes, when the design aims for a concept, something that is novel, something that does not exist yet, or “asking consumers what they want is useless, because they do not know what they want” (Kleef et al. 2005: 181). Also, it is generally recognised that oftentimes the views and knowledge of some design process participants tend to dominate. This can be seen from the fact that the design process in seen to be political by nature, and all design in in/for someone’s interests (Karasti 2001), from the time and resource limitations of the design process in
real life (which can lead to designers stating the users are not aware of the real-life technical and cost limitations), as well as from the traditional “if we build it, they will come” philosophy. Furthermore, the designers’ knowledge of system design as well as of users—which has also been called design thinking (Beyer and Holtzblatt 1998) or technical experience and expertise to suggest potential design factors and alternative solutions—has often been emphasised. Therefore the knowledge considered legitimate within system design is not seen to be the knowledge of those who use the technology, who are seen to experience the system, but are not seen as experts in HCI and are not considered to be able to analyse or articulate directly their requirements (Smith and Dunckley 2002).

2.3 Need for tacit and explicit knowledge

The study is based on the notion that the participants of the design process, namely users and designers, both possess knowledge needed toward the successful design. Furthermore, for the user as well as for the design professional there are some things that are known but cannot be articulated. “Tacit knowledge” has been described as personal, non-articulated, silent, hidden experience-based and skill type bodily knowledge and “what we know but cannot articulate” (Polanyi 1966, Nonaka and Takeuchi, 1995), and explicit knowledge then is objective, sequential, digital and rational, or what we know and can articulate (synthesis of Polanyi 1966, and Nonaka and Takeuchi 1995:8). The classical knowledge process model by Nonaka and Takeuchi (1995) sees organisational knowledge being created through a continuous dialogue, or interaction, between tacit and explicit knowledge. Individuals develop new knowledge, but organisations play a critical role in articulating and amplifying that knowledge. This transformation of tacit into explicit knowledge has also been called “vertical knowledge transfer”, highlighting the “horizontal knowledge transfer”, e.g. sharing knowledge in face-to-face contacts and the overall knowledge transfer is described as occur through direct personal interaction and intermediated transfer with codified, explicit, available knowledge (Nätti 2005). For the purposes of this research, knowledge transfer is seen to be a knowledge process in itself, which is included in the process of knowledge creation.

The knowledge spiral by Nonaka and Takeuchi (see Figure 1.) centres on “knowledge conversion” and identifies four different patterns of interaction between tacit and explicit knowledge:

- Socialisation involves the sharing and exchanging of tacit knowledge between individuals to create common mental models and abilities, most frequently through the medium shared experience (apprentices learn by observation and imitation of experts, children learn by observation and imitation of adults etc.)
- Externalisation is the process of articulating tacit knowledge into comprehensive forms that can be understood by others into explicit knowledge (into models, concepts, analogies, stories and metaphors). Hence, there are two processes operating: (I) individuals sharing their mental models with others, and (II) also reflecting and analysing their own mental models hence creating conceptual knowledge.
- Throughout the combination phase, existing explicit knowledge is combined or reconfigured in order to generate new explicit knowledge. The three processes that result in systemic knowledge include (I) capturing and integrating new knowledge. (II) disseminating new knowledge, and (III) editing and processing new knowledge.
- Internalisation is the process of adding to explicit knowledge (principles, procedures, methodologies) into tacit new knowledge (in the form of sensations, memories, images) through experimenting in various ways, through real life experience or simulations. The resulting synthetic knowledge is shared throughout the organisation, and converted into tacit knowledge by individuals.

![Figure 1: Knowledge creation process (Nonaka and Takeuchi 1995)](image)
3. Framework for user-centred design with knowledge processes

The goal of the design process can be expressed as: to enable the context-specific knowledge process in which the tacit knowledge of users and design professionals is modified to explicit knowledge, combined and finally embedded in a concept, product or service. Hence, the construct (see Figure 2.) of understanding and analysing user-centred design with a knowledge-based approach is presented with two components: (1) toward context-specific knowledge, with (2) linked knowledge processes of users and designers. These components are presented with examples of applying them to the context of interest-based communities and mobile technology (presented in italics in this paper and also found in Still et al. 2002, Ijäs et al. 2003; Isomursu et al. 2004; Still et al. 2004; and Still et al. 2005).

3.1 Toward context-specific knowledge

The knowledge processes are proposed to build on the existing context-specific knowledge. It is suggested that the existing context-specific knowledge is primarily explicit knowledge. Capturing it is seen integral and useful for the purposes of the design process, and many times can be seen to provide a certain level of user understanding. The quest for context-specific knowledge is made possible with designers’ building on their existing knowledge of technology, the different facets and approaches to usability and use-context (based on their experiences) as well as their understanding on users in general. This is proposed to occur through a thorough analysis of the context-specific knowledge: user, technology, usability, and use-context.

Users interact directly with the design factors that determine usability and benefits of the system, and their resulting knowledge is also context-specific. Contrary to the designers, who “can make use of their own experiences and visions during the process of designing a new product” (Jääskö and Keinonen 2006), much of users’
approaches and experiences with the usability and use-context most often have not been clearly articulated, leading to the need for knowledge transformation processes. It is integral that designer/design team appreciates the context-specificity of the knowledge. This moves the designer away from the “universal” or “cookie-cutter” approaches, and allows for creative methods of involving the user toward user understanding.

The research context of interest-based communities and mobile technology presented a challenge for this research. Not only was there limited research available that was related, but also the research team was accustomed to operating within the scope of organisations and their members. Hence, the research included a comprehensive exploration into the world of communities in general, looking at virtual communities, online communities and interest-based communities, their communication and collaboration using technology. Some of the results are presented in table 1. (and this analysis and its representation can be seen to be processes as well as results of knowledge processes of researchers, collecting user information, interpreting it, discussing it and finally presenting it in an explicit form).

Table 1. Exploring the context of interest-based communities.

<table>
<thead>
<tr>
<th>People</th>
<th>Virtual stables community</th>
<th>Birdwatchers community</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-14 year old horse-aficionados (girls)</td>
<td>Birdwatchers of different ages</td>
<td></td>
</tr>
<tr>
<td>Shared purpose</td>
<td>Horses, horseback riding, and other related activities</td>
<td>Birds, especially rare birds and their observation</td>
</tr>
<tr>
<td>Rules</td>
<td>Unwritten and even written rules guiding behaviour and content-creation</td>
<td>Written manual by a formal association</td>
</tr>
<tr>
<td>Shared context</td>
<td>Virtual world, mostly fantasy taking place in virtual world</td>
<td>Real-world experiences are shared in virtual world</td>
</tr>
<tr>
<td>Shared content</td>
<td>Clip-art pictures, copied photos, stories about horses and related activities, places</td>
<td>Original photos of birds, stories about sightings, weather info, location info</td>
</tr>
</tbody>
</table>

3.2 Linked knowledge processes

At the core of the framework is the understanding that both the users and the designers need to move on the knowledge spiral with their own, separate though interlinked knowledge processes. These knowledge processes happen within a person’s head, and as such they are not something that a person does consciously, but are a natural process. The goal of representing these processes with a framework and with the knowledge-spiral model by Nonaka and Takeuchi (1995) is to emphasise the interplay between tacit and explicit knowledge. User understanding, which can be called background information—gaining a rich picture of what makes up the detail of the users’ lives, the things they do and us (Jones and Marsden 2006)—is generated during the first knowledge process of the designer, when the explicit knowledge about users is interpreted and combined with the existing design knowledge (both tacit and explicit) of the design team. As in all the knowledge processes within design process, the context-specific knowledge is combined with the general design knowledge.

In the research about interest-based communities and mobile technology, user understanding was partly conducted with sharing the space of the community. The physical space of community members was shared during interviews and observations. For example, researchers observed members of virtual stables using their desktop computer to participate in the community activities as well visited a stable. In addition, researchers shared the virtual environment (web pages and discussion forums) in which the communities interact:

- Researchers participated in the discussion forums of birdwatchers (sometimes only following the discussion, sometimes with active participation)
- Researchers analysed the content and structure of web pages of virtual stables—finding out user knowledge such as 63 percent of virtual stable home pages had photos (mostly copied from picture libraries) in them
- Researchers analysed the development of community communication in case of
birdwatchers, including the current use of mobile technology
To gain access to tacit knowledge of users as well as to integrate that to the tacit and explicit knowledge of the designers, further knowledge spiralling is needed. As designers are the primary actors on the designing process, the knowledge created during the first knowledge process enables them to involve the users to the process in an appropriate and useful manner.

In involving the interest-based community members to the design process, the research team faced severe problems. For example, in the case of birdwatchers, researchers wanted to observe the community activities in real-life situations at a bird observatory, but very few birdwatchers arrived to the observatory during the observation times and observation methods did not trigger community activity as no rare birds were sighted. In the case of virtual stables, achieving a natural and relaxed atmosphere with the pre-teen and teenage girls proved difficult, and resulted in quick answers such as "I don't know", "It's ok", and "That would be nice". Hence, it became integral to use a method that would involve users in an appropriate, useful and successful manner—which resulted in creating a method of web-based storytelling environment for the virtual stable community, enabling the community members to activities that are natural to them in the virtual stable community context. The community members were asked to write stories about how they would use a dedicated mobile device at a real stable and at a virtual stable environment. Users are regarded as an essential part of the process and can act as co-designers. As a result of their knowledge process, their tacit knowledge becomes apparent for the purposes of the design process. This knowledge from user(s) is hence not the design professional's view or translation of the user needs, separate of the use and user, as in the traditional way in design process. Nor is it simply seen to be the user's response to the questions "what do you need" or "what do you want", which could be communicated during some user involvement activities.

The online enquiry method of web-based storytelling for virtual community members resulted in 24 narratives of users using a mobile device in the virtual stable environment, and 29 stories narratives of using a mobile device in the stable environment. Clearly, these were explicit, written descriptions, but hardly something that by themselves can act as description of user requirements. One example of a story received is:

I sit down by the computer and take out my mobile device. I connect it to computer and transfer all my recordings and pictures to the computer and load them to the Internet. I open up the guest book of my virtual stable and write the most important messages to the mobile device. In addition, I add the horse’s neighs I recorded the home page of my virtual stable so that everyone visiting my virtual stable can hear them. I add new pictures to the virtual horses’ pages and also add a video I shot at the stable. I have drawn pictures of horses at a real stable and I add those to the virtual stable (Jannika, 11 years)

The context-specific explicit knowledge from designers may influence this knowledge creation process, which is something that designers need to be aware of. However, user understanding gained from the previous knowledge process can assist in this. The participation of users is not enough, as designers and other professionals are needed to complete the design process. The resulting knowledge is seen to be a synthesis, an outcome of the knowledge process as well as the knowledge process itself by design professionals and by users. This knowledge and process have been generated and understood through specific courses of action aimed at turning existing situations into preferred ones in specific contexts.

In the case of virtual stables, the research team analysed all the stories, and found them to be relevant and very descriptive. Furthermore, analysis according to the functions the mobile device was seen to perform, brought following situated knowledge such as camera function was seen in 66 percent of the usage scenarios at real stables and in 50 percent of the usage scenarios involving virtual stables. In the case of birdwatchers, designers created use-cases of communication to describe the user behaviour:

Sofia receives Mari’s message about a rare bird sighting, as it matches her profile. Because she is vacationing out-of-town, she uses her mobile to change her profile so that she does not get any more updates about that bird (hence only paying for receiving one message).

Furthermore, knowledge itself is not enough, but it needs to be used, materialised, or embedded in concepts, models, and artefacts. As knowledge is sometimes seen to be valuable only when it is shared, also the knowledge gained during the design process is seen to be successful only when applied toward a concept or product. This concept represents the design in a way that it can be demonstrated, altered and discussed (Jones and Marsden 2006), hence providing a base for furthering the design process. This can be seen to require for researchers ability to look at the
challenge from different angles and to elaborate the initial solutions to produce the concept descriptions for decision-making (Takala et al. 2006)

In the context of virtual stables, based on the users’ narratives, researchers used for example contextual inquiry methods of affinity diagrams to transform the knowledge derived from user involvement, combined this with their own knowledge, evaluated the value of both of this knowledge in the concept creation process—and chose to present this as a prototype of an enhanced concept for a dedicated mobile device. This device (a) emphasised the buddy element, as it was seen as a friend-like thing that supports and even gives advice to the user, (b) included a key-pad for faster alpha-numerical input (based on the fantasy and stories being at the core of community), (c) allowed easy and versatile use of different functions, (d) supporting a rich use of multimedia, and augmenting that even with smell-recorder. The use-cases presented about birdwatchers were organised by researcher to show the integration of communication technology—demonstrating how the community members fluently use both computers and mobile phones, but also showing how knowledge sharing between these technologies brings challenges to users, as different formatting might be needed, and the knowledge transfer does not happen automatically.

The need for multiple linked knowledge cycles of designers and users should be highlighted when moving from beyond concept, and as each concept or prototype is seen as a stepping-stone for next and better ones (Jones and Marsden 2006). Hence, even though the framework exhibits only one knowledge process for users, in many cases there might be need for user involvement several times, for example first with concept, then with prototype, and then with the product itself, as well as with evaluation of all of these. Evaluation and subsequent selection can be seen to be based on the criteria that the presentation itself produces, or against a set of fixed criteria, based on a company’s business strategy, identified customer needs or business environment drivers (Takala et al. 2006). Overall, knowledge-based description for design process with linked knowledge processes of users and designers is compatible with the process of user-information-based concepting (Jääskö and Keinonen 2006), with interaction design (Jones and Marsden 2006) and with the product concept process (Takala et al. 2006), all of which are seen applicable to the initial phases of design of mobile devices/technology—which was the specific context of this study, as it did not go beyond prototyping (case virtual stables) or with concepting (case birdwatchers). The framework can be seen to explain the phases/layers of these other approaches to design process (see Table 2), therefore addressing the needs and roles of designers and users as well as the contextuality of knowledge.

Table 2: Knowledge-based approach to design explaining other approaches to design.

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Background research/information acquisition—to explore a wide range of possibilities to identify opportunities.</td>
<td>Understanding users—having a sense of people’s capabilities and limitations</td>
<td>Constructing an understandable picture of the user’s present behaviour: 1. Collecting user information 2. Interpreting user information</td>
<td>Knowledge process toward user understanding, first round(s) of designers knowledge process, where designers share, exchange, collect, interpret, and understand context-specific knowledge about users, technology and usability, and user involvement</td>
</tr>
<tr>
<td>Concept generation/creation</td>
<td>Developing prototype design—representing a proposed interaction design</td>
<td>Description of new user behaviour</td>
<td>Capturing tacit knowledge from users allowing users to actively contribute their knowledge to the design process with their knowledge process</td>
</tr>
<tr>
<td>Evaluation—selection from the concepts.</td>
<td>Evaluation</td>
<td>Description of a new concept</td>
<td>Designers’ knowledge process to embed the knowledge in a concept, product, service—or description of new user behaviour (this can then serve as starting knowledge for the next cycle)</td>
</tr>
</tbody>
</table>
4. Discussion

This paper described the user-centred design process as a set of context-specific knowledge processes, which address the dichotomies of (1) designer vs. user, emphasising the value of knowledge from both, based on the principle of user-centricity, and (2) tacit vs. explicit knowledge, accentuating the interplay between them, based on the principle of knowledge-based approach. Both are generally used to understand design process, however, their combination is not typical. Hence, this paper presents a novel perspective into the design process. The framework emphasises the context-specificity of knowledge that acts as inputs and outputs of the design process. The knowledge processes of designers and users are fuelled by this knowledge. Especially valuable is seen the tacit knowledge, which needs to be made explicit during the user-centred design process. As the tacit knowledge has not been articulated before, it is seen to provide new insights and hence value to the design process. The framework was created and used in the context of interpreting and understanding the process of designing mobile communication technology for interest-based communities. Because the framework is partly a result of the challenges faced during the research process – it was created and applied simultaneously—the framework was considered constructive and applicable when designing for the interest-based communities. It helped to organise the related, relevant concepts, provided means for seeing the connections between the different concepts, and guided the research process in general. In the context of the research, the framework supported the achievement of the research process goals, which included not only gaining thorough knowledge about the interest-based communities and their members' expectations about mobile technology, but also embedding the knowledge into concepts of dedicated mobile devices and applications that could be used by the community members.

It is proposed that the framework can be applicable outside its original scope of interest-based communities. This is proposed because the concepts and approaches used in the framework are usually also utilised outside the context of the study (namely in business and learning organisations). At least, it is suggested that people participating in design processes in general could consider (a) the elevated role of the user, as the framework demonstrates a visible, active and needed role, (b) the means and methods of involving the user, as universal, cookie-cutter approaches may not provide the desired outcomes, (c) the roles and responsibilities of designers progressing beyond the explicit and visible, toward tacit knowledge that brings the fresh and innovative knowledge needed for the design.

References

Partaking as a Tool for Knowledge Creation and Sharing in Practice

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Abstract: In this paper evidence that sustains the importance of partaking in promoting knowledge creation and sharing, is gathered from a recent study of optimisation of a corrugated cardboard machine. The investigating method is action research combined with the theoretical views of the SCOT approach (Pinch and Bijker, 1989; Latour, 1987; Law, 1992). It is revealed how inclusion of workers in discussions concerning their workplace, promotes an ownership to their work. This was accomplished by creating a trusting environment allowing workers to speak open and freely (Webb et. al, 2002). Hence knowledge creation and sharing concentrates on those who need the knowledge which is developed. In reality what happened in this project was a redistribution of power and influence (Lukes, 1974).

Keywords: Learning and knowledge process, Scot, involvement, power creation, trust

1. Introduction

This paper demonstrates the importance of partaking in promoting knowledge creation and sharing in practice. When this happens it causes a change in power structures by giving more responsibility to workers. The case presented in this paper shows how it was necessary to restructure power in order to develop a high degree of employee involvement. This was one of the effects of involving employees in an internal project, which aimed to increase the production efficiency of a corrugated cardboard machine in a paper and cardboard mill. The paper and cardboard mill had been striving to fulfill their strategic vision – ‘We shall inspire and improve’ – in order to enable the company to take a leading market position by 2008 (Company Leaflet for internal distribution). The idea behind this vision was that a strong focus on inspiration would improve the daily work, since this would lead to an increase in worker motivation and job satisfaction. The top management team formulated the company vision, and all employees were informed about the vision in a large barbeque party defined as a kick-off meeting. The company continued to work with their vision for one year after the kick-off meeting, but as time progressed, the momentum in this work was lost. In order to speed up their work with their strategic vision the company started to search for ways to revitalise the process. At the same time a regional research programme was announced which was aimed at increasing the innovation capacity of regional companies within the nutrition- and paper industries by focusing on the inclusion of workers in discussions on work challenges and problems. This programme was called the Value Creation 2010 Research Project (VS2010). The paper and cardboard mill therefore decided to join the VS2010 project.

As a result of their entry into the VS2010 research programme, researchers were invited to the company to discuss how they should work to realise the company’s strategic vision. Consequently, with the aid of the researchers the company defined four internal projects. 1) One project was to focus on how to improve internal communication in the company. 2) Another project was to focus on problems related to sick leave and work towards reducing this. 3) A third project was to focus on improving the work environment and improve work climate. 4) The last project was aimed at increasing production efficiency in general, but should start with increasing the efficiency of, the heart of the company according to the production manager, the company’s corrugated cardboard machine.

2. Reflections over method and data

The empirical data used in this paper is taken from a recent study carried out in a paper and cardboard mill to optimise a corrugated cardboard machine. The process began in November 2005 and is still going on. The epistemological background for this investigation was the SCOT approach in combination with communities of practice (CoP) (Pinch and Bijker, 1989; Latour, 1987; Law, 1992; Wenger, 1998). Our study was carried out using action research (Levin and Klev, 2002). Data were collected in the form of interviews, observations and meetings with the employees and managers working at the corrugated cardboard machine over a period of six months. The first months were used to interview all employees working at the corrugated cardboard machine. The researcher participated in the two daily work shifts at the machine. In this way the researcher developed an overview of the work processes at the corrugated cardboard machine, got to know the employees who worked
with the machine and earned their trust. In addition interviews were conducted with the production manager and the foreman to identify technical challenges and machine production potential. As a result of these activities a report was written which described the current challenges at the corrugated cardboard machine and how these challenges could be met. This report was then presented first to the employees at the machine to get their feedback and to anchor the process at the shop floor level.

### 3. Defining an inclusive learning approach

In accordance with Illeris (1999) we claim that learning is both about experience, practice, skills, knowledge, attitudes, and emotional reactions. Illeris (1999) has tried to tie together some of the different perspectives on learning. He says that learning comprises the results of the learning processes; the cognitive processes taking place within each individual, the social interaction between the individual and his/her material and social surroundings, and finally learning as a synonym for teaching. He narrows down this broad definition by saying that learning basically consists of two related processes, which influence each other. Firstly, the co-play between the individual and its surroundings including interaction with different types of media (e.g. a book, a tape, a computer), and secondly the internal cognitive acquisition- and preparation process leading to something being learned, a learning result (Illeris, 1999, p.15-16). In this paper Illeris’ (1999) definition of learning is used. We define learning as having taken place when a project worker is able to reconstruct, reapply and explain how a particular solution solved a particular problem during the product development project. Thus learning involves some negotiation of meaning, it has been made tacit (been internalised within the individual) (Easterby-Smith et. al. 1999; Polanyi, 1983) and it has been reified (materialised in some way) (Wenger, 1998). This implies that learning occurs through social interaction (Wenger, 1998; Lave and Wenger, 1991). Wenger (1998) later explored in more detail how practice is more than just a learning process; the community of practice is created as a continuous process of negotiation and renegotiation of meaning and this process forms our identity. His idea is that members of a community of practice participate in a shared activity or enterprise. But, he emphasises that participation embraces ‘all kinds of relations, conflictual as well as harmonious, intimate as well as political, competitive as well as cooperative’. It also includes ‘our ability (or inability) to shape the practice’, and furthermore, ‘participation goes beyond direct engagement in specific activities with specific people. It places the negotiation of meaning in the context of our forms of membership in various communities. It is a constituent of our identity’ (Wenger, 1998: 57). Learning is, under these conditions, considered to be a social process, which occurs as a result of the interaction between the people attached to the project. The results of the learning process materialise through identifiable changes in the produced product, or in changes in the processes related to production or both. But an inclusive learning approach involves taking into consideration how power constellations influence decisions, and acknowledging that power and knowledge are inextricably intertwined. Therefore power structures will influence what is known and who knows. Our point of departure for an analysis of power and knowledge is based on the three dimensions of power elaborated by Lukes (1974); power may not only exist in an actual conflict, or when actors constrain themselves from raising certain issues because of different barriers, but also when people’s needs and desires are shaped by agents of power so that the outcome is not in their real interest, Klev (1993). Lukes (1974) identifies three dimensions of power as follows:

- In Lukes’ first dimension of power he sees a person A as exercising power over a person B in a manner that is contrary to B’s interests.
- In Lukes’ second dimension of power, power is something that suppresses decisions and issues where there is an observable conflict of interest, typically when policies are formed based on what should be included and what should not be included.
- In Lukes’ third dimension of power, he claims that control of knowledge is critical to the exercise power.

Lukes’ first dimension of power focuses on behaviour in the decision making process, where there is an observable conflict of interests between the participating actors, in determining who wins and who loses in clearly defined issues. The absence of anyone in the debate, their non – participation – is interpreted as being due to their own apathy, and not due to a process of exclusion from the political process. Knowledge may be understood as the resources that can be mobilised to influence debates and to create new knowledge. However, little attention is paid in this definition of power to those who are not represented in the decision making process, nor to how forms of power affect what types of problems come to be a part of the agenda. Bacharach and Baratz (1970) criticised Lukes’ first dimension of power by arguing that this dimension has a strong behavioural focus, in terms of identified human actors. In Lukes’ (1974) second...
dimension of power, power suppresses decisions and issues when there are observable conflicts of interest, typically when policies are formed based on what should or should not be included. In Lukes’ (1974) third dimension of power he claims that control of knowledge is critical to the exercise of power. Knowledge mechanisms such as information control, secrecy, education, socialisation, and the creation of political beliefs and ideologies become important in creating an understanding of how power operates. This three dimensional framework of power has been a useful way of understanding power and knowledge creation. It focuses on all the various constellations of interest; the first two dimensions concentrate on the view of the interests of the individual. In this paper we are interested in showing how power manifests itself as a division between the management’s overall vision and the work processes taking place at the corrugated cardboard machine. We are particularly concerned with the dynamics between periphery and core, in terms of power differences, as regards different actors or actor groups and their chances of having a say in processes that concern them.

4. Restructuring power at the corrugated cardboard machine

This case study of the corrugated cardboard machine started in mid November 2005. The scope of the project was defined after discussions with the employees working at the cardboard machine where the aim was to increase the efficiency of the machine by 25 percent. The project group consisted of the foreman and the external researcher, who decided to investigate the potential for increasing the efficiency of the cardboard machine by 25 percent. After some preliminary investigations it became obvious that the achievement of this large increase in efficiency was realistic. But, the researcher pointed out at this stage that this would not be a quick fix for the company. Implementation would take time and both the technical staff and the organisation itself would have to cooperate in order to fulfil the efficiency potential of the machine.

4.1 First project meeting

At the first meeting in the paper mill the project group discussed challenges and problems related to a low utilisation of the cardboard machine. It became apparent that some ways to increasing efficiency, mostly of a technical character, were already known. However, the company had so far not been able to implement solutions to increase the efficiency of the cardboard machine. Despite a rather open atmosphere in the meeting nothing was said about the reasons why a systematic examination of the matter had not been formally undertaken. It was decided that the project group would consist of the foreman of the cardboard machine and the external researcher. Furthermore, the project group decided to determine how a 25 percent increase in efficiency at the cardboard machine could be achieved. The project group agreed that a 25 percent increase was very ambitious, but acknowledged that an ambitious aim was needed to attract attention to the project within and outside the company. Hence, the rest of this first meeting was dedicated to discussing how different problems and consecutive solutions effectively could improve performance on the cardboard machine.

4.2 Second project meeting

At the second project meeting, which was arranged by the production manager, all employees working the two daily shifts at the cardboard machine participated. The foreman, the union representative, and the researcher also participated. The purpose of this meeting was to anchor the project with the employees, to ensure their engagement and participation in identifying problems and solutions to problems. The production manager presented the new project and told the employees about the aim to increase efficiency at the cardboard machine by about 25 percent. The employees responded irritably that they had made suggestions for improvements for a long time without being heard. The employees were suspicious about what was happening, and some of them expressed fear that the researcher was the top management's representative and was thus intent on finding ways of reducing the number of operators working at the cardboard machine. The atmosphere was tense with a heated discussion. After a while the union representative, the foreman and the researcher took more active part in the discussion and the atmosphere changed. At the end of the meeting the employees were much more positive towards the project. The production manager, the foreman, the union representative and the researcher felt that it was up to them and in particular the researcher to establish the necessary trust between the project group and the employees working at the cardboard machine if the project were to succeed.

4.3 Collaboration with staff at the cardboard machine

As the project proceeded the collaboration with the staff at the cardboard machine improved, and the necessary trust between the staff and the investigating researcher was established. The employees contributed with positive feedback to
the researcher, based on how they perceived the work challenges related to the cardboard machine and how efficiency could be improved. The researcher spent a lot of time in the company with the employees, and was present at all their shifts. The atmosphere has been open and good. At one point, the employees on the evening shift told the researcher: 'We will manage this project together' (Employee statement). Gradually the focus the staff had on the machine changed from purely technical problems to also include organisational challenges. Communication gradually improved in an atmosphere characterised by strong trust. Consequently, the investigating researcher’s phone number was handed out to all employees at the cardboard machine. In this way the employees were able to report to the researcher whenever an interesting development occurred at the cardboard machine. During the working process only actors working directly at the cardboard machine were involved in the work. However, the project group, even at the board level of the company, continually informed the rest of the organisation in order to avoid any negative reactions from individual actors or actor groups.

### 4.4 Implementation of project results

The project group understood very early in the project that the successful implementation of the potential solutions to improve the efficiency of the cardboard machine by 25% could only take place through a strong anchoring of these solutions with the staff on the machine. Consequently, before the project results were presented to the management, the staff working on the cardboard machine was gathered to approve the potential technical/organisational solutions. This took place in an open discussion in a trusting atmosphere, creating a common understanding of what would be presented to the management. Shortly thereafter, the operators working at the cardboard machine took part in a workshop. There, the project group presented questions challenging them to prioritise a task list to improve the efficiency of the machine, assigning each item to a responsible actor. Surprisingly only organisational elements were mentioned in the discussions. During the workshop the production manager turned up, announcing that the operators had free reigns to start up the improvement work. His only restriction was that the cardboard machine had to be kept running.

### 5. Discussion

The study demonstrates the importance of including workers in discussions concerning their workplace. Through a broad participatory process the workers became aware of how they could contribute, and they developed a sense of ownership in relation to the process (Wenger, 1998). This was achieved by building trust between the researcher and the workers, and creating a safe atmosphere where the workers could speak open and freely. Three important prerequisites that helped to achieve knowledge sharing were established at the beginning of this project. Firstly, only those working with the cardboard machine were included in the process. Secondly, no representatives from management were included in the process. Finally, the researcher was entrusted with the project by the management. In this way the study of this project is an example of a bottom-up process that demonstrates how the fundament for knowledge creation and sharing needs to be anchored at the level where the problems occur and where the solutions to the problems will be implemented. This way of approaching knowledge creation and sharing is based on who is supposed to know and who needs to know (Webb et. al., 2002). In reality what happened in this project was a redistribution of power and influence (Lukes, 1974).

Power is here understood as defined by Dahl (1969), Bacharach and Baratz (1970) and Lukes (1974), giving us an understanding that power may not only exist in an actual conflict, or when actors constrain themselves from raising certain issues because of different barriers, but also when people's needs and desires are shaped by power agents to make the outcome not to be in their real interest, Klev (1993). In the studied case we saw that already in the first and second project meetings signs of constrains and a display of power. Since, employees working at the cardboard machine were aware of the weaknesses of the machine and how to commence them, but did not feel they were heard since no attempts had been made to increase the efficiency of the machine. Furthermore, the employees saw the introduction of the new project to make the machine more efficient with the use of an external researcher, as an additional power execution. It was only when the employees realised that the invited researcher was not there as a representative from management. This manifested it self most clearly in the second project meeting where the atmosphere changed from tense to more positive. This of course was also a result of assurance from the researcher that he was not the top management's representative aiming for reduction of the number of operators at the machine. In this way through the meetings between the researcher and the personnel working at the cardboard machine, trust between the parties was established. We see this as a fundamental, for being able to restructure power. How can a practice develop unless there is a minimum of trustworthiness present in the
relationships constituting that practice? Trust must be considered in a discussion of what element make the social practice between superiors and subordinates happen. According to Karen Jones (1996) trust consists of two elements, 1) A cognitive and 2) An affective. She sees the first element, cognition, as based upon understanding the conditions that makes us trust in the other. This is based upon “optimism about the goodwill and competence of another” (Jones, 1996: 7). The affective element of trust is based upon how emotions “are distinctive ways of seeing a situation” (Jones, 1996: 11). Therefore the affective element influences “one’s willingness to rely on the other seems reasonable” (Jones, 1996: 11). Therefore our interpretation is that to develop a new practice where responsibility and decisional power is moved further down in the organisation, need consider both cognitive and affective aspects.

In line with Bertalanaffy (1998) a system is a structured assembly of components and sub-systems, which interact through interfaces. The elements and their interactions constitute a total system. Organisations are open systems and interact with their environment. They exhibit the character of steady state, wherein a dynamic interaction of systems elements adjust to changes in the environment. In the socio – technical systems perspective one tries to understand problems within an organisation as matters deriving from the relations between the social and the technical sub-systems (Trist and Bamfort, 1951). The organisation is viewed as a system. The social system is humans in the organisation and the relations between them. Levin, Fossen and Gjersvik (1994) claim that this first of all has something to do with the individual's needs and wishes related to his of hers working conditions, and secondly with inter-human relations as, safety, support, involvement, status, power and social networks. As Susman (1983) argues, the socio-technical system design is a search for the best solution, involving the same time conflicting requirements of the technical and social systems. This often means that one has to compromise with the requirements of a perfect technology, in order to get a well – functioning social system. It may be necessary to make other technical choices in order to achieve a joint optimisation of the overall system. From this, a technological innovation will take place in the interplay between humans and machines, in the search for a joint optimisation.

Emery and Emery (1974) claim that socio-technical design concept serve as a reference when analysing parts of a whole, where the whole is represented by the industrial production of an enterprise. This context requires a selection to be made regarding how to use the technology, independent of its complexity.

A formulation of socio-technical design is given by Elden et al (1986): ‘A socio-technical design implies that the human is regarded as a social individual with necessary and important relations to fellow workers, superiors and subordinates. The human being is part of a larger community. He or she has capabilities of both thinking and of carrying out manual tasks. At the same time the individual can develop itself through learning based on new experiences. The technology has to be designed in such a way that is useful when utilised by human beings’. An important prerequisite for the acceptance of the researcher's investigation of the cardboard machine amongst the employees was the establishment of trust but also the fact that the investigating researcher had substantial knowledge about paper and cardboard production. The researcher had both a university degree within the field and long practical experience from the paper and packaging industry. Furthermore, by using an action research approach the establishment of the weaknesses and corresponding improvements of the machine, there was a dialogue with the employees working at them machine. Through this dialogue the employees were given the opportunity to demonstrate their own knowledge, and being listened to. In short they were given influence, which led to specific changes in the machine. Hence, their suggestions were for the first time actually made real.

For an engaged researcher phronesis will be the intellectual activity related to participation in a practical activity aimed at clarifying problems, risks and possibilities. To be able to conduct a successful action research process the researcher need a personal disposition that signals humbleness, reflection and authority to the environment. In this way it is possible to achieve ‘local interaction, negotiation and talk’ (Engstrom, 1998; 2-3). As can be read from the case with the cardboard machine, this local interaction occurred and as the project and its result manifested itself the employees saw themselves on the same side as the researcher “We shall manage this together”. Consequently, partaking promoted knowledge sharing. Consequently, a researcher depends on a close engagement to the studied environment and needs to understand how employees define what is meaningful for them. To accomplish this, the researcher needs both substance knowledge and process knowledge to arrive at different stages in the action research project. But, it is the practical abilities and personal traits of the researcher as a facilitator
that lay the foundation for the action research process, and will in the long run be senior to any substance knowledge. Understanding how these factors influence the research process, will equip both researchers and those being researched, with a more thorough understanding of how integrity and involvement may intervene, without either of them suffering during the research process.

Gaventa and Cornwall (2001) claim that it is fundamental for understanding, power and how this influence decisions, to acknowledge that power and knowledge are inextricably intertwined. Therefore power influence what will be known and who will know. In line with Dahl (1969) to exhibit power over another person means to administer a pressure forming the other's behaviour. According to Gaventa and Cornwall (2001) change processes can challenge deep-rooted use of power. When we are conceptualisation Action Research (AR) as social processes Levin (2002) claims that we have to deal with the Social Construction of Technology (SCOT) of Bijker (1987), to identify that construction of new technology depends on the involved social actors. Taking this position further, our attention is directed to the Actor Network Theory, ANT (Latour 1987; Callon and Law 1982; Law 1992). The basic idea in ANT is to study how actors construct their network to promote their own interests. The power play in this construction process and the results can only be understood in terms of which actors have what kind of power, and what type of resources are available for creating the change. In line with the ANT thinking, actors enrol in the social processes, where interests and power are played out to influence what the result of the change process should be. To understand the implications of power it is necessary to define what we mean with power in this paper. In Lukes’ (1974) first dimension of power, focus is on behaviour in the decision making process, where it is an observable conflicts of interests between participation actors, to determine who wins and who loosens in clearly defined issues. The absence of anyone in the debate, their non – participation is interpreted as their own apathy, not as a process of exclusion of the political process. Knowledge may be understood as resources to be mobilised to influence debates and to create new knowledge. Bacharach and Baratz (1962, 1963) criticised Lukes’ first dimension of power by arguing that this dimension has a strong behavioural focus, in terms of identified human actors. At the cardboard machine there was an observable conflict of interest between the participating actors, given that historically problems related to the machine had previously been raised, but been ignored. This created an atmosphere of suspicion and indifference undermining attempts to distribute responsibility and stimulate knowledge sharing. Additionally three requirements supported the partaking process. Firstly, only those working with the cardboard machine were included in the process. Secondly, no representatives from management were included in the processes at the corrugated cardboard machine. Finally, it was the research first had to earn the management trust in order to proceed with the project, and this was achieved in part by his technical background giving him authority and secondly by continuously informs management about project progression.

In Lukes' (1974) second dimension of power, power is something that suppresses decisions and an issue, which there is an observable conflict of interest, typically when policies are formed, based on what should be included and what should not be included. It was apparent during the first two project meetings, that there was an observable conflict of interest between the employees at the cardboard machine and the project manager. Only after the union representative, foreman and the researcher started to engage in the whereabouts of the cardboard machine by emphasising collaboration with the employees, did conflicts of interest start to dissolve. In Lukes’ (1974) third dimension of power he claims that control of knowledge is critical to the exercise power. Knowledge mechanisms as information control, secrecy, education, socialisation, and the creation of political beliefs and ideologies become important to create an understanding of how the power operates. At the cardboard machine the control of information was obvious since there was a clear top-down control of the activities and influences on the work at the machine. Hence, the employees’ attitude were hostile, since they had previously had not been heard. A change in this attitude was accomplished as a result of gradually changing the information flow to a bottom-up flow.

The implications of these perspectives on power are that the engaged researcher needs to understand and deal with the display of power between actors, their different interests, decisions and results. It is necessary to understand, how power influences the situation in which the action research process takes place. Being able to identify and knowing how to even out the power balance are therefore seen as crucial for the role of the researcher, to induce social change. Alvesson (2002) claim that ‘even if power is not solely negative, the concept draws attention to how someone is being subordinated and shaped in accordance with a particular regular force, giving priority to certain interest and neglecting
other’ (pp. 122). Our research support this claim by focusing on the division that power introduces between what we define as the periphery and core in the studied organisations. In all learning processes there will be partakers who have a personal interest in participating, and these persons have the power to decide what the content of the learning process should be, and thus influences what is being learned. This is what we can find it the actor-network-theory (ANT) (Latour, 1987; Callon and Law, 1982). Vital in the ANT is that actors construct networks to further specific viewpoints, and where the essence is the power play during construction of the innovation process. This result becomes a documentation of what actors had access to what resources during the innovation process (Levin, 2002). It is possible to reverse a negative balance between power, influence and knowledge distribution if employees are included in decision processes. Furthermore, inclusion needs to be followed by action thus there needs to be a direct relationship between solutions to problems and their implementation. Only through implementation is it possible to foster a positive atmosphere where the periphery feels they are included and can actually see the effects of their problem solving efforts. In this way what is achieved at the cardboard machine, as interpreted by the employees, are the power of example. This will pave the way for a new regime of power, where knowledge and learning processes adds to the power of those how experience the problems on a daily basis.

6. Conclusions

This paper has proven how the success of knowledge creation and sharing in an organisation depend on addressing concrete problems and involving those facing the problems in their solution. The project group analysed the possible causes of low capacity at the cardboard machine, focusing on technical elements. During this investigation it became apparent that the organisation knew about many of these technical challenges, but few changes had been implemented to improve the machine. Thus, the low efficiency of the cardboard machine could not be blamed solely on technical problems; part of the explanation could be found in the organisation itself, in particular the lack of communication between management and employees. This is consistent with the socio-technical thinking necessary for bridging the gap between technology and the organisation. According to Levin et. al. (1994; 2002) this is called a socio-technical approach. Susman (1983) claims that socio-technical design involves a search for the best solution, which often leads to opposing demands from the technical and social systems. This means that relations between the technical and social systems must be optimal in order to arrive at good solutions involving compromises from both parties (Trist and Bamforth, 1951). This also applies to the case study of the cardboard machine and this relationship is illustrated in Figure 1.

![Figure 1: Illustration of the Socio-Technical Relation](image)

One of the consequences of the corrugated cardboard project, a technological transfer project, was that it forced through necessary organisational changes in the company. Using a technological project, it was possible to restructure power, start a learning process and convince the management that this was a fruitful approach that eventually would lead to an increase in efficiency at the corrugated cardboard machine. It is worth noting that these processes rely heavily on trust, not only at the shop floor level, but also on trust from the managerial level. Thus this study demonstrates the importance of anchoring the fundament for knowledge creation and sharing at the organisation level where problems occur and where solutions need to be implemented. Consequently the approach used in this research is a bottom-up process. This way of approaching knowledge creation and sharing, concentrates on those who need the knowledge and who faces the daily problems.

References


Elden, M. et al. (1986) Mennesker i arbeid (Humans at Work), Universitetsforlaget, Oslo.


Educational Ontology and Knowledge Testing

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Abstract: The Bologna declaration aims at providing solutions for the problems and challenges of European Higher Education. One of its main goals is the introduction of a common framework of transparent and comparable degrees that ensures the recognition of knowledge and qualifications of citizens all across the European Union. This paper will discuss an ontology-based model that supports the creation of transparent curricula content (Educational Ontology) and the promotion of reliable knowledge testing (Adaptive Knowledge Testing System). Beside the description of the evolution of the Educational Ontology, which has been developed within a research project by the Department of Information Systems, role of the ontology in managing, mapping and sharing the knowledge of curricula will be discussed in details as well. The Educational Ontology addresses establishing relation between the requirements of labour markets and the content of curricula through competencies that can be acquired during a given training program. Another critical aspect of this research concerns the measuring of knowledge. The second part of the paper will focus on the possibilities of adaptive knowledge testing and describes how a suitably elaborated ontology model can support adaptive testing of students by enabling a detailed exploration of missing knowledge and knowledge areas.

Keywords: knowledge representation, ontology, adaptive testing

1. Introduction

The Sorbonne Joint Declaration of 25th of May 1998 was the first one, which proposed the creation of the European area of higher education as a key way to promote citizen’s mobility and employability and Continents overall development. The Bologna declaration (1999) acknowledged the importance of these statements and initiated remarkable reforms of European Higher Education, also recognising its crucial role in social, economic and human growth of the Continent. Beside the creation of the European Higher Education Area, the Bologna process aims at:

- Adapting easily readable and comparable degrees,
- Adapting a system essentially based on two main cycles,
- Establishing a system of credits,
- Promoting mobility,
- Promoting European co-operation in quality assurance and
- Promoting the necessary European dimensions in higher education.

The goal of introducing a common framework of transparent and comparable degrees that ensures the recognition of knowledge and qualifications of citizens all across the European Union was highlighted again in the Berlin Communiqué (2003), which added a third cycle (doctoral cycle) to the Bologna Process.

"Ministers encourage the member States to elaborate a framework of comparable and compatible qualifications for their higher education systems, which should seek to describe qualifications in terms of workload, level, learning outcomes, competences and profile."

The members of the Joint Quality Initiative aimed at developing descriptors for Bachelor’s and Master’s that might be shared within Europe and be available for a variety of purposes, depending on particular national, regional or institutional contexts and requirements. This was one of the first initiatives, which provided support for facilitating the comparison of degrees. The launch of these Dublin descriptors also indicates that competences should have a key role in providing transparent and comparable curricula and qualifications. Beside the description of the evolution of the Educational Ontology, its role in overcoming still existing obstacles of access between cycles and its role in measuring knowledge in a reliable and objective way will be also discussed in the paper. The European Higher Education Area is structured around three cycles where each level has the function of preparing the student for the labour market, for further competence building and for active citizenship. Accordingly, the demonstrated research aims at providing ontological relation between competencies acquired during a training program and labour market requirements. Preparing the student for the labour market and for further competence building also requires setting up ontological relation between the content of curricula and competences. A further goal of this research is to provide support for adaptive knowledge testing with the help of the Educational Ontology. The curricula of Business Informatics will be described analysed in this research.
2. Contribution

One major goal of the research is to establish ontological relation between the requirements of labour markets and the content of curricula with the help of competencies that can be acquired during the Business Informatics training program. Accordingly, it must be thoroughly investigated whether it is possible to work out an ontology model that is suitable for modelling the concepts and semantic relations of all the Business Informatics curricula, even despite the fact that these subjects are subsequently different in scope and nature as well. Further objective of the research is to support the adaptive assessment of knowledge acquired by the students, especially in connection with the efficiency of education and detailed exploration of missing knowledge areas. To verify the hypothesis the principles and methods of adaptive examination and solutions for computer-aided testing must be acquainted and analysed and procedure planned to be adopted must be selected too. This requires the determination of the knowledge area to be tested and the expected level of knowledge as well.

The goal of the new adaptive testing system is not only the improvement of efficiency and fastness and the quick announcement of exam results, but to point out those knowledge areas or curriculum parts, where the individual has shortcomings. For proving the hypothesis, the role of Educational Ontology in determining missing knowledge areas and the necessity of classification and structuring of the knowledge base of training must be examined too. Furthermore it must be explained how the ontology can support the construction and operation of the adaptive testing system and the most appropriate solution for connecting the two system must be revealed as well. Keeping these goals in view the following research questions should be analysed and related activities must be accomplished during the course of research:

- How the knowledge of Business Informatics curricula should be structured and modelled?
  Specification of Business Informatics curricula and competences that can be acquired during the training program and this way must be represented in the ontology

- How the model of the Educational Ontology should be build up?
  Clarification of the concepts of ontology and its components as the tool of knowledge representation.
  Analysis of the utilisation domains and application possibilities of ontologies.

3. Educational ontology

A challenge of modelling is that the scope of curricula taught in Business Informatics training program is wide and curricula are substantively different in nature. For example the modelling of Knowledge Management curriculum may require different approach, then the modelling of Mathematics. Moreover it should be also taken into consideration that the structure and content of a subject may be at least partly different in different institutions. Accordingly in the first cycle of development the research has concentrated on defining the major classes of the ontology, pointing out the role of competences and concentrating on facilitating comparability.

3.1 Initial ontology model

Competences have played central role in the first version of the ontology model to enable grabbing the common features of different curricula. In higher education, accreditation documents must provide a list of goals of the given training program in the form of competencies. This means that competencies and curricula of the training program must be aligned. Accordingly classes of “Competence module” and “Curricula module” were formed and connected to each other with the “belongs to” relation in the ontology to enable tracing of knowledge and competences possessed by students. Modules represent standardised units (of curricula or competences) that facilitate the comparison of curricula and competences of different institutions and universities. Competencies also have to be aligned with labour market requirements. In this
case groups of tasks that are necessary to successfully carry out work duties and the required competencies must be aligned, so in the ontology the class of “Group of tasks” is connected to the class of “Competence Module” with the “required by” relation. Curricula are modelled by defining their major parts that we call knowledge areas. The class of “Knowledge Area” is further structured into elements that are the least knowledge elements; assertions that are set up by assertions, elements and logical rules, which are divided into logical operational symbols and inference rules (like IF-THEN, THEN-IF). This part of the conceptual model ensures the comparison of the curricula’s contents and provides a basis of testing system by enabling inferencing. Figure 1 depicts the initial ontology model.

Creation of ontology and its content always has to be based on consensus and its easy use and understanding also has to be ensured. Although the above described model provides a promising approach for structuring the given domain and offers efficient help in comparing knowledge covered by the curricula of different institutions by applying modules, the actual construction of the ontology – especially the modelling of knowledge areas – would expect enormous efforts from the experts of the field, from the teachers. For that very reason the model requires modifications and improvement, and its connection with adaptive testing system should be elaborated as well.

Figure 1: Initial Ontology model

3.2 Improvement of the ontology model

Knowing the amount of work required to produce ontologies even for the simplest concepts, the improvement of the ontology was focused on providing easily definable and applicable classes and precise determination of relations, also keeping the goal of knowledge testing in view. This section gives a description of all ontology classes and the introduced changes too.

3.2.1 Scope of activities

The “Scope of Activities” class contains all of those professions, employments and activities that can be successfully performed with acquisition of those competencies that are provided by the training program.

3.2.2 Group of tasks / competence module

In the first version of the model the “Group of Tasks” and the “Competence Module” class
ensured the connection between the scope of activities and knowledge areas acquired during the training. Taking into account the goals of the research and the above-mentioned problems these classes are too general. Instead the following elements were introduced in the model:

- "Task" and "Competence" class
- One scope of activities should be in direct "specified by" – "served by" relation with tasks. This way the given scope of activities prescribes a number of concrete tasks and not a group of tasks.
- Each task should be in "requires" relation with competences.

This way not sets (competence modules, group of tasks), but their elements are connected to each other. This solution also enables a facilitated execution of comparison and declaration of differences between competence modules. At the same time the "Group of Tasks" and the "Competence Module" classes should be kept in the model to enable the definition of the sets of tasks and competences as well and ensure further ways of comparison.

3.2.3 Curriculum module

In the first model “Knowledge Area” and the “Competence Module” has been connected through the “Curriculum Module". In the modified model knowledge areas and competences are connected indirectly with the “requires” and “ensures” connection. (A competence requires the knowledge of a given knowledge area and the good command of a knowledge area ensures the existence of certain competence(s).) The class of “Knowledge Area” is an intersection of the ontology, where the model can be divided into two parts:

- One part of the model describes the relation of knowledge areas and labour market requirements with the help of the above-described elements.
- The other part will depict the internal structure of knowledge areas.

Figure 2 depicts the first part of the model in the following way:
- Rectangles sign classes.
- Arrows depict 0-N relations (so a competence may have several prerequisites, scope of activities may specify more tasks at the same time and it is also possible that a competence those not have any prerequisites).

![Figure 2: Ontological relation of Knowledge Areas and Scope of Activities](image_url)

3.2.4 Knowledge areas

In the former model knowledge areas have been divided into basic concepts and sub-knowledge-areas, but the internal structure of knowledge areas must be refined to allow of effective ontology construction and the efficient functioning of the adaptive knowledge testing system.

“Knowledge Area” is the superclass of the ontology, representing major parts of a given curriculum. Each "Knowledge Area" may have several "Sub-Knowledge-Areas". Not only the internal relations, but relations connecting different knowledge areas are also important regarding knowledge testing. The “is part of” relation is still an important element of the model.
connecting knowledge areas and sub-knowledge-areas in the model. At the same time a new relation has to be introduced, namely the “requires knowledge of” relation. This relation will have an essential role in supporting adaptive testing. If in the course of testing it is revealed that the student has severe deficiencies on a given knowledge area, then it is possible to put questions on those areas that must be learnt in advance.

For the sake of testing all of those elements of knowledge areas are also listed in the ontology about which questions could be put during testing. These objects are called “Knowledge Elements” and they have the following major types: “Basic concepts”, “Theorems” and “Examples”. The internal structure of knowledge elements is not examined in details. For example we do not conduct precise analysis on how different basic concepts are based on each other. Knowledge elements are only examined from that point of providing support for the adaptive testing. The introduction of this method has practical reasons, since an overall, comprehensive analysis of the internal structure of knowledge elements is enormous and an almost unaccomplishable task.

Compared to the thorough analyses of these elements, the simple listing of elements is relatively easy work. Moreover if test questions are connected to each knowledge element, then it also enables the adequate functioning of the testing system. Although, in order to precisely define the internal structure of knowledge areas relations that represent the connection between different knowledge elements also must be described. The role of “premise” and “conclusion” relations is to determine which basic concepts are used to declare a given theorem and which basic concepts are formed by the declaration of a theorem. The “refers to” relation determines connection between knowledge elements of the ontology. Namely, a basic concept or theorem may refer to another basic concept or theorem and an example may refer to any of the other two knowledge elements. The goal of introducing this relation is to enable making connection between knowledge elements, where it is indispensable in ensuring understanding and formation of clear ontology structure. Applying the previously described marking system of Figure 2 the internal structure of knowledge areas can be depicted in the following way (Figure 3.):

![Figure 3: Internal structure of Knowledge Areas](image)

### 3.2.5 Testbank

In order to provide adequate support by the educational ontology for the testing system several theoretical foundations and conceptions must be laid down in this model. One pillar of the testing system is the set of test questions. Main characteristics of test questions should be the following:

- A question must be connected to one or more Knowledge Elements or Knowledge Areas. On the other hand a Knowledge Element or Knowledge Area may have more then one-test question. The Educational Ontology structures this way the Testbank.

- All questions should be weighted according to their difficulty.

- Test questions will be provided in the form of multiple-choice questions. So parts of the question must be the following:
  - Question
  - Correct answer
  - False answers

Figure 4 shows the entire and final model of the Educational Ontology, also depicting how test questions connect to the elements of the ontology. (Test questions are connected with dashed lines to the ontology, indicating, that they don’t form a part of the ontology.)
4. Adaptive knowledge testing

Primarily, the ontology aims at capturing and modelling all knowledge, which is part of the curricula of Business Informatics program. Besides, a suitably elaborated ontology model can support the (adaptive) knowledge testing of students by enabling a detailed exploration of missing knowledge and knowledge areas (KA). The ontology model is developed as a part of a research project conducted by the Department of Information Systems at the Corvinus University of Budapest, which aims at introducing an interface, which can develop a customised qualification program, based on the individual’s previous qualifications, completed levels, corporate trainings and practical experiences, in case of entering a certain educational level. Two main groups of input are needed to build up a qualification program. On one hand the individual’s knowledge and abilities must be measured, on the other hand a definition must be given about the prerequisites of the targeted qualification, which depends on the quality assurance and the accreditation system of higher education. After testing the individual’s knowledge, a customised supplementary training program should be allocated. A corresponding adaptive test provides help to the individual, who draws on this service. If the candidate passes the exercises and tests successfully, than the prerequisites for the certain qualification are fulfilled, so the student may enrol to the targeted level. As an additional benefit, some parts of this solution may be used for correcting the deficiencies of a certain curriculum during the qualification, as an ad-hoc support of education. The model itself consists of two main modules: the Test Module, which consists of the Educational Ontology, Testbank; and Adaptive Examination System; and the e-Learning environment, which contains a Learning Management System and a Learning Content Management System. The Educational Ontology plays a key role in setting into operation the Test Module and also has an indirect influence on the functioning of the whole learning environment.

The main principles of adaptive testing also have to be analysed to enable the development of an adequate testing system and its connection with the ontology. The main idea of adaptive testing is that the test should tailor itself to the estimated ability level of test takers and take into account how each test taker has answered previous questions. Accordingly the test taker always...
encounters personally challenging questions in the test. Alfred Binet (1905) worked out the first form of adaptive testing. In his intelligence test he aimed at making a diagnosis of the individual candidate by the following simple strategy: The test items (questions) were ranked according to their difficulty. He would then start testing the candidate with a set of questions targeted at the estimated level of candidate's ability. If the candidate succeeded, Binet continued to give successively harder questions till the candidate frequently failed and vice-versa. With this strategy Binet could easily define or estimate the real ability level of the candidate. Lord's (1971) Flexilevel Testing Procedure, in which he applied adaptive techniques in test evaluation, is also an important contribution to adaptive testing, just like its variants, such as Hening's Step Procedure or Lewis and Sheehan's Testlets. All of these procedures is easy to implement with computers, but Reckase (1974) was the first who worked out a methodology of computer adaptive testing (CAT) (Linacre 2000). The basic principles of computer adaptive testing are provided by Thiessen and Mislevy (1990):

- Test can be taken anytime, no need of group-administered testing.
- There are no identical tests, as every test is tailored to the needs and capabilities of the test-taker.
- Questions are presented on a computer screen.
- After the answer is confirmed there is no chance to change it.
- The examinee is not allowed to skip any of the questions.
- The questioning process is fully and dynamically controlled.

4.1 Supporting knowledge testing

In the previous section it has been already introduced how test questions are connected to the ontology and how the Educational Ontology structures Testbank. In this section possible ways of applying the Educational Ontology in knowledge testing and other implementation questions are discussed. With the help of the developed ontology we can get answers very easily for several administrative questions. On one hand, the applied structure ensures easy access to all of that information (knowledge areas, competences) that is necessary for conducting a specific task. On the other hand, if a candidate provides information about her/his knowledge, the system is able to define and list all of those tasks and activities that the candidate is able to conduct. Moreover, the combination of the above-mentioned two cases is also possible. If the candidate describes what kind of tasks he wants to conduct (what scope of activities is that he/she wants to do) and the knowledge he/she has, then based on the ontology model it can be laid down which competences he/she still has to acquire.

Another important application of the ontology is to provide support for the exploration of missing knowledge areas. Primarily, the goal of examination must be described to be able to define those knowledge areas that are necessary for the fulfilment of those tasks that are related to the defined goals. These knowledge areas must be examined when looking for deficiencies. The tool of exploring missing knowledge is the test. The proposed goal and the ontology determine the scope of test questions in the exam. Based on the distribution of correct and incorrect answers on the structure of the ontology an adequate figure can be drawn about the knowledge and deficiencies of the candidate. In setting up such test the structure of the Educational Ontology and semantic relations among knowledge elements provide efficient support.

4.1.1 Testing procedure

After the elaboration of the ontology the next step of the research was to work out a testing procedure, an algorithm that will define the order of questions and enables adaptively. The testing procedure starts the examination at the top of the hierarchy of knowledge areas. It gives the student a testlet having so many questions that cover the given knowledge area. If he answers properly – vis. the sum of points received for his answers reach a given level (for example 60%) – we put questions about all the basic concepts and all the sub-knowledge-area of this knowledge area. If the student does not know the answer for the question related to the basic concept the knowing of the knowledge area will be refused. If he answers badly for some sub-knowledge-area the knowledge area and these sub-areas will be not accepted, but if there are some sub-knowledge-area whose questions were answered properly then the testing engine interrogate them again in the previous manner. Namely the testing engine executes a depth first graph search algorithm in such manner that it closes a branch if the student does not know the given knowledge area or its sub-knowledge-areas (all of them) or a given basic concept.

4.1.2 Questions of implementation

Beside the challenge of developing an ontology model that suits all of the requirements arisen by different curricula, selecting the most appropriate ontology language for formalisation is also a critical aspect of the project. The applied ontology language will also determine the usefulness of the
reasoning engine. The higher the expressiveness of the ontology language is, the lower will be the number of questions that can be answered with the help of the reasoning engine (Corcho, Gómez-Pérez 2000), (Gómez-Pérez, Corcho 2002). Finally selecting a proper ontology-engineering tool, which is capable of handling even several thousands of concepts and applying the required ontology language is also a critical decision of the project. For the machine readable representation of all the classes and relations defined in the Educational Ontology the application of OWL DL ontology language is proved to be an adequate solution. From the wide range of existing ontology editing tools we have chosen Protégé2000 that is the most known and widely applied open-source ontology editor capable of handling OWL ontologies. The Testbank has also been built into the Protégé system and finally a Java software was developed that runs the program of adaptive testing.

5. Conclusions
In the current phase of the research curricula of the Business Informatics program are modelled and uploaded to the Educational Ontology and several students have already tested the adaptive knowledge testing system as well. The primary goal of the adaptive knowledge testing system, which is supported by the Educational Ontology, is to explore missing knowledge areas. At the same with the help of the ontology the accumulation of acquired competences and knowledge can also be determined. This way employers will be able to reinforce the position of student, trainee and employee when these persons want to enter in the labour market, want to look for another job or continue their study. In the future by improving the ontology and extending its content a common understanding of levels of competences based on learning outcomes can be established and this way educational systems can compare their positions. Qualifications of “higher” level embrace the competences of “lower” levels. This suggests that there is a hierarchy between competences. Improving the model and applying further relations can also model this hierarchy in the Educational Ontology.

References