

# **NEW PRODUCT DEVELOPMENT AND MANAGEMENT OF KNOWLEDGE IN PORTUGUESE HIGHER EDUCATION**

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## **ABSTRACT**

This chapter uses key concepts in the knowledge management literature to analyse the procedures and practices used by a project management team to identify, create, store, disseminate, and apply knowledge management systems for successful project completion. This project allowed a long established participant to develop on-line delivery capabilities in Portuguese higher education.

The case study suggests that, throughout the project, implementing effective knowledge management practices required that participants widened and deepened the required knowledge base in five distinct areas: project management, the team, product/solution, the companies involved in the project, and the interaction with the external environment. The analysis also suggests as key requirements for effective knowledge management those relating to trust between the parties, key knowledge workers, and heavy dependence on new information and communication technologies.

## **KEYWORDS**

Knowledge management, e-Business, e-Learning, project management, new product development

## INTRODUCTION

Recent focus on knowledge management (KM) has been stimulated by the idea that companies must increase their ability to learn if they are to operate successfully in an environment characterised by rapid technological and societal change, globalisation, and increased competition (Senge, 1990). However, despite the attractiveness of the concept, there is no consensus on how knowledge can be efficiently managed. This is not surprising since KM is a pervasive and difficult concept to observe in organisations.

The advent of wide spread and easily accessible networks of personal computers (i.e. Internet) during the 1990s promised new ways to deliver teaching content for higher education. However, the advent of new technologies challenged higher education establishments to develop new learning environments, a milieu conducive to asynchronous transfer of knowledge and skills. Although much has been written about the potential of the Internet for teaching and learning, there has been little explanation of what people actually *do* on-line (Salmon, 2001, p. 34). Moreover, little has been said on the practical value of diagnosing the success or failure of implementing information and telecommunications technologies (ICT) in industry (Fincham, 2001) and even less in higher education.

The current chapter tries to overcome shortcomings associated to the practical observation of KM in organisations by focusing on a specific process. This process looks at the implementation of an e-Learning project in higher education. The research explores KM practices used by the project participants during development of the new business. In this way the chapter offers an interpretation and an understanding of the sequence of events upon which participants in the project team assessed the relative success of the new business development process. The chapter also provides hypothesis building around effective KM practice through reflection and interpretation of a particular setting and events in an organisation.

The chapter proceeds as follows. Next section starts by reviewing the central concepts in the KM literature, further offering an analysis framework to assess the implementation of effective knowledge management practice within an e-Learning scheme (called 'Project NewLearning'). The following section encompasses the method and study design, as well as the context of the case material. Next the case material is assessed in light of the notions and main ideas behind the current thinking in KM. The final section puts forward a summary and tentative conclusions.

## **KNOWLEDGE MANAGEMENT AND SYSTEM DEVELOPMENT**

### ***Knowledge: A Strategic Imperative?***

In recent years, the organisation and management literature has emphasised the prominent role of knowledge in the organisation. This prominence has led to reassessing previous contributions to the broad areas of management and economics as well as resulting in the development of some new streams of research. Of these new topic areas the knowledge-based view of the firm is one of the most popular (e.g. Brown and Duguid, 1991). This perspective builds on the so-called resource-based view of the firm (e.g. Penrose, 1959, or Polyani, 1966), learning in organisations (e.g. Argyris and Schön, 1978), and organisational capabilities and competencies (Prahalad and Hamel, 1990). At the same time, the emergence of the so-called 'New Economy' has contributed to a renewed interest of both academics and practitioners on the topic of managing knowledge. The main organisational features characterising this 'New Economy' seems to be, on one hand, the reliance and dependence on massive information transfers and consequent intensive use of information and communication technologies (ICT), and, on the other hand, the increased use of collaborative networks which cross department, functional, organisational, physical and national frontiers. It can be argued that all organisations structures, from Weber's definitions of bureaucracy onwards, qualify as a form of technology (Galbraith, 1973; Scott, 1975). However, ICT applications and the impact of ICT on organisational change is an area worthy of examination for three reasons. Firstly ICT applications are one of the most important drivers of the current mode of globalisation. Secondly information systems researchers are in many cases themselves designers. As a result much of the research is directed at achieving an outcome in terms of improved practice, rather than simply at the creation of social theory and improved understanding or new knowledge. Thirdly information systems provide a visibility to the processes of failure and its accommodation within organisations, therefore improving the assessment of performance in, and of the organisation. Information systems are among the most socially embedded technical artefacts. This embeddedness has implications for both their design and development and for the perception of their failure.

For the 'New Economy', increased volume of information transfers and more intensive use of ICT applications take place at all levels of economic activity: the macro level of global markets and economic trends, the meso level of interfirm networks and value chains, and the

micro level of the firm. At all these levels, the ability of the firm to manage its knowledge emerges as the only alternative capable of processing such information arrays in a meaningful way. An effective way to disseminate, control and reproduce these information arrays becomes the most important resource to achieve effective competitive advantage (Drucker, 1991).

This perspective on competitive advantage is based on two main assumptions: harnessing 'brainpower' and social networks inside organisations. Firstly, knowledge is conceived as an asset that can be managed, just as the more 'traditional' cash flow emerging from changes in raw materials or number of employees.

The same conception of knowledge as an asset has been replicated in International Accounting Standards, where intangible assets are now considered the unconsumed portion of past expenditure and a right to future economic benefits. This as opposed to previous accounting definitions, which distinguished asset types according to their physical characteristics. Both the knowledge and accounting views would then coincide in that organisations have rights not over the person but over the right to exploit skills.

If knowledge is perceived as an asset that can be managed, then KM should be seen as the set of activities and practices used by organisations to harness 'brainpower', that is, skills, processes, organisational capabilities and other internal intangible resources that articulate managers' strategic intent (Davenport and Prusak, 1998). In other words, organisations invest and develop in KM as a response to the need of taking advantage of positive cash flows emerging from recently implemented systems and practices in areas such as innovation at the product, services, and organisation levels.

Secondly, knowledge cannot be dissociated from the particular context in which is generated and used. Different contexts have distinct knowledge requirements and as a result, distinct forms of managing knowledge are needed in order to implement the organisation's strategic intent (Demarest, 1997).

Knowledge can only be created and shared within the particularities of a social system, in which the individual is its core element. In such a social network, knowledge is transferred from the individual to the organisation and back to the individual through the collaboration dynamics between all parties involved in a particular business process: value can thus be created by individual action but also at the group level. Without this assumption there is only information management as the focus will be on new information and communication technologies. There will be KM when information is organised and facts turned into data, at

the same time data will have been linked with other data and converted into useful context for decision taking.

In short, the ability of an organisation to manage its knowledge has been identified as a potential source of competitive advantage provided there is some sort of way for organisations to manage that knowledge. This same view suggests that ICT applications could play an important role in articulating KM practice. However, in spite the concept of knowledge being quite attractive, as the next section will show, there is no consensus on how knowledge can be effectively managed.

### ***Concepts in Knowledge Management***

Given the widespread interest on knowledge and KM, it is not surprising the emergence of a wide variety of definitions, theories, models, and other intellectual and pragmatic tools to systematically think about these matters. In order to understand how knowledge can be managed in organisations within the context of fieldwork around an e-Learning project, it is first necessary to define and delimit some key concepts. This section briefly addresses this need by establishing a reference for:

- Data, information, and knowledge;
- Knowledge and knowing;
- Forms of knowledge;
- Level of observation (i.e. general and specific); and
- Types of knowledge.

Knowledge, data and information are distinct terms (Blackler, 1993, 1995; Spender, 1996). Data are simple facts and figures out of context that are, therefore, not directly meaningful. To be useful to the organisation, the data are processed into finished information by connecting them to other data. Information can therefore be defined as organised facts and data, or data which have been linked with other data and converted into a useful context for specific use. Finally, knowledge is what is used by a human agent to meaningfully organise information through experience, communication, inference, or intuition. Knowledge, as opposed to data and information, always has a human factor.

It is also usual to distinguish between knowledge and knowing (Blackler, 1995; Cook and Brown, 1999). Knowledge is associated to the content of what is known, which can be stored and manipulated; knowing refers to the process of simultaneously giving a meaning to information, and transforming that meaning into action with value for the organisation.

Knowledge is regarded as something that people have, whereas knowing is regarded as something that people do. In KM terms, this means that organisations should concentrate on knowledge both as an object and as a process.

Another useful distinction is between forms of knowledge, of which the terms tacit and explicit knowledge have gained widespread acceptance (Nonaka, 1994). Explicit knowledge is formal, systematic, easy to communicate, store and share, and tacit knowledge is highly personal, hard to formalize and to communicate to others, and context-dependent. Tacit knowledge consists partly of technical skills (the 'know-how') and partly of mental models, beliefs, and perspectives (a cognitive dimension). Mechanisms that transform tacit into explicit or other combinations between the two are discussed in Nonaka (1994).

The level of observation refers to the concepts of individual, group, and organisation knowledge. At the individual level, researchers focus on how individuals develop new understandings and acquire and interpret knowledge (Argyris and Schön, 1978; Lyles et al., 1996). At the group and organisation level, authors usually propose that knowledge is dependent on the ability to share common understandings and to exploit them. For KM, this implies that mechanisms and processes at an individual level may differ from those at a group and organisation level. Furthermore, it also becomes important to know how the interaction between the three levels operates in the organisation.

Knowledge also range from general to specific (Whitaker, 1996). General knowledge is broad and independent of particular events. The context of general knowledge is usually shared, therefore it is relatively easy and meaningful to codify and exchange. Specific knowledge, in contrast, is context-specific. The codification process becomes more difficult as it is required that both knowledge and its context be described and managed.

A final distinction is made between procedural and declarative knowledge (Cohen and Sproull, 1996). Procedural knowledge characterizes individual knowledge of well-practiced skills, both motor and cognitive. It is about *how* something occurs or is performed.

Declarative knowledge relates to facts and propositions. It is about knowing *what* do to.

These and other concepts are currently the focus of much research as there is a need both to define with greater precision their meaning, and to assess their usefulness in understanding life in and of organisations. Knowledge-intensive processes, such as new businesses projects or the new product development (NPD) process, are particularly at the heart of this research. In fact, NPD can be defined as a process that requires the capability to obtain, transform and interpret large amounts of market, technical, financial and other internal and external information, in order to develop product ideas and evaluate their technical soundness,

manufacturability and economic feasibility (Ancona and Caldwell, 1990). In line with this definition, the NPD process is, therefore, a knowledge-creation process, in which new ideas and concepts are transformed into new or improved products. In the process, knowledge is used and new knowledge is created, which can be used for more new ideas and concepts. Conceiving the NPD process in these terms requires a progressive shift of focus from structures and functions, to individuals and teams, and finally to knowledge and KM. In addition, it is important to have an integrated framework to explain the relationships amongst the aforementioned concepts. One such example is the knowledge process, which is presented below.

### ***The Knowledge Management Process***

Central to KM is a description of the process used to explain how knowledge is created and shared in organisations, as well as to clarify how both the notions of knowledge as a resource, and the difference between information and knowledge, relate to each other in a specific context. Based on analytical work by, among others, Brown and Duguid (1991), Denning (1998), Huber (1991), Kerssens-van Drongelen et al. (1996), and Nonaka (1994), as well as on practices observed at various organisations during the 1980s and 1990s, such as Arthur Andersen, Ernst & Young and the World Bank (Denning, 1998) the knowledge process can be depicted as a cycle or spiral with five sections, as illustrated in Figure 1.

<Insert figure 1 here>

The five spokes depicting the knowledge process in Figure 1 considered:

- *Identification of the Knowledge Base*. This consists of mapping the organisation's existing knowledge, that is, identifying what is the knowledge base in a particular business situations.
- *Knowledge Creation and Capture*. This identifies the sources of information and ideas, and its focus is on individual information and ideas creation and capturing.
- *Knowledge Storage and Retrieval* identifies the repositories of individual and organisation knowledge. This phase seeks to organise, structure, and maintain a knowledge warehousing and mining system and all the tools and systems which are required to index and document the organisation's memory.

- *Knowledge Sharing and Dissemination* are mechanisms that link individual with group and organisation knowledge. As previously explained, new knowledge is created from the sharing and disseminating processes that occur within a social context.
- *Knowledge Application, Trading, and Exploitation*. Application and trading of new knowledge with the aim of improving both the intra- and inter-company activities and ultimately the firm's efficiency and effectiveness.

In this chapter the knowledge process cycle was used as a framework to assess the implementation of an e-Learning project. The focus on one case study helped identifying key problems and issues in KM and allowed more interpretation and sense-making of the context and narrative of participants. The assessment of a single project also aimed to identify the practices and mechanisms used by participants to capture, create, store, share, and apply the relevant knowledge in the specific context of NPD.

The framework selected to evaluate KM practice was challenged when deciding upon an effective strategy to research web delivery of educational services. First of all the so-called revolution in ICT had been noisily acknowledged for decades, but hyperbole and exaggeration left little doubt of real technological change (Fincham, 2002; Bátiz-Lazo and Wood, 2003). The range of technical changes had been so extensive that the term 'computer' had become obscure. For instance, in the vernacular, the word 'computer' has been known to encompass systems as varied as desktop personal machines, networks of industrial and office automation or the infrastructure of the Internet. In the context of this variety, the focus during the research was on 'computer systems development' (Friedman and Cornford, 1989). In other words, the commercial development of software and software applications, carried on for the most part in corporate settings and involving subsidiary activities like the maintenance of information networks, the management of outsourced operations and the buying-in of services and hardware (Fincham, 2002, p. 2). Systems development was thus considered to combine technological innovation with strategic planning and wider forms of organisational change.

The analysis framework was then related to the application and development of computer system within the context of higher education. During the 1990s a debate emerged around the rapidly increasing use of ICT in education and the appropriateness of methodologies researching electronic delivery such as conference mediated learning or the Internet (Salmon

2000 and 2001). There was criticism of evaluation studies and their excessive attention to learners' reaction rather than to learning outcomes. In the same vein, calls were made to emphasise the role of the learner and the teacher rather than the role of technology. Clearly, electronic mediated learning and Internet delivery in particular were part of a constant flux being experienced in the world of ICT applications. Research around the impact of ICT on educational practice in this chapter then moved forward based on the notion of 'problem solving' (as opposed to theory development). An emphasis on problem solving was necessary because a considerable amount of creativity is required to build the appropriate environment for learning to take place on-line. For instance, successful implementation of ICT applications to create adequate learning environments progress only when designers and educationalists responsible for the project progress have had the continual assistance and goodwill of participants and respondents (see further Salmon, 2000). Hence the need to link fieldwork in an educational setting to an established body of knowledge within the broad literatures of business and management.

Succinctly, we rejected the role of an overarching theory for computer mediated learning. At the same time, avoided the risk that research into computer mediated learning resulted in simple descriptions of the experiences of facilitators and learners or descriptions of ICT applications. For a better understanding of how to build appropriate environments for on-line learning, a framework and analytical model considering the knowledge process as a cycle (as proposed in Figure 1) was used. The role of model building and assessment of theory then became important and central to the empirical work in this chapter, to the extent that research results could then be referred back to an established body of literature. Moreover, linking the knowledge process cycle with a specific project (observed during the development of a new product in the Portuguese higher education), enabled the fieldwork in this chapter to critically explore research questions.

## **THE NEWLEARNING PROJECT**

### ***Research Design and Methodology***

This paper is based on a case-study methodology, namely on a single NPD project. As explained by Yin (1994), the case study is the most suitable strategy when the researcher is interested on understanding the relationships between a phenomenon and its context. Reconstruction of the case study was made through documentation analysis and successive

in-depth interviews with the project co-ordinator. Early versions of the case description were submitted to project managers from the entities involved for cross-checking and refinement. Feedback received was used to clarify narratives and descriptions. Analysis of the case material was informed by the concepts outlined around the knowledge process cycle (see Figure 1), and limited to an exploration of KM issues that were used within the project. Fieldwork in this chapter is exploratory and partially inductive. This approach was chosen because detailed knowledge about the use of KM practices in the context of NPD of e-Learning projects was found limited (after recommendations on theory-building and case study research by Eisenhardt, 1989). The emphasis on an inductive approach also followed research in the already broad and continually widening distance education field, where there has been a predominance of deductive qualitative and quantitative research (Burt, 1997; Salmon, 2000). However, a deductive approach was not completely discarded. In fact, it is not possible to prevent the work on KM practices previously presented from influencing the research, hence the research approach aimed at combining the benefits of a thorough free description of the case material with the conceptual framework described above. In sum, instead of testing pre-defined hypotheses, the study used fieldwork examples to identify management challenges and to generate and refine ideas for future research.

### ***Case Description***

#### The Organisations

Project NewLearning was the result of a need felt by the customer organisation -*the customer*- to diversify the distribution of its teaching courses, namely by implementing an e-Learning solution. This need was captured by the consultant organisation -*the consultant*-, which recognised a business opportunity and therefore got involved in the project right from its inception.

The customer was a private organisation which had been established for many years in the Portuguese higher education and executive-training sectors, offering educational services for undergraduates, post-graduates and further education (i.e. executive training). Although learning facilitators often had post-graduate qualifications (including higher degrees by research from elsewhere in Europe and the US), there was a lack of vocational inclination to support and encourage research active staff. Learning facilitators spent most of their time in industry or self-employed activities, whereas the customer's full time staff primarily dealt

with administrative issues. Course content at the customer, therefore, evolved from a combination of developments elsewhere in Europe and North America together with a 'reflective manager' practice.

Reflective practice can be seen to be a reaction to the more technical and competency based teaching and learning strategies. The notion of reflective practitioner is linked with learning and action, research and enquiry (Rose, 1992). The idea is not new and can be traced back to Dewey (1910). Reflective practice suggests that skills cannot be gained in isolation from context (Salmon, 2000). Reflective practice further suggested that developing appropriate environments for on-line learning should include intensive electronic (including on-line) interaction of the project team rather than reliance on more traditional work methods.

The customer had had long-standing experience in delivering courses in a traditional way: attendance of students and executives to structured and programmed classes (i.e. face to face, synchronous delivery), but lacked significant know-how with regards to the provision of educational services through a web portal. Project NewLearning was designed exclusively for executive-training market, due to the shorter length of these courses and to the constraints of adult learners, such as less free time to attend the teaching sessions than young undergraduate students. The consultant was a global, multidisciplinary professional services organisation operating in areas such as business consulting, corporate finance, human capital, legal services, and tax services. In Portugal, the consultant had experience in implementing e-Business solutions, but was less familiar with the strategic definitions and detail of implementing e-Learning projects.

## Team Members

Team composition and team members' involvement varied throughout the project. The following people had direct responsibility over the project:

- Customer: director of the Executive Centre (project co-ordinator in the first phase of the project), director of IT, several lecturers, senior decision makers, and a project co-ordinator (in the second phase of the project).
- Consultant: three experts in project management and one in distance learning. The latter came from a foreign office elsewhere in the consultant's organisation, because he was the only one in the European division to have both the experience and specific competencies in e-Learning. Despite brief participation in the project -only a few times during the first phase, he played an important role in defining the final business concept.

## The NewLearning Project

The project started in the first quarter of 2000, with the concept generation and definition stage. After several months of changes and negotiation, the project concept was accepted by the customer during the third quarter of the year. The second stage -project feasibility and financial viability- started in 2001, and was concluded by the summer of the same year. The project then entered its third stage or full implementation of the business plan and was expected to run for at least five more years.

## The Process

The project was characterised by intense contacts and enduring communication between the customer and the consultant. Notwithstanding the extensive consultant's experience in project management, some of the practices described below were new in NewLearning. The reason for this resided both in the novelty of the project and in the fact that the consultant was being exposed to the customer's market for the first time.

The relative success of the project was assessed through the 'narrative' of participants.

Narratives is a term that covers the general process of construction of meaning and that can take a variety of forms such as stories, themes and serials (Czarniawska, 1998).

Stories are regarded as the 'basic unit' of narrative. Stories reflect participant's perceptions and allow interpreting particular setting and events in organisations. Setting, events and consequences join together in a plot that attributes overall meaning to separate elements.

Themes, by contrast, have no plot nor outcome (they do not 'tell a story') but are more about the dramatisation of events and provide an interpretative link between stories and episodes.

Narratives are important when assessing ICT applications or NPD projects because participants' sequence of events tells of the perceptions about the relative success or failure in an ICT implementation project (Fincham, 2002). In other words, practices describing the NewLearning process (from both a customer and consultant point of view) could be presented in a chronological order but *per se* they would not represent a particular biography nor can they be reckoned to represent success or failure. Rather, assessing success or failure can be identified from generic themes that recur across different stories.

Given that the local office of the consultant had little experience in the market of the customer, the consultant started by conducting a survey in order to identify and explore

similar experiences. Namely experiences where Internet delivery had allowed a private or public organisation to develop a significant presence in higher education. Information was gathered through internal and external searches. The internal search was based on the company's intranet and contacts with other European offices. This search showed that this project had unique and novel features that made it new in worldwide terms for the consultant. The external search was made through studying existing e-Learning models in Europe and North America, as well as through informal questions to key information-providers -e.g. people working for other companies similar to the customer's organisation. The communication means were mainly email, Internet, and printed media.

A team composed of people from the customer and from the consultant was created almost at the beginning of the project, not only to generate information regarding the customer's needs, culture, practices, concerns, and problems, but also to deliberate on the project goals, purposes, and concept. In addition, several university lecturers (both with direct links to the customer and independents) were invited to hold interviews with the consultants. The aim of these interviews was to transmit their unique and experienced accounts in relation to a traditional educational model and their opinions and comments with regards to an alternative model based on the web.

Shortly after the official project start-off, the consultant invited the customer's project co-ordinator to attend its annual international conference. This was an internal meeting on new learning technologies and was held in the US. Two reasons explain this unusual invitation: firstly, it was an opportunity to improve the customer's -and also the consultant's- knowledge on e-Learning matters; and secondly, since the consultant is also involved in the development of teaching contents worldwide, this seemed to be an interesting way of sharing the consultant's corporate university with the customer.

Towards the end of the third quarter of 2000, the consultant decided to take a stake on e-Learning. As a result, some team members of the NewLearning project were sent out to visit the European office which had more experience in e-Learning issues. This resulted in additional documentation brought to the Portuguese group and in the inclusion of the consultant team members in an international learning and KM network.

After the go-ahead for the second phase and still during the negotiation period (see above), another internal conference was organised by the consultant. The theme of this second conference was best practices in business consulting. The customer's project co-ordinator was invited to present NewLearning, to talk about its uniqueness and novelty, and also to

show how collaboration and integration between the parties -customer and consultant- had shaped the project right from the beginning.

When the second stage -project feasibility and financial viability- started in the beginning of year 2001, several other practices were implemented:

Another person came to the team representing the customer. This person was in direct and permanent contact with one of the key consultant members, holding long-term working meetings throughout the second stage either in the consultant's office or in the customer's facilities. These very intense contacts aimed at creating and sharing ideas through brainstorming sessions with regards to the financial aspects of the project, the systems' architecture, its potential problems for learners, etc. Meanwhile, the consultant company had also brought financial experts into the team.

By his own initiative, this new team member -project co-ordinator- registered to an on-line course offered by an international e-Learning provider. The aim was to experience how a potential learner would feel by taking such type of course, namely the difficulties of distance learning from a learner perspective, the advantages and disadvantages of this teaching method, etc. He also got involved into an international virtual learning community.

The perceived boundaries between the customer's and the consultant's organisations dematerialised by the activities of key individuals, which were the operational 'faces' and 'names' of NewLearning. For quick reference, these persons are referred to in this chapter as the two customer-project co-ordinators (one in the first phase and another in the second phase) and the consultant-project co-ordinator (involved in all phases).

The consultant organised a conference to divulge organisational learning and KM by its customers. NewLearning was again presented, with the aim of showing the shared experiences and learning lessons that resulted throughout the process. The purpose of this meeting was to explore the potential market for new e-Learning projects, which had become a strategic issue for the consultant.

The European leader on e-Learning of the consultant organisation sponsored yet another international academic and industrial conference on the topic in the first quarter of 2001. Both the customer and the consultant attended the international meeting, but no presentation was delivered at this particular moment. However, during the conference, a private workshop was organised by the consultant's company to share experiences on e-Learning, which included NewLearning.

Throughout all the process -both phases- several presentations were made by the consultant to the customer, in order to inform on the progress of the project and to show successive

prototypes. A prototype is in this context encompassed a ‘dummy’ demonstration of what the e-Learning concept would look like. These sessions were very animated, with an intense information exchange between the consultant and a demanding customer. These sessions allowed the consultant to refine graphical interfaces as well as the system’s functionality.

## **CASE ANALYSIS AND DISCUSSION: KM IN PROJECT NEWLEARNING**

### ***A First Move***

Project NewLearning represented a first move in the Portuguese e-Learning market because it aimed to deliver a solution based not only on on-line training supporting materials - characteristic of existing e-Learning projects-, but also on the building of a full on-line training programme. The new product’s web presence encompassed a corporate portal aimed at improving the organisation’s external responsiveness. This aim was met by the learning portal offering a focal point for a set of innovative interactions that resulted from key contact points between the consultant’s customer and the customer’s customers.

The novelty of the project, the relatively low experience of both parties, and the lack of benchmarks in the Portuguese market meant that this was a project full of risks and uncertainties. The challenge for the project team was to translate market and technical intelligence, learnings, and legacy knowledge into a newly effective product design and distribution configuration that could meet and exceed the few competitive benchmarks in the evolving global market. In general terms, the process was characterised by an immediate and wholesale destruction of the ‘walls’ between the working parts of the extended enterprise (i.e. the perceived boundaries between the customer’s and the consultant’s organisation). The traditional NPD process based on clearly-market boundaries between two separate entities each with well-defined roles, was not observed. Instead, it was substituted by an NPD process based on blurred and fuzzy frontiers between two entities -which at times function as *one* single entity-, each with a reservoir of knowledge that was continuously transferred between individuals. In this sense, project NewLearning resembled less the case of perfect role-definition as traditionally put forward by authors like Clark and Wheelwright (1993), and Cooper (1990) than that of flexible and evolving roles and responsibilities, as suggested by Hill et al. (2000), Kamoche and Cunha (2000), or Nonaka (1990), amongst others.

Both entities realised that they required a higher-order comprehension of matters than that underlying more traditional or less knowledge-intensive projects. These matters included the

specific product contents and the wider context represented by the novel business activity. Both parties focused their efforts on the innovation at hand using a number of practices, which although may not have the labelled KM practice, were in fact directed at elevating the degree of understanding and knowledge about a common goal in order to deliver a new product. More than advanced integrative practices between two distinct parties, these mechanisms were used to deconstruct the whole NPD process with regards to the distinctions between *internal-external*, *in-out*, and even *customer-consultant*.

### ***Business Practices as KM Practices***

#### Cycle stage 1: Identification of the Knowledge base

The first important element in the knowledge process is the identification of the organisation's knowledge content, i.e. what knowledge is required in the particular situation. This corresponds to discovering the existing intellectual capital (Wiig, 1997) or knowledge base (Zeleny et al., 1990). In dynamical terms, the assessment of narratives suggested that if the NewLearning project was pictured as a two phase-process -strategic definition and implementation-, then distinct but complementary capabilities of the participants emerged. On the one hand, the consultant had strong competencies in implementing e-Businesses, but less experience in the strategic definition of a business model in the distinct higher-education and executive-training markets. On the other hand, the customer organisation was a leader in its industrial sector, with well-built capabilities to deliver teaching contents and also for the strategic analysis of Portuguese higher and further education markets. The complementary nature of distinct capabilities opened opportunities to develop joint competencies in order to create synergies which would result on the first project in Portugal to integrate the strategic definition of an e-Learning concept with its implementation. In structural terms, the process was aimed at widening and deepening the knowledge base for NewLearning in the following categories (Figure 2):

**<Insert figure 2 here>**

*Project management:* project NewLearning was a complex interplay of activities, with a highly interdependent set of tasks and information involving inputs and outputs of each member. Knowledge about the project was embedded in the phases and in the objectives of

each phase, timings and deadlines, existing sub-processes, and risks and costs associated to changes.

*The team*: knowledge about other's roles in the team, their personal characteristics, location of informants, and team functioning. It is knowledge about who is who in the team and about others' knowledge. A substantial part of this knowledge is likely to be tacit and vulnerable to changes in the project, as it is mostly stored in individuals.

*Product/solution*: this category included several dimensions of the product/solution: technical characteristics, applications, end users, performance in the marketplace, objectives of the project, etc.

*The companies*: structure, strategy, goals and mission, organisational routines, rules and accepted behaviours, informal organisation, information gatekeepers, and culture and politics. This and the next category provided both parties with information regarding the environment on which both companies gravitate. It is general knowledge, as opposed to specific knowledge (the previous three categories), which is more context-dependent.

*External environment*: market and end-customers' characteristics, market trends, competitors, similar products/solutions in the marketplace, legislative constraints, suppliers, other companies that may have been involved in a partnership, and other entities.

## Cycle stage 2: Knowledge Creation and Capture

An important section of the cycle involves the creation and capturing of knowledge, aimed at locating or generating the information and ideas required to carry out the project. As mentioned above, this category considers knowledge produced as the result of individual efforts only, and not of the social dynamics between project team members. As far as NewLearning was concerned, it can be assumed that there was an important gap between what was known and what was necessary to know, due to the incomplete competencies of the parties and especially to the project novelty.

The assessment of narratives within the case study also suggested that some of the practices normally used by the consultant to manage a project were indeed used. Within the consultant's organisation there were pre-existing templates, protocols, standard procedures, project management techniques and software, and a stage-gate system (Cooper, 1990), detailing the type of tasks to be carried out by individual consultants when engaging with a customer. One such pre-set task was undertaking a survey of organisations with similar capabilities to those of the customer. Specifically for NewLearning, this survey attempted to

identify successful and unsuccessful e-Learning projects elsewhere in Europe and in the US as well as assess the potential of usefulness for NewLearning of lessons participants in those other projects had had.

The fact that it was standard practice for the consultant organisation to identify and assess established industry practice suggest that central questions to be answered by the project's exploratory phase responded to the consultant's own framework for business-analysis, which specified areas upon which information had to be collected. These areas included strategic positioning of the customer, internal supporting processes of the new business, technologies to be used, and human resources and organisational structure, amongst others.

However, there were also some new practices that developed as part of the tasks around NewLearning, such as, for example, the instance when in the second phase of the project the new team member enrolled into an on-line course at his own initiative. The spontaneous registration into virtual networks was also an attempt by the project co-ordinators to localise sources of ideas and information. Both these actions denoted elements of individual inspiration and improvisation that helped carrying out the project.

Active use and participation of project members in an on-line learning environment was consistent with the customer's 'reflective practitioner' teaching approach, and illustrates a complex interplay between knowing and knowledge. In fact, e.g. enrolling into an on-line course is an action of knowing, which generates insights -knowledge- about the final-customers' views on distance learning.

Succinctly, required knowledge can be created through numerous ways: assessment tools (e.g. framework for business-analysis used by the consultant), best practices (e.g. internal search), lessons learned (e.g. other projects), non-competitors (e.g. external search), yellow pages (e.g. the expert in distance learning), and hands-on experience (e.g. the team member that embarked on a distance course).

### Cycle stage 3: Knowledge Storage and Retrieval

With regards to knowledge storage and retrieval, the analysis of narratives suggested that despite the increasing efforts to stock up all the information of an NPD project in a hardware format, there was some knowledge that was not easily transformed into a readable layout. The following elements constituted the knowledge repositories in NewLearning (Figure 3):

**<Insert figure 3 here>**

*Documentware*: output documents (reports, communication logs, etc.), and also procedures, guidelines and business models that instructed how to deliver a project in process (e.g. main milestones), technological (e.g. technical requirements) and financial terms (e.g. commercial targets).

*Humanware*: project team members from the consultant and customer organisations. This category also comprises participants that had a brief, yet crucial, input (e.g. the expert in distance learning). Elements stored in humanware included: lessons learned from the project (e.g. the information-procurement routines in the beginning of the project), the wrongdoings (e.g. bad practices), procedural knowledge (e.g. who to contact for a specific question on e-Learning), and intuition (e.g. a feeling for potential problems in a similar project).

*Hardware*: intranet and Internet, project management software, internal databases, and tele-, video-, and computer-conferences. Included in this category were also presentations and successive prototypes versions that served to communicate the realisation in visible terms of the project.

*Groupware*: cultural identity and image of the customer organisation, its informal characteristics, and the attributes of the higher-education and executive-training industry. Groupware also included the consultant's corporate university. Similarly to humanware, the groupware exists in people's and groups' minds and in organisational routines and structures. Documentware and hardware are tangible elements which are relatively easy to use by authorised and competent individuals. Conversely, the knowledge contained in humanware and groupware repositories is difficult to code and record in a written format because much of that knowledge is tacit (Nonaka and Takeuchi, 1995). One difficulty in KM is the conversion of tacit into explicit knowledge, due to the technical problems that may be involved, but especially due to the paradox that it bears to the company. On one hand any sudden unavailability of a key individual would probably lead to that knowledge being inaccessible. On the other hand, it is this difficulty of coding and transferring that makes these repositories hard to imitate and use by other entities (Cunha et al., 1999), therefore creating advantages over competitors. It is interesting to note, however, that a chapter such as the current one is an attempt to convert parts of this uncoded and tacit knowledge into an explicit format.

Cycle stage 4: Knowledge Sharing and Dissemination

A central step in the KM process is sharing and dissemination of knowledge. The importance of this step derives from the fact that most of the knowledge-in-context necessary for a project such as the one under analysis is created during the intense social and network activity between all the relevant parties. Significant sharing and distribution means used in project NewLearning included: the mixed team composed of customer and consultant members, the successive interviews between individual consultants and several lecturers, the various conferences and presentations, international learning and KM network, joint work by team members, and prototypes.

These means illustrate the use of certain essential concepts in KM, some of which were previously described. For example, the mixed teams and the international virtual learning and KM network, are some of the forms of communities of practice (Brown and Duguid, 1990), or communities of knowing (Boland and Tenkasi, 1995). Projects such as NewLearning are characterised by a process of distributed cognition in which multiple communities of specialised knowledge workers, each dealing with a part of an overall project problem, interact to create patterns of sense making and behaviour displayed by the project as a whole. Developing a new project can therefore be regarded as a working-innovating-learning cycle, in which different communities of individuals bring their knowledge and past experience together in order to transform an idea into a final product. The essential link between adjacent communities is made through individual actors who belong to several groups at the same time, such as the consultants that are part of the mixed team and of the international learning and KM network.

The joint work by key team members, especially the team composed of the customer and consultant project co-ordinators, in the second phase of the project, shows how knowledge is transformed from tacit into explicit/tacit throughout NewLearning. This team of two is a powerful way of tapping the tacit and often highly subjective insights, intuitions, and hunches of both customer and consultant and making those insights available for testing and use by the project team as a whole (explicit knowledge) or to other individuals (tacit knowledge). A similar role is played by prototypes. A prototype is a technology or product - explicit knowledge- that symbolises the consultant's commitment and embodied tacit knowledge regarding the project, and requires that the customer is comfortable with and understands the images and symbols used by the other entity.

Cycle stage 5: Knowledge Application, Trading, and Exploitation

The final section of the process is knowledge application, trading, and commercialisation. However interesting it may be the generation of new knowledge, the final goal of the process is to use that knowledge in favour of the organisation. Both companies involved in NewLearning operate in highly competitive markets, hence knowledge is regarded as a resource that if well managed should contribute to achieving the firm's goals and mission. The most obvious application of knowledge in the present case was the final product (i.e. the e-Learning solution), which was the main deliverable of the whole project and represented its most important tangible output. However, other spin-offs of the project could also be linked to KM concepts, as described next.

Towards the end of the first phase, the consultant decided to focus on the emergent e-Learning market. Several direct and indirect actions were taken thereafter, such as the team members that visited the European office with more experience in e-Learning, their enrolment in an international learning and KM network, the internal conference on best practices in business consulting that was held during the negotiation period, in which the customer was invited to talk about the project, and another conference organised by the consultant, already in the second phase, aimed at publicising organisational learning and KM topics by its customers. The purpose of some of these measures was to explore a potential market which had become strategically pertinent for the consultant over the previous six months. Although a definite causal link could not be established, there was an interesting relationship between the creation of a new market focus on e-Learning by the consultant and the initiation of the NewLearning project. One can argue, at the end, that NewLearning played at least an important role on creating a new business area for the consultant company. A final important output of NewLearning is the possible institutionalisation of some of the practices used during the project, which were initialised by the people involved. For example, the participation of a customer in the consultant's internal conference was not a common procedure, however after NewLearning other similar actions took place. Such examples illustrate how individual learning can become organisational learning, and is consistent with what has been described in some literature. For example, March (1991) theorised that the product of the organisation process is the institutionalisation of an organisation schema reflected in organisational systems and routines. Routines are the places where the lessons of experience are accumulated. They are embedded in the organisation and are reflected in an organisation's consistency in behaviour (see also Kim, 1993).

## CONCLUDING REMARKS

Empirical evidence documented in this chapter points to how organisations and teams involved in NPD create the brainpower needed to transform an idea into a final product/solution. The concepts and especially the notion of Knowledge Management Cycle seemed to provide an interesting lens for analysing complex organisational processes such as the new product development process.

The analysis suggests that the knowledge base necessary for an innovative project covers areas such as project management, the team, product/solution, the companies involved in the project, and external environment. This base represents a complex set of knowledge elements to be managed and is permanently evolving during a project. In fact, this base can be regarded as the ideal intelligent infrastructure of an NPD project, but it does not suffice, per se, to successfully take a project to market. Other dynamical elements play a crucial role, which were observed in NewLearning.

Firstly, the project showed how two entities consciously combined efforts in order to improve understanding of an area where there was an evident and significant gap. This collaboration was characterised by an exemplar process of trust building, mutual confidence, and openness to information and ideas exchange, from two companies used to operate under two apparently irreconcilable philosophies: on one hand the more information-and-knowledge-protection oriented paradigm of the consultant organisation, and on the other the information-and-knowledge-sharing oriented paradigm of the customer organisation.

A second important factor that emerged from the case is the intense use of new ICTs, which allowed the creation and recreation of the conditions for faster, easier, and cheaper access to information. However, as suggested by Handy (1995), information is only useful if transformed through corporate intelligence into new ideas. This transformation was accomplished by actions of key individuals, such as the three project co-ordinators, who to a large extent shaped the acquisition, circulation, dissemination and application of new and existing knowledge in NewLearning. In addition to the specific technical skills, the analysis suggested that these knowledge workers relied on a certain level of creativity and improvisation to achieve the project's goals.

To conclude, the observations reported in this study illustrate how the highly abstract field of KM and its concepts can be used to examine a central process in modern innovative organisations. The findings need confirmation in similar settings and situations, as only one

case was reported in this chapter. More projects would permit to perform a cross-case analysis and hence refine the aspects described above and highlight others not captured by this research. Furthermore, the lack of benchmarks and the fact that the project has only concluded up to its implementation stage (i.e. resilience to environmental turbulence and acceptance by potential users is still to be thoroughly tested), suggested that an evaluation of the KM practices used in NewLearning could be very feeble, if not impossible.

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## **REFERENCES**

- Ancona, D.G. and Caldwell, D. (1990) Beyond boundary spanning: managing external dependence in product development teams. *The Journal of High Technology Management Research*, 1(2), 119-135.
- Argyris, C. and Schön, D. (1978) *Organizational Learning: A Theory of Action Perspective*. Reading MA, Addison-Wesley.
- Bátiz-Lazo, B. and Wood, D. (2003) Diffusion of Information Technology Innovations within Retail Banking: An Historical Review. In L.A. Joia (ed.) *IT-Based Management: Challenges and Solutions*, pp. 232-52. Hershey PA, Idea Group Publishing.
- Blackler, F. (1993) Knowledge and the Theory of Organizations: Organizations as Activity Systems and the Reframing of Management. *Journal of Management Studies*, 30(6), 863-884.
- Blackler, F. (1995) Knowledge, Knowledge Work and Organizations: An Overview and Interpretation. *Organization Studies*, 16(6), 1021-1046.
- Brown, J.S. and Duguid, P. (1991) Organizational Learning and Communities of Practice: Toward a Unified View of Working, Learning, and Innovation. *Organization Science*, 2, 40-57.
- Burt, G. (1997) *Face to Face with Distance Education*. Milton Keynes, Open and Distance Education Statistics.
- Clark, K.B. and Wheelwright, S.C. (1993) *Managing New Product and Process Development: Text and Cases*. New York: The Free Press.

- Cohen, M.D. and Sproull, L.S. (1996) Editors' Introduction. In M.D. Cohen and L.S. Sproull (eds.), *Organizational Learning*, Thousand Oaks CA, Sage.
- Cook, S.D.N. and Brown, J.S. (1999) Bridging epistemologies: the generative dance between organizational knowledge and organizational knowing. *Organization Science*, 10(4), 381-400.
- Cooper, R.G. (1990) Stage-gate systems: a new tool for managing new products. *Business Horizons* 33(3), 44-54.
- Cunha, M.P., Gomes, J.F.S. and Cunha, R.C. (1999) Recursos Humanos e Vantagem Competitiva: A Perspectiva da Organização Baseada nos Recursos. *Revista Portuguesa de Gestão*, 1, 57-66.
- Czarniawska, B. (1998) *A Narrative Approach to Organisational Studies*. Thousand Oaks CA, Sage.
- Davenport, T.K. and Prusak, L. (1998) *Working Knowledge: How Organisations Manage What They Know*. Boston MA, Harvard Business School Press.
- Demarest, M. (1997) Understanding Knowledge Management. *Long Range Planning*, 30(3), 374-384.
- Denning, S. (1998) What is Knowledge Management? *World Development Report*, World Bank.
- Dewey, J. (1910) *How Do We Think?* London, Heath.
- Drucker, P.F. (1991) The New Productivity Challenge. *Harvard Business Review*, 69(Nov-Dec), 69-76.
- Eisenhardt, K. (1989) Building Theories from Case-Study Research. *Academy of Management Review*, 14(4), 532-550.
- Fincham, R. (2002) Narratives of Success and Failure in Systems Development. *British Journal of Management*, 13(1), pp. 1-14.
- Friedman, A. and Cornford, D. (1989) *Computer Systems Development*. Chichester, Wiley.
- Galbraith, J. (1973) *Designing Complex Organizations*, Reading MA, Addison-Wesley.
- Handy, C. (1995) Trust and the Virtual Organisation. *Harvard Business Review*, May-June, 40-50.
- Hill, S.; Martin, R. and Harris, M. (2000) Decentralization, integration and the post-bureaucratic organization: the case of R&D. *Journal of Management Studies* 37(4), 563-585.
- Huber, G.P. (1991) Organizational Learning: The Contributing Processes and the Literatures. *Organization Science*, 2, 88-115.

- Kamoche, K. and Cunha, M.P. (2000) Minimal structures: from jazz improvisation to product innovation. *Organization Studies* 22(5), 733-764.
- Kerssens-van Drongelen, I.C., Weerd-Nederhof, P.C. & Fisscher, O.A.M. (1996). Describing the Issues of Knowledge Management in R&D: Towards a Communication and Analysis Tool. *R&D Management*, 26(3), 213-229.
- Kim, D.H. (1993) The Link between Individual and Organizational Learning. *Sloan Management Review*, 35(1), 37-50.
- Lyles, M., Krogh, G. von; Roos, J., & Kleine, D. (1996) The Impact of Individual and Organizational Learning on the Formation and Management of Organizational Co-operation. In G. von Krogh and J. Roos (eds.), *Managing Knowledge: Perspectives on Co-operation and Competition*, pp. 82-99 London, Sage Publications.
- March, J.G. (1991) Exploration and Exploitation in Organizational Learning. *Organization Science*, 2(1), 71-87.
- Nonaka, I. (1990) Redundant, overlapping organization: A Japanese approach to managing the innovation process. *California Management Review*, 32(3), 27-38.
- Nonaka, I. (1994) A Dynamic Theory of Organizational Knowledge Creation. *Organization Science*, 5, 14-37.
- Nonaka, I. and Takeuchi, H. (1995) *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*. New York, Oxford University Press.
- Penrose, E. (1959) *The Theory of the Growth of the Firm*, (2<sup>nd</sup> ed., 1980). Oxford, Basil Blackwell.
- Ponalyi, M. (1966) *The Tacit Dimension*. New York, Doubleday.
- Prahalad, C.K. and Hamel, G. (1990) The Core Competence of the Corporation. *Harvard Business Review*, 68(3), 79-91.
- Rose, A. (1992) Framing Our Experiences: Research Notes on Reflective Practice. *Adult Learning* (January), p. 5.
- Salmon, G. (2000) Approaches to Researching and Teaching Online. In C. Steeples and C. Jones (eds.) *Networked Learning: Perspectives and Issues*. London, BCS.
- Salmon, G. (2001) E-Moderating: Far from Remote. *People Management*, 27, 34-36.
- Scott, W.R. (1975) Organizational Structure, *Annual Review of Sociology*, 1, 1-20.
- Senge, P.M. (1990) *The Fifth Discipline*. New York, Doubleday.
- Spender, J.-C. (1996) Competitive Advantage from Tacit Knowledge? Unpacking the Concept and its Strategic Implications. In B. Moingeon and A. Edmondson (eds.),

*Organizational Learning and Competitive Advantage*, pp. 56-73. London, Sage Publications.

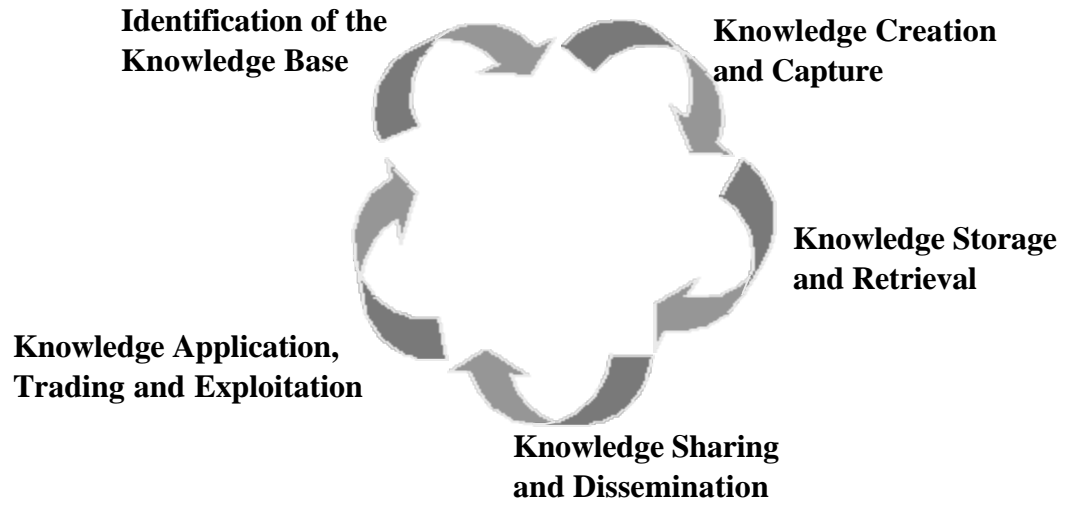
Whitaker, R. (1996) Managing context in enterprise knowledge processes. *European Management Journal*, 14(4), 399-406.

Wiiig, K.M. (1997) Integrating Intellectual Capital and Knowledge Management. *Long Range Planning*, 30(3), 399-405.

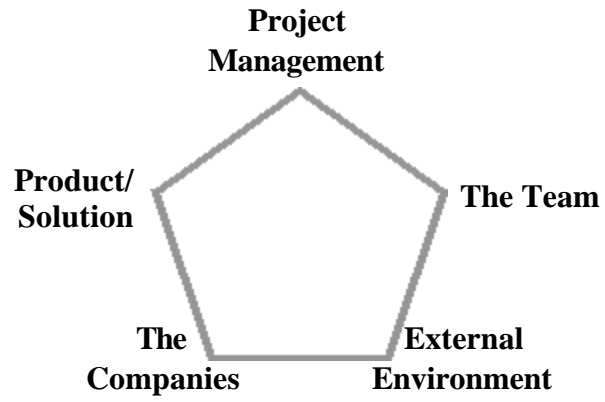
Yin, R. (1994) *Case Study Research: Design and Methods* (2<sup>nd</sup> ed.), Thousand Oaks CA, Sage.

Zeleny, M., Cornet, R.J. and Stoner, J.A.F. (1990) Moving from the Age of Specialization to the Era of Integration. *Human Systems Management*, 9(3), 153-172.

**Figure 1- The Knowledge Process**



**Figure 2- The Knowledge Base in NewLearning**



**Figure 3- Knowledge Storage and Retrieval in NewLearning**

