Creation of Innovation by Knowledge Management – A case study of a learning software organisation

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Abstract: Within the paradigm of the "knowledge driven economy" the role of knowledge in fostering innovative products, services and processes has been increasingly realised by academics and practitioners in recent years. Although considerable effort has been undertaken to point out the importance of knowledge within innovation systems and to investigate patterns of knowledge creation and transformation the measurement of its impact on innovation is still not based on sufficient empirical basis.
The study CIKM, "Creation of Innovation through Knowledge Management", sponsored by the European Commission through the IST Project No. IST-2001-34442, investigates the impact of knowledge management on innovation performance at company level. The project conducts empirical research across four European countries and four industry sectors. One of the four industrial sectors investigated is the software sector; seen as a dynamic, innovative sector with a requirement for high speed of knowledge creation and diffusion.

1 Introduction

In recent years a number of studies [EC00], [Sk00], [OE99] have investigated the role of knowledge in (national/European) innovation systems and their impact on organisational and regional competitiveness. Especially in fast growing sectors like the software industry, with a high speed of technological development, knowledge and its appropriate management is a decisive factor in global competition. Knowledge turns out to be the dominating resource for the production of added value. Furthermore, the increased complexity of knowledge requirements, as many products and/or services need a knowledge base from more than one discipline, make the measurement of the impact on innovation very difficult. This short summary of changes in the role of knowledge and its use and diffusion illustrate a paradigm shift which is referred to as a shift to a "knowledge driven economy", as the effective and efficient generation and use of knowledge as well as the transfer of knowledge into successful innovation is seen as the competitive advantage of organisations today.
Several studies show a significant linkage between the generation, use and diffusion of knowledge and the ability of companies to successfully compete in highly innovative industries [Sk00], [EC00], [OE99]. Therefore CIKM aims at linking knowledge management with innovation management in a holistic view and examining the impact knowledge management has on the innovation performance of companies in order to help to understand and improve their innovative effectiveness.

2 Interrelations between knowledge management and innovation

2.1 Knowledge Management – Definitions and Background

"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 or repositories but also in organisational routines, processes, practices and norms." [DP97]

This definition highlights the potential paradoxes. Knowledge can be fluid or structured, and can move from one to the other, knowledge can be tacit yet needs to be made explicit, knowledge is seen as an asset – yet it is in individual minds. Tacit knowledge is implicitly grasped and cannot be easily articulated. It is difficult to pass on, the use of stories and metaphors may help transference of knowledge

Having this definition and characteristics of "knowledge" in mind, it is also necessary to define "knowledge management" (KM). Literature bears several definitions for KM, which range from more general and fuzzy definitions over rather internally focused ones to those who include the link to innovation creation. In this context Beckmann [Bta97] sees KM as the formalisation of and access to experience knowledge and expertise that create new capabilities, enables superior performance, encourages innovation and enhances customer value. Different approaches in literature aim to get further understanding of KM by using particular perspectives. These are for example the "process approach" or "human relation/organizational approach", which basically conclude that KM should rather rely on many disciplines and not only e.g. on IT and architectural design. In the context of this paper, the model of conversion of knowledge from Nonaka and Takeuchi [NT95] is helpful to understand more about tacit knowledge creation.

2.2 Innovation – Definitions and Background

Innovation is crucial to the success and survival of companies. It is seen as the single most important building block of competitive advantage. "Successful innovation of products or processes [or services] gives a company something unique that its competitors lack." [HJ98]. This is supported by the findings of the Innobarometer made by the European Commission which states that the main reason for innovation activity is to build up the market share and ensure/increase the profitability of the company in order to protect the future independence of the company. However, innovation is often confused with invention – but the latter is only the first step in a long process of bringing a good idea to widespread and effective use. Tidd and Ahuja [TBP97] [AL01] concur with this, stating that "innovation refers to the commercialising of the invention".

Different types of innovation can be delivered, for example it may be a product-, process- or organizational innovation. The scope of innovation can range in scope from radical/disruptive to incremental/evolutionary innovation) [Tp98], [Ccm97]. Depending on the type, complexity and scope, the role of knowledge in the innovation process is crucial. For more radical innovations, new knowledge needs to be created or applied from very different contexts. For incremental innovations, it is more important to re-use existing knowledge in many aspects of the product's design, manufacture and delivery.

Various mechanisms exist to deliberately feed new knowledge into the organisation, for example communities of practice, the reading of technical journals, conversations with customers and suppliers etc. Literature supports the view that you need new, external knowledge to generate innovation [MM69]. March and Simon [MS58], commenting at an organisational level, suggested that borrowing rather than invention was fueling innovation. Additionally information useful to innovation can come from other internal units in the organisation. So in different organisations particular sets of practices for feeding and creating knowledge and sources from which it is drawn may be found.

3 Scale & Scope of CIKM

In order to examine the impact that knowledge management has on the innovation performance of companies with a holistic understanding, CIKM tries to incorporate the different approaches to knowledge management (Strategic, HR, Process, Technology) and perspectives of innovation performance (financial oriented, customer oriented, process oriented, innovation oriented).
The 18-month project started with a literature review, expert interviews and industry cases for exploration and is conducting a large survey in four European countries with companies from the sectors of I.T., Telecommunications, Finance and Mechanical engineering. The survey is complemented by focus group sessions and case studies of organisations chosen on the basis of the survey results. The project focuses on the early phases of incremental or radical product/service innovations that have been successfully commercialised.

4 Key findings from exploration – case study of a learning software organisation

Having completed the first phase of case studies the project has now entered the broad empirical study phase. The full project report will be available by the end of 2003. This article aims at highlighting first insights from a case study of a knowledge management software organisation; exploring the role of knowledge and its management in the innovation process.

4.1 Main market dynamic and innovativeness

Innovation in the case study software company is to a large extent customer-driven and tailored. However standardisation plays a central role in the development of new products to be able to realise and optimise scale-effects in the sale of the software. The impact of this means that different components of knowledge are seen as necessary to create economically successful products. On the one hand the organisation needs knowledge about future developments from the standardisation committees which will be very important for directing the future software platforms. On the other hand they need very customer specific knowledge about the use, and handling of knowledge in the context of the specific industry and in the context of the specific customer to develop custom-tailored solutions. The case study company has three units that are engaged in this innovation process. These are the sales unit, the research unit (development of new applications) and the professional services unit (who implement the applications at the customer site).

4.2 Knowledge management practices

Within the case study company different knowledge is required at different phases of the innovation process. Sales activities and the identification of the customer demands by the professional services unit require tacit knowledge. However when the requirement for definition and specification of the functional solution is needed codified knowledge of project reports are used, these include tasks, problems and solutions of former projects.

The identification of the external knowledge starts with sales, who are in close contact with the industries and the customers. Generally speaking, the more dynamic a particular sales marketplace, the less is documented in minutes and vice versa, the less dynamic a marketplace, the more likely information and know-how is codified.

Identification of opportunities is also an inherent part of the research unit's work, who contribute this knowledge input to board meetings as well as feeding the knowledge into the different internal and virtual new product development communities. These communities are encouraged as an organisational form of the development work; this in combination with the slack time given to the employees, build the framework in which all participants can share their enthusiasm regarding the creative development of new applications. In the same way the communities of practice support the use of the tacit knowledge that is highly embodied in this group of specialists. "Successful" staffing and HR are seen as critical success factors of this framework/model necessary to reveal the individuals' potential and their tacit knowledge.

The knowledge developed by the sales unit is saved and spread over a database. It includes all contact and interaction data that are necessary for conclusions about success and failing factors in the sales-customer-relationship. All staff members have unrestricted access to the database as the employees ultimately are the ones who can judge about the depth of information they need. The professional services unit increasingly uses project reports for the dissemination of knowledge which has been generated by former projects. Quarterly personal meetings between the staff are carried out, together with the development of a FAQ database for the sharing of tacit knowledge.

5 Outlook

In the context of this paper, the initial exploratory case studies supported and underpinned the following hypothesis: "The more dynamic the environment the less knowledge is documented in databases, therefore the more important the role of tacit knowledge is." A further hypothesis has been developed having seen within the exploratory case studies different KM practices adopted in the early phases of the innovation process. Categorising these phases as being the "detection of market demands/future trends" and "generation and transfer of ideas", these two stages seem to be supported by different sets of KM practices: For the "detection of market demands" IT-centred KM practices seem more important whereas for "idea generation and transfer" organisational KM practices are more important. Organisational practices may include job rotation, cross functional project teams, discussion forums, idea workshops, lesson learned sessions or internal project presentations which are seen as supporting the sharing of experiences (socialisation, articulating and internalising tacit knowledge). An early indication for future study can be seen at this time point in the project, this would be the requirement for research into the field of Human Resources, staffing issues,

levels, knowledge workers etc. The rationale being that if innovation comes down to the importance of tacit knowledge and therefore to the individuals that are creating and disseminating the knowledge, then the question should be raised of what kind of personality type a tacit knowledge worker might have and how these could be identified, tested and developed.

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