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# Cost, Benefit Engineering for Collaborative Knowledge Creation within Knowledge Workspaces

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**Abstract:** In order to be globally competitive, enterprises of all sizes face an imminent need to shift from classic organizational structures to being more diverse and distributed internally as well as externally. This shift is mainly redefining the classic process driven workspaces to loosely coupled knowledge based workspaces, focusing on knowledge assets to gain competitive advantage in innovation and time-to-delivery of products and services. This paper is an attempt to describe an approach that looks into this shift and goes on further to contextualise the variables that drive the temporal composition of knowledge workspace's assets and then models these variables with quantifiable value for an enterprise wealth. To measure the optimal value of this interaction cost benefit engineering principles are considered. This paper also considers a case study for possible implementation of the approach based on the future possibilities in the real world scenario.

## 1. Introduction

The current trend shows that the enterprises, large and small, are facing constant competition from the global markets to increase their pace to innovate, produce and provide at higher quality with a higher degree of customizability of their products and services. In order to hold the leading position in the market, the leading enterprises have recognised the need to shift from classic organizational functional structures to being more diverse and distributed internally as well as externally, mainly depending on knowledge as a basis for competitive advantage in innovation [1] [6] [7] [11] [12].

For enterprises, this change is driven by knowledge workers relying on dynamic virtual linking, with complementing entities holding relevant knowledge (Figure 1). The level of optimization and efficiency required is directly proportional to the qualitative and quantitative value of knowledge and knowledge management. The correct placement of knowledge and information sources and their interaction to optimize the organizational view is of key importance. The bigger impact could be foreseen at the virtual associations that are temporal in nature and are based on knowledge processing [3] [14]. These associations define knowledge workspaces that are established based on similar knowledge focus. These workspaces are further classified into two levels, internal to the enterprises and overlapping with external (inter-prises). This view is sketched in the figure 1 below:

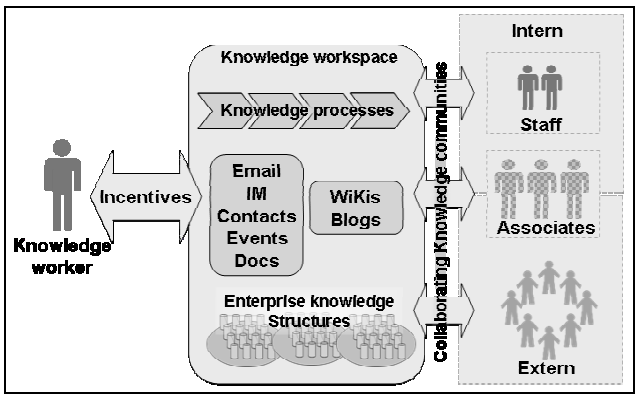


*Figure 1: Context Aware Knowledge Communities*

## 2. Research problem and Objectives

The knowledge workers within an enterprise are working on distributed applications that at best, have a common data warehouse [4]. Such applications are based on the organizational processes that are not designed to focus on knowledge management. Therefore most of the organizations are lacking a big potential in utilising their internal resources (people, data/information). There is a lot of information available but to define the relevance of this information within enterprise processes for knowledge workers is a challenge [5]. Over the last decade, researchers, consultants and industrialists have developed a plethora of tools, methods and probable solutions in an attempt to address the perceived quantification of knowledge workspaces [13]. Most of the approaches are technology oriented which is a promising and may be an essential supporting factor but is not the solution itself [2].

As such, knowledge can be seen as the contextualised processing of information, and this contextualisation is based upon experience. The recent research shows that even with a drive towards the virtual knowledge workspaces at the current state the business processes are resilient to such change in an enterprise and remain static and isolated, not utilizing the collective potential of the knowledge workers [9] [10]. In most cases there is no understanding of organizational mapping to accommodate the knowledge management processes based on knowledge workspaces (collective intelligence/experience).

The research within ACTIVE focuses upon the semi-automated learning of ad-hoc, informal knowledge processes, and then using those processes to improve knowledge use and re-use within an organization. To support those aims, part of ACTIVE project will investigate the following questions:

a. How can personal knowledge be quantifiable and valued within wider enterprise business processes?
b. Which functions define informal knowledge processes and how can they be classified?
c. How can the knowledge workspace be mapped and what are the organizational limitations?
d. How can we classify knowledge processes based on existing knowledge services or software tools?
e. At what level of granularity do the business processes map the informal knowledge processes?

These aims are illustrated into two steps and four perspectives in the next section.

## 3. Research Approach/Methodology

The research strategy is aimed at activating, integrating and building self-sustaining knowledge workspaces within an enterprise. To support that aim, the research is focussed upon analysing an organisation for four perspectives (as shown in Figure 2): business

processes; knowledge assets and interactions; evaluating the knowledge workspace; and, value prediction.

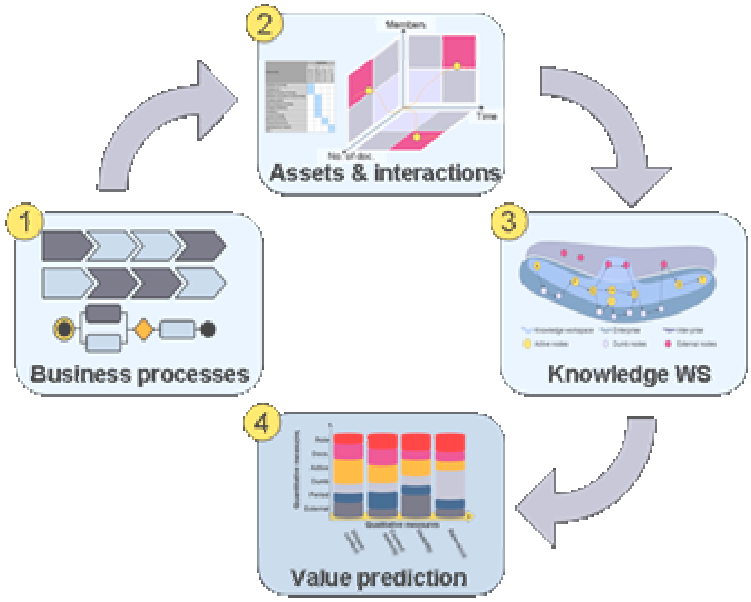


*Figure 2: Four Perspectives, to Enable the Knowledge Workspace (Core Model)*

The first three perspectives focusing on segmenting and mapping the knowledge within the organisational processes of the enterprise, resulting in a quantitative measurement matrix based on the structure and behaviour of those knowledge assets. The fourth perspective applies the matrix back upon the enterprise; the matrix is used to perform predictive calculations upon how effective the knowledge has been reused. A crucial measure of success is that the fourth perspective incorporates cost benefit measures.

The first perspective starts by taking the reference process model as an input to identify and classify the process segments within existing enterprise. The output of this part is a landscape of clearly structured segments of knowledge assets or zones. The second analyses the temporal interactions between these zones or assets and the output is a clear definition or limitations of each zones. The workspace descriptions are formulated based on the interrelations between the zones or assets. These descriptions cover the behaviour and limitations of these workspaces which are at stage classified as enterprise knowledge workspaces.

Currently, further definition is required as to the measures required in the fourth perspective, and further studies are being conducted to refine the scope of value prediction for the enterprise knowledge workspaces. The assets defining the knowledge workspace for specific processes are monitored over time with the product value achieved and then overlapping factors are counted for possible contribution by the assets base on the unintentional contribution to other knowledge workspaces. However, preliminary studies have shown that based on the classification of the enterprise work spaces the benefit driven costs could be estimated for the product based business processes.

Within the project this model will be applied to the case studies, telecommunication, consulting and integrated circuit respectively. In the next chapter a case study of BT is described emphasizing the need and direct relevance of such an approach and the implementation challenges for a knowledge worker and the organization.

## 4. Case Study and Implementation

Knowledge workers, such as the authors and readers of this paper, face three challenges. Firstly, we need information delivered which is relevant to our current task. Conversely, we do not want to be aware of information that distracts us onto lower priority work. Low

priority information, e.g. emails, instant messages etc, should be stored up for when the current task is complete. In short, we need a system that understands the context of our work. Secondly, we need to share information between colleagues without being overwhelmed. If our colleague has information of use to us, we want to know about it, but not be deluged with everything else that 'might' be of relevance. We don't want a complex system for sharing knowledge; we want something simple and intuitive. Finally, as we negotiate our everyday actions, e.g. to put together a bid proposal or organise a teleconference, we want our systems to remind us of what to do next, based on what we did last time, or perhaps what someone else with the same task did.

The BT case study will be based on the needs of knowledge workers within an internal sales organisation. Specifically, it is currently planned that there will be at least three user communities. Firstly, a community of technical specialists supporting sales and after-sales activities; this community will consist of 100 travelling specialists plus 30 desk-based specialists. Secondly, a community of legal and regulatory specialists; specialists in this area understand the complex legal environment in which BT operates and provide advice to sales and other staff. Thirdly, a community of marketers undertaking market and competitor analysis; these marketers are defining new products and services, managing channels to market for these products and services.

In each of these cases, a goal is to achieve visibility of past solutions and reuse them for current problems. Another goal is to optimise specialist skills by identifying those skills when required to undertake new tasks or to provide advice. In both cases a linkage needs to be created between desk-based and field-based staff, and across geographical areas. This work will exploit the synergy of social computing and formal semantics developed within ACTIVE project. Discussion with customers has revealed the need to use context to present and prioritise knowledge and this will be a key part of the case study, drawing on the work of automatic context discovery. The case study will also be used to evaluate the use of automated process recommendation, which will guide the users in following the right process steps in an unobtrusive way.

One particular example of this arises in the first community described above where a standard sales journey is defined, but often deviated from. The challenge here is to optimise the 'journey' based on actual behaviour; to issue reminders to users to keep them on the standard journey whilst at the same time allowing deviations to fit particular conditions. The presence of different communities in the case study will be particularly useful in understanding how social and economic factors differ across communities defined by different professional disciplines. Participants in the case study use the normal range of office productivity tools, e.g. word-processing, presentation and spreadsheet applications and email. BT knowledge workers also make heavy use of the internal and external knowledge sources, for example BT's own intranet and external Web pages.

Figure 3 below gives an overview of BT case study in regards to the research approach and the project.

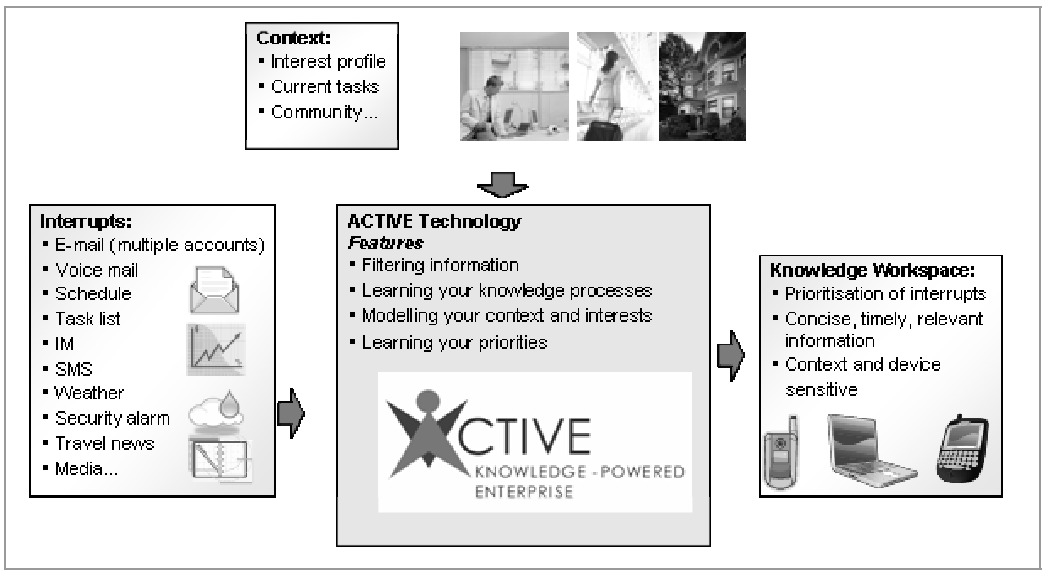


*Figure 3: BT Case Study in Perspective to the Envisaged Research*

Figure 3 shows at a schematic level the way in which it is envisaged ACTIVE technology will interact with data associated with the user to provide an advanced environment for supporting knowledge work. The key inputs are the wide range of information available to, indeed overwhelming, today's knowledge worker, along with a model of the user context including interest profile, current task, location and device to which the user currently has access. By observation of the user, ACTIVE technology will learn both the user's interest profile and knowledge processes (those informal processes which all knowledge workers use but which are not captured in formal Enterprise BPM systems). The Knowledge Workspace then uses this information to prioritise all information and interrupts, as well as supporting the knowledge worker by identifying and automatically suggesting next steps in their current process.

## 5. Further Steps

Further steps are to develop individual sub-model for each of the case studies within the project and then to extract common attributes to develop a meta-model. This would be used to develop measures to support the knowledge workers within enterprise knowledge workspaces both at the system and business process level. The main steps ahead are to develop and then to deploy the model and its results by first evaluating the existing application being used by the knowledge workers (mainly outlook, firefox, internet explorer) and then validating the social-enterprise applications that are coming up in the horizon, like xobni, smartdesktop, etc. In parallel, organisational structures are being evaluated to identify right placement of the project results to minimize the possible deployment disruptions for the workflow.

### *5.1 Deployment Challenges*

In the context of the deployment of the approach and research results there are challenges that need to be considered for each case study. In the case of BT, the following are being tackled:

- Initial engagement needs to be made with the participants from BT Retail sales workforce (sales specialists, technical consultants, sales consultants). This means both first obtaining agreement from their senior management, and then creating sufficient interest amongst the potential participants.

- The participants need to be kept interested for 3 years. The target is to have more than 200 people involved in the trial in the last six months of the project.
- The participants are very busy people who are very jealous of their time. Access to their time will be limited and they will not tolerate anything which hinders their work. The tools with which they are provided will need to be both useful and robust.
- The participants already interact with multiple systems. We need to be careful, therefore, of introducing new systems. We may not be able to use this case study as a test-bed for all ACTIVE technology. Instead we need to be selective and only introduce that technology which is potentially beneficial to this particular community.
- ACTIVE technology needs to be integrated into those systems used by the trial participants. This means both generic knowledge worker technology, e.g. email, and also systems that are specific to this particular community.

In the future the presented approach shall be extended to other project phases. Furthermore the chosen course of action allows a transferability of other problem domains, because the approach is not sector specific and therefore should be transferable to other industrial sector.

## 6. Conclusions

In the awake of recent technological achievements in the social online platforms and applications, the need to manage knowledge by supporting the knowledge worker within enterprises is recognised as a key success factor. Inline with the topics addressed above some complementing research issues are gaining attention in the research communities:

**Value of Interaction:** How can the value of interactions be properly captured in socially aware virtual environments? How can we cope with potentially undesirable situations like social imbalances or dominance in the virtual space? [15][16][17].

**Value of Reflexive Knowledge to Task Performance:** To what extent can reflexive knowledge be captured and used in a goal-oriented context to improve practice within demand-driven environments? Can agents provide useful traceability information for sustainability in reflexive communities of practice, and will it help identify best practices? [18][19]

**Role of incentives**: As the approach presented in this paper is by nature an augmentation to natural social structures, we must carefully examine the relevant human factors and social influences – incentives – for the enterprise environment based on trust, preference, and perspective [20].

The approach presented in the paper is an initial step toward defining a meta-model for the enterprises to be able to realign their workspaces and knowledge workers to include and manage knowledge within their daily workflow, may that be through business processes or information systems.

There is a considerable gap and further research is needed to achieve the right combination of business process realignment and information system enhancements before the true value for business benefit could be assessed. Until then the research focus remains on development and evolution of dynamic and virtual ‘enterprise knowledge workspaces’ that rely on collaborative assets and are self organized.

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