Agent Action: Business cases with individualised information services in a Business Intelligence context

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Abstract

Information services for Business Intelligence are becoming more integrated in day-to-day operations. This paper describes how the use of intelligent agent-enabled decision support in conjunction with the organisational trends of more dispersed and decentralised organic organised enterprises, enables new practice in the field of Business Intelligence (BI). The two business cases, illustrate the evolving area of Business Intelligence information services for large global enterprises. The information services in the cases aim to provide different levels of personalisation features through the use of intelligent agents. Traditional ideas of how to provide the organisation with right information at the right time and place according to the corporate communications top-down strategy and editorial process, or through Business Intelligence professionals who produce high-end reports, are undergoing change shown in the cases. Employees and managers start to get the information needed directly from the Internet, and are becoming more self-sufficient when it comes to Business Intelligence.

Keywords*: Agent-enabled decision support, Business Intelligence, Competitive Intelligence,* Knowledge Management, Community-of-Practice, Personalisation

1. Introduction

In a strongly competitive and global environment, most organisations today are facing a great need to broaden the perspective of Business Intelligence to stay competitive in their market arena. It becomes more and more obvious that each and every individual within the organisation needs to have relevant external information, to be able to operate in day-to-day business effectively, especially when the enterprise becomes more organic. The idea of providing the organisation with correct and timely information top-down, from a professional staff of information and business intelligence personal stands in a strong contrast to the organic organisation inherent behaviours [1, 2].

1.1. Business Intelligence

According to the dictionary intelligence is defined as: the capacity to know or understand; readiness of comprehension; knowledge imparted or acquired, whether by study, research or experience; the act or state of knowing; the exercise of understanding [3].

Defined most broadly, "intelligence" is the collection and analysis of information on markets, technologies, customers and competitors, as well as on socioeconomic and external political trends [4]. The term Business Intelligence is often in computer press mentioned within the area of Data Mining and Data Warehouse. Information analysis and business decisions support systems often relates to a business intelligence context [5].

The area of Business Intelligence has been practised since the early 1980's, transformed from more military based processes within organisations like Central Intelligence Agency (CIA) [6]. This is the reason why the terms strategic and tactical intelligence is used. A more precise description on Business Intelligence that is used is Competitive Intelligence (CI), where the focus is getting a competitive advantage for the enterprise [7]. Competitive Intelligence is a process that involves collecting, analysing and action on information about competitors and the competitive environment [8]. An important goal of any CI process is to develop actionable intelligence. Making sense of the enterprises competitive environment involves sharing knowledge with colleagues [9].

Business Intelligence applications focus has been on helping the BI-professionals and experts. The business intelligence practice to this day still imply a high degree of manual processing [5]. Information technology use is leveraging some of the critical laborious activities within BI. There are some key problems with traditional CI, the lack of incentives to share information throughout the organisation, and how to integrate CI into the decision making process [10].All the same, to get strategic use of Business Intelligence, corporations still needs an operative and effective community of business intelligence professionals.

1.2. Purpose

In this paper empirical data from two business cases, show how agent-enabled decision support is used in a Business Intelligence-context, and what organisational implications it might have.

1.3. Delimitation

In this paper Business Intelligence is related to *unstructured information*. Unstructured information is "human friendly", such as internal or external websites, documents, email, newsgroups as well as chat, voice and video. The inherited nature of unstructured information makes it difficult to capture, aggregate, evaluate and qualify for distribution and action. The terminology for this type of Business Intelligence is usually termed as environmental scanning or media surveillance [11]. The reason for narrowing the Business Intelligence focus in this paper, to the area of unstructured information resources, is the trend of burgeoning masses of unstructured information [12]. This trend is an avalanche, where most of the daily operations of a knowledge worker are related to unstructured information rather than traditional structures, even more so, when it comes down to information resources outside the boundary of the own enterprise. The business environment of most enterprises today is very fuzzy [13].

1.4. Disposition

The structure of this paper is as follows. In the next section the authors outline related research, such as information technologies related to individualised information services, as well as organisational theories related to communities of practice. The following section describes research site and method. The two following sections separately describe the business cases. First an intranet portal at LM Ericsson AB (Ericsson), which is a community of practice based Business Intelligence site, and second an intranet pilot at Hi3G Access AB ("3", Three will be used all through the paper), which aims to integrate Business Intelligence with Knowledge Management. Following the case descriptions is a discussion section and finally concluding remarks.

2. Related research

2.1. Individualised Information Services

Information Services has historically been related to public information databases. In this paper an Information Service is seen as a set of services to handle a specific business context of the enterprise information architecture. The enterprise information architecture may consist of a set of information systems as well as to other non formalised information resources [14]. The information service may be packaged as an Intranet-portal, but could easily be included in any end-user interface.

Personalisation has several dimensions, dealing with the notion of a given end-user and information service in its context. The efforts to individualise end-user experiences has in many cases failed to fulfil the proclaimed ideas of enterprise one-to-one. [15] In

practise many Intranet portals have different levels of personalisation. The configuration made by an end-user is set according the assumptions related to role and responsibility. The ability to individualise an information service rarely handles the dynamics of arbitrary information needs over time, and the end-users actual knowledge and frame of reference. Many end-users get distracted and loose attention, because of overexposure of less relevant and timely information [1, 12]. In this paper mainly dynamic profiling is used to personalise the end-users experience of the different information services. The dynamic profile is feed by end-user information behaviours, such as training of intelligent-agents.

Research within agent-technologies usually explore different lab related studies regarding how to cope with the vast information overflow, using intelligent agents mainly based on different rules-based mechanisms [16]. The agent-technology studies has recently transformed into practice in real business contexts, because today there is a handful agent-software vendors acting on the global arena, working with many of the biggest enterprises.

Decision support systems are usually focused on historical data behaviour, and analytical approaches. Many researchers discuss the extension of these mart models, to include real-time data from environmental scanning [17]. With an extended model on the use of enterprise decision support environments, future business intelligence information services will be combinations of more traditional decision support systems and intelligent agents enabled decision support.

2.2. Communities of Practice or Interest

Communities of Practice (CoP), are groups of people informally bound together by shared expertise and passion for a joint enterprise [18]. Amongst practitioners the term communities of practice is more used as a way to describe actual networks of individuals set out to achieve better performance, and results together. Knowledge sharing is vital for a cultivated and active network [19]. Overall it is a result of social participation and communities are mainly seen as social interrelations in which people construct meaning and identity in relation to each other and the professional domains of which they are part.

Communities of interest may be communities of practice. To be able to discern individual interest through different forms of active profiling of Information and Communication Technologies (ICT) usage behaviours are a very compelling idea, because

individual interests sometimes tell us more about the tacit knowledge, than all manual efforts to codify knowledge. This has been shown in two separate pilots described in [20, 21], where the results show significant findings regarding the use of active profiling to achieve community of interest creation or cultivation.

3. Research site and method

All described data from the business cases has been gathered through interpretive case studies [22-25]. One of the researchers has been involved in the development of the described applications. At Ericsson, the involvement was first as management consultant (1999) thereafter as researcher/consultant (2000-2002), and lastly 2003 solely as a researcher. At "3" the involvement has from 2002 been researcher/consultant

A brief description of the research process:
1. Intervention on a consulting basis developing the applications
2. Interviews performed to gather more interpretative material with responsible personnel from the two organisations. The interviews have been set-up in a less formal setting, lasting from one to three hours per interview. At Ericsson the interviews were preformed with three separate persons, first the business stakeholder, secondly the system owner, and lastly the project manager, systems architect/-developer and information architect. At "3", interviews were preformed with two persons, the business stakeholder, and the system owner and project manager.
3. Document analysis of ongoing electronic collaboration, with everything from e-mail correspondence to project documentation.

3.1. Delimitation

This paper focuses on the assumptions and implementation strategies made by the business stakeholders, systems owners and project management. No end-users have been involved in the interview setting.

The data that has been used to study the use of the information services in the cases are the web-logs, the amount of registered end-user and their visible use of the applications. The behaviours of the applications in

the described business cases show a trend that is very interesting to further investigate.

3.2. Common Technical platform

Autonomy (http://www.autonomy.com) is a software vendor in the Knowledge Management Systems (KMS) arena. Autonomy is the least common denominator in the described business cases. Autonomy provides a technical solution with features for information retrieval, automatic hyper-linking, intelligent-agents, automatic information classification and taxonomy generation and lastly dynamic profiling that gives strong possibilities to individualise the information services. The profiling feature makes the end-user aware of possible collaboration networks and communities. Autonomy uses advanced pattern-matching techniques together with neural-networks to make concept-agents of either information items (in all forms, structured, semi- and unstructured) or end-user profiling.

4. Case Study LM Ericsson AB, Community of practice based Business Intelligence

Ericsson, as a major player on the global Telecommunications market, needed a more efficient tool to keep track of its competitors, research and trends within the Telecom industry. At the corporate level, Business Intelligence personnel had an active network of approx. 250 people around the world within Ericsson who fully or partially worked within the field of Competitive /Business Intelligence or Business Development. The Business Intelligence network was asked to qualify the most relevant resources of business intelligence information, and estimate a corresponding priority to the resources [26, 27].

As in most large enterprises the procurement of expensive reports within the business was totally decentralised, to all local operations around the world. This was a very lucrative business for research institutes selling expensive reports several times. In many cases the quest of finding the information material was a mission impossible, even if it was digitally stored. Very often the material was in paper copy only.

The main business case at Ericsson was to centralise the procurement of expensive external reports, and to make it accessible through one corporate Business Intelligence portal.

The Business Intelligence Centre portal (*the BIC*) at Ericsson, used to have an editorial process, where Business Intelligence-professionals commented material and published reports. Today the BIC is mainly based on procured external information material, with little or none editorial effort.

Intelligent-agents are widely used by most end-users, and because of this there are many opportunities to use the "find-expert" or "community" functions, based on similar interests expressed in content behaviour in the dynamic profile. Each saved end-user agent is stored as a dynamic profile segment that is cross-linked to all other end-users profiles. This feature enables a "community" function.

The collaborative network of Business Intelligence professionals, in other words the community of practice, works as information source qualifiers. One interesting notice is that some of the very expensive resources, that almost all in the community of Business Intelligence professionals, initially proclaimed to be of critical business value, were never read at all in the portal. Therefore Ericsson has excluded the never read resources from the portal.

At present the BIC is one of the most popular intranet sites within Ericsson. It is the third most used intranet portal at Ericsson. Because use, and frequency has increased since the start, the community of Business Intelligence professionals are now in minority, even though the tool is mainly focused on their working domain. One interesting result of this change of end-user base is the up-coming new community network of personnel sharing mainly similar interests. Approximately 10-15% of all Ericsson employees use the BIC on a regular basis. The main reason is that the body of individuals within the enterprise has an urgent information need to accurate trends about the business environment, so that they are able to act on a timely and corresponding manner. Even though the overall agenda on a strategic level is aligned, there are local organisational settings with specific needs. The BI-specialist cannot provide the whole enterprise with the exact information on all separate information needs. The needs are very individual, and this is the foundation for the success of the intelligent-agent, because they fulfil this information delivery task.

Due to a large and diverse end-user base, and an active community of practice combined with highly qualified information resources, the BIC has managed to cultivate the site, which is the hardest thing within a

Knowledge Management or Business Intelligence information service [28].

All end-user profiling and relevance correlation within the portal, from content and communities is done automatically. The absence of manual effort in the way profiling and personalisation is performed, is one critical success factor. Almost no internal Ericsson material is available through the BIC except for the published business intelligence reports edited by the business intelligence professionals.

According to web-logs and other end-user behaviour statistics, there are some major differences in use amongst the users. The active community of Business Intelligence professionals are very familiar with the content available in the portal, so they tend to be very specific in their information retrieval and intelligent-agent creation, compared to the large masses of non Business Intelligence professionals. The latter use the features of pre-trained agents, illustrated in the user interface as a simple taxonomy navigation tool, and also "find expert" or "community" functions. When less active users train an agent, they seem to be much more conceptual, than specific, since they don't know exactly which reports to find.

The main acclaimed business values with the BIC within Ericsson are:
1. Provide Ericsson managers, executives and professionals with qualified and relevant Business Intelligence material
2. Centralised procurement of expensive research material from known brands.
3. Activate and cultivate communities of practice within Ericsson, and provide them with opportunities to find soul mates on a global basis.

The last claim is something that Ericsson is looking into more, for the future development of the site. The BIC is mainly used as an information retrieval and intelligent agent site, with little or no opportunities to collaboration, except for the ability to connect to people within the community. The BIC shouldn't be seen as a CIS, it is more of a KMS with Business Intelligence information, and options on finding colleagues based on interest.

5. Case Study Hi3G Access AB ("3"), Integration of Business Intelligence and Knowledge Management

Hi3G Access AB ("3") is part of the global network of Telecommunication operator's Hutchinson 3G (H3G) within the Hutchinson Whampoa Ltd. sphere.

In a highly competitive and unexplored market, as the 3rd generation of mobile communications is, there is a great need to follow external trends on mobile usage, strategic competitor moves, as well as socioeconomic and political movements, to keep the business in line with business positioning and the development of commercially working mobile artefacts and applications. Because of this, the Business Development department at "3", saw a never ending organisational information need focusing on Competitive Intelligence where Business Development personnel drowned in operational actions to help their peers, management and owners. "3" decided to develop a pilot called 3BI as evaluation platform handling the obstacles described.

The pilot site named 3BI is used as a proof-of-concept within H3G. In a decentralised, and modern global organisation there is a focus on individuals, and how to help the individual with personalised information services [29]. All the different companies within "3", had a strong local market focus, but still managed to use as much as possible from best-of-practice within the whole enterprise, and the generic technical platforms. The proof-of-concept project team for 3BI saw a need to integrate internal material, on a day-to-day basis with information of more external nature at an early stage. In other words make the 3BI-portal a more integrated Knowledge Management solution.

In order to be able to develop the proof-of-concept pilot 3BI, to become more of a Workspace portal [30], than a side-show Business Intelligence only site, all users were given the choice of using:
1. Management update email, which is a personalised editorial service that provides managers, executives and professionals with qualified management articles on a monthly basis, with an editorial comment. This improves continuous learning, and reflections.
2. Agent-mail, which is a service that provides each user with an agent-results on a daily basis. This is mainly focusing on environmental scanning and media surveillance.
3. A small client application that work as a small foot-print *push client* that automatically relates corresponding relevant information elements internally or

externally from the portal according to what the user is doing in his or her active window.

Another vital issue in the development of 3BI was to outsource as much of the manual work of capturing information as possible, to lower the over all maintenance costs, and boost information quality from day one.

All material within the repository will automatically be categorised, and put into a dynamic taxonomy whether it is internal documents stored on the central fileserver or incoming news-feeds. This feature will help both the administrative personnel maintaining the information architectures as well as the information navigation possibilities for all end user. Finally it reduces the implicit needs for manual classification of all digitally stored information. To be able to grasp the large amounts data, information and knowledge items within the portal, there is a great need to both supply a core domain taxonomy that is corporate wide, which is provided through pre-trained category agents. This should be combined with more arbitrary taxonomies set up by each individual user co-ordinated with the automatic generated taxonomy. Combining these ways of information classification provides a more comprehensive information navigation method, and less laborious. It is vital to be able to combine both personal and corporate information and knowledge management [31].

3BI uses also features to help collaboration and expertise networks. It delivers a powerful infrastructure solution that enables "3" to automatically discover, visualise and effectively manage cohesive communities of practice and interests, which helps individuals and teams of people effectively at every stage of the value chain towards their goals.

An intranet portal like 3BI should supply both traditional content management processes as well as more collaborative aspects, and make them aware on both content and peers relevant on everyday business matters [32, 33].

The main acclaimed business values with 3BI within "3" are:

1. 3BI will provide the employees at 3 with relevant information internally or externally through a automatically generated taxonomy, and options to personalise through the usage of information agents.

2. 3BI will emphasis the usage of Communities of Practice, to help personnel to find peers when needed.
3. 3BI will use activating techniques, to integrate to content into day-to-day work for each employee, so that the portal won't be a sideshow.

The maintenance and information management of 3BI is mainly focused on to specific tasks, qualifying resources and training of the overall taxonomy. On top of that very little effort will be put into editorial processes.

6. Discussion

The information services in the business cases described intend to provide employees with relevant Business Intelligence information, with options on using different forms of personalisation.

The BIC within Ericsson is an active site that has been up and running for more than two years, and with a large number of returning users, whereas the second example 3BI at "3" is still in a pilot phase.

The traditional approach to Business Intelligence has since the start been to organise a group of information and business intelligence specialists that are educated for the assignment at hand. The BI-specialists are very qualified in information aggregation, qualification and the reporting mechanisms. The overall idea was that this special group should supply the organisation with correct information regarding the strategic planning in correspondence to environmental scanning. Another very central idea was that all executives, leaders, managers and professionals should be supplied with the exact same information, so that the business could be aligned to the overall business plans. To provide the organisation with unbiased information is central in all traditional Business Intelligence processes [34].

The main pillars behind "intelligence" remains the same on a strategic level, but there is a greater need to involve the whole body of the corporate knowledge to be competitive and mix the strategic positioning with more operative day-to-day issues solved by all personnel [3, 11, 29, 35, 36].

"My experience is that the more we try to institutionalize competitive intelligence, the less we seem to accomplish."
David Drew VP of IT 3M, CIO Magazine [4]

The term one-to-one has sometimes been overused, but still has a profound impact on how individuals interact with information, with peers within collaborative networks. Future information services should all include some form of personalisation [15]. The business case described in this paper has focused on how to provide the individual within the enterprise with personalised information. With individualised information services in a Business Intelligence context, every employee within the enterprise has the option of becoming a BI-specialist with their specific focus.

Large organizations continue to struggle with the fundamental issue of 'how do we know what we know?' [18, 37] Until recently, it was customary for the enterprise to place a higher value on explicit knowledge - whether codifying knowledge in manuals and procedures or capturing it in databases. However, a drive to increase the yield and return on investment of Information Technology is fuelling a growing recognition that experts and their tacit knowledge - skills, experience and 'know-how' - are just as important and indeed vital, to leveraging explicit assets too [38].

Expertise management is the task of brokering the right connections between people - the most valuable asset a company has - as well as information. Identifying the constantly changing knowledge held by employees is a vexing problem. Often staff members suspect that the expertise is available; they simply do not know where to look. In small companies, finding an expert can be as easy as asking a question over a cubicle wall, but in large, dispersed companies, numbers can easily hide the experts. The rewards of identifying and managing expertise as well as promoting collaboration are potentially the most significant the enterprise can capture and are equalled only in scale to the costs of failure when expertise is mismanaged or ignored [39].

With the BIC Ericsson has managed to cultivate and organise a living community of practice and interest on a global basis.

With present system functionality it is not easy to find an expert base solely on peer profiles as these profiles describe interests and not competencies. In many cases similar interest might be good enough as a starting point in the quest for knowledge. The main reason for this shortcoming is the content and information architecture within the portal, and it's lack of operational data. Business Intelligence professionals have done the collection and aggregation, and also sometimes analysis. They might have an overall strategic view on what the BIC should provide the employees with as an information service, but not any in depth operational knowledge within the context the individual employee works and acts. Even a successful site such as the BIC is still a sideshow for the larger community of the registered users, except the network of Business Intelligence professionals. The BIC is undergoing radical changes at present.

The design of BIC needs to embody operational information from the end-users, so that actual collaboration is possible, and the use will be on a day-to-day basis.

To be able to provide an individual information services in a Business Intelligence context, there is a need for an Enterprise Information Architectures [14] [40], that combines internal structured, semi- and unstructured information resources as well with more external information resources. In a large enterprise such as Ericsson this underlying information architecture is not a trivial task when deciding what internal information resources to include. The 3BI pilot has a similar concept, as the BIC, but is enhanced in that matter of internal and external integration of information, to be able to provide an enterprise information architecture that is relevant in day-to-day business operations.

To become organic in terms of empowered and vitalised knowledge users working as true information nomads in the future organic enterprise [2] there is a great need to provide similar features as it has been done in the 3BI-portal., such as possibilities of being aware of colleagues or relevant information by using activating techniques. The learning processes will not work without the information and integration into day-to-day business [13, 41].

6.1. Future research

Future research will include analysis of the intended business values of these applications with the actual impact they have on collaboration networks and communities as well as individual end-users.

At Ericsson this will be in the context to further evaluate the usage and the business values, whereas in the "3" business case the researchers will participate more on an action research basis [42, 43], and actually intervene in the change processes.

7. Concluding remarks

Business Intelligence should be seen as an individualised information service, and an integrated part of everyday life within a business, not a sideshow. Integration of internal and external sources is critical. Business Intelligence and Knowledge Management initiatives within an organisation should be fruitfully intertwined.

A Business Intelligence information service should both supply top-down editorial communication strategies supported by a content management infrastructure as well as more collaborative driven approaches.

Derived from the obstacles shown in the business cases and how they have used the technology at hand, there are some critical success factors to consider regarding the BI-professionals. The information and business intelligence specialists within the organisation should take on the roles and tasks of:

1. Source qualifiers and taxonomy professionals, to be able to provide value added services on top of the business intelligence information architecture.
2. Validate the quality of information.
3. Evaluate the usage, utilisation and user behaviours within the community of practice to be able to evolve with the ever-changing business needs of new information sources and taxonomies.
4. All editorial work should emphasize comment, link and categorize good examples provided automatic. This implies subjective opinions (such as is this good or bad; important or waste of time; is this piece of information old or new; has it happened before and so forth).

The proposed tasks for the BI-specialist stand in contrast to their agenda today, which is to write extensive in depth reports.

The organisational change processes need to overcome the barriers built on the traditional organisational behaviours regarding corporate communications and business intelligence. This is crucial for a successful implementation regardless of technical platform.

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