Managerial & Technical Insight in Knowledge Management

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Corporate Knowledge is an asset but its management is no trivial task. In this publication the voyage towards a Corporate Knowledge Management system for a large organization (more than 15000 employees and 1000 location sites) will be presented. Managerial aspects along with technical issues will be detailed. The project management techniques used, technical decisions, corporate strategy along with Business and Technical challenges accompanied by their resolution and courses of action will provide the guidelines for the successful implementation of a Knowledge Management System.

Introduction

One of the benefits of current technology is that it enables, especially corporations to accumulate large volumes of data which serve as corporate knowledge. However, accessing this knowledge is a challenge. The corporation must set objectives (conceptual framework), define the Knowledge Management methodology and provide employees with easy access in order for them to utilize this Knowledge pool [1]. Higher management commitment is essential for the successful implementation of knowledge management. [2], [3].

In an organization with more than 15.000 employees accessing the right information at the right time is essential, but poses several challenges [4]. Some of the concepts that need to be considered include, identifying knowledge sources, classifying information, cleansing metadata and identifying a presentation / searching mechanism.

This case study presents the implementation of a "Knowledge Mechanism" in a large organization (> 15.000 employees). It will be reviewed under the prism of Managerial and Technical issues identified and resolved. With respect to the managerial issues, higher management's commitment, resistance to change and personnel involvement will be discussed. Additionally, infrastructural technical aspects and issues raised by Variety will be addressed.

Knowledge is accumulated fast with respect to volume, constantly changes and comes in different forms. These characteristics, direct to the Big Data ecosystem.

Big Data is primarily defined in terms of V's, based on the first definition by Laney [5]:
Volume: Refers to the amount of data being created and stored [6] in the digital universe.
Velocity: In Big Data environments the speed in which data change is quite high.
Variety: This characteristic has to do with the data itself and the flavors it can pertain. Sensors, IoT (Internet of Things), database records, video and audio have different formats and standards, let alone the fact that in many cases alternative communication protocols must be used to disseminate the data streams.

Corporate sites, e-mails, corporate documents (policies, announcements, etc.), product definitions and brochures, corporate informational databases and Frequently Asked Questions come into perspective when Corporate Knowledge is investigated [7]. It is evident that these are stored in different formats and thus Variety, which constitutes the biggest challenge in Big Data environments [8], comes into play.

Identify The Need

During executive meetings, top and higher level management expressed their concerns that they were losing valuable time trying to access existing knowledge in the intranet such as consultation on legal matters, etc. without success.

The CIO called an IT meeting and expressed his concerns about the organization's knowledge management, with respect to presentation and search engine usability. The task of identifying state of the art technologies to address the issue was assigned to the IT Research and Development department.

Information Technology is an essential, but not sufficient, part of the knowledge revolution [9]. This is why the CIO also requested the involvement of several other departments.

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Embarking on a Trip Towards Knowledge

People are the main enablers in the Knowledge Management ecosystem and Information Technology is the fundamental tool [12].

An important factor, in the successful implementation of a Knowledge Management initiative, is the development of an organizational infrastructure which will facilitate the establishment of organizational groups whose members will have the necessary skills to create, distribute and prioritize the knowledge efforts [14].

In attaining the expected dissemination of knowledge and realizing the competitive advantage, the "Knowledge Refinery" process was exercised. This process includes the following five stages [15] (Figure 1):

1. **Acquisition**. Information and knowledge created within the organization alongside with external resources should be acquired.
2. **Refining**. Before storing knowledge, it will have to go through the process of value-adding, which includes cleansing, labelling, indexing, sorting, abstracting, standardising, integrating and re-categorizing.
3. **Storage and Retrieval**. In this stage upstream repository and downstream knowledge distribution should be bridged.
4. **Distribution**. The mechanisms to make use of the content and access the knowledge repository should be identified.
5. **Presentation**. End-users' knowledge capitalization based on the knowledge repository should be the ultimate goal. Mechanisms for flexible arrangement, selection and integration should be present in order for the environment to be easy enough for the users' to use.

Implementation Process

Implemented Solution
For the **Backend**, SOLR 5.1.0 indexing infrastructure mechanism was installed and customised whilst for the **Frontend** it was decided to utilise browser enabled technologies in an attempt to simulate the functionality of Google with which almost all users were familiar. JQuery, JSON and Ajax were selected.

Project Management
In delivering a system there are several project management techniques utilized within the system development methodology (SDM) with the Waterfall, Structured Model and Object-oriented Systems Development representing the traditional approach and SCRUM representing the agile – new generation – approach [25]. In realising the advantages provided by both methodologies the Water-SCRUM-fall methodology was employed, which is the reality for most agile organizations [27]:

- Self-Adjusting.
- Self-MonitoringExtended Involvement.
- Effective Resource management.
- Upfront work required for governance.

Building The "Knowledge Base"
In building the system the following areas were investigated and addressed:

- Indexing & Searching (SOLR)
- Access – Authentication & Authorization
- IIS Location Security
- User Interphase (UI)

Variety Issues
Variety is the extremely wide range of sources and data types that exist in the digital universe [28]. It is identified that Variety directly affects data integrity which in turn increases erroneous data [6]. The following areas were identified to be affected of variety manifestations:

- Sources
- RDBMS
- File System
- Data Types

Although the Variety issues might seem trivial, it is important to understand that in most cases the problem was that data were missing or data were not displayed correctly (malformed HTML) thus severely damaging the systems credibility.

User Acceptance Test (UAT)
It is difficult to define the UAT phase on an on-going process. Different teams on different sprints were developing and constantly testing their partial deliverables. It was very important that independent interdisciplinary teams with the use of sprints tested all components and actually redesigned and adjusted the technical requirements. UAT and testing had the following phases:

- System Test.
- Functional Test.
- Performance Test.
- UI ease of use.

Once the independent components were tested, in many cases, based on the results, the actual design and infrastructure were redesigned. All parts were put together in formulating the final system. At that stage an interoperability / integration test was performed just to make sure that components cooperated efficiently and the system was handed over to the users. In order to avoid any implementation failures the project team decided that the "go-live" process would utilize a phased-in approach

Going Public
The project team had managed to succeed in developing a high-tech project within budget and in time. Users were educated through an eLearning system.

Current Situation

Knowledge was identified to be vested on different departments based on their expertise. The information and respective knowledge, was in departmental "silos" since interdepartmental exchange of information was limited. It was also recognized that each department utilised different means of storing and communicating knowledge.

Legal Department
Requests are addressed to the head of the department and then assigned to respective lawyers by forwarding the request mail. Each lawyer in turn will reply to the initiator of the request with the appropriate proposal. In this case knowledge is lost.

Information Technology Help Desk
Every request is handled through a Ticketing system. If the agent considered this was an "important issue," based on his experience and the propensity of reoccurrence, he would log the problem and its accepted solution into a WIKI developed and maintained by the department. This practice resulted in frequent knowledge loss since recording was vested upon agents.

Commercial Help Desk
Requests are sent via corporate e-mail to a shared mailbox which is viewed by the department's. All requests are recorded in a spreadsheet in order to; a) Enable employees to know the next request from the "stack;" b) Serve as a basis for further analysis. Reoccurring requests are investigated upon and a Frequently-Asked-Question document is formulated. FAQ knowledge database is revised for outdated content. In this case the process of knowledge management is more structured and knowledge is disseminated across the organization. Structure, classification, relevancy and use are monitored and maintained through a structured process.

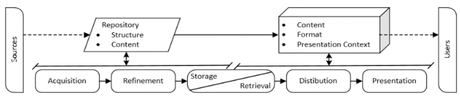

Figure 1. "Knowledge Refinery" Process

Technical Infrastructure

In order to identify the system to be implemented the following options were examined: a WIKI, a Content Management System (CMS) and a Search Engine.

The WIKI was found unsuitable because in the corporate world wikis are utilised in ad-hoc problem solving, whilst they are considered a misfit for applications that exhibit characteristics like formalized content and infrequently changed content [16]. One of the most important features presented by CMSs in the corporate world is security and accountability since it is of utmost importance for the organization to know when a document was changed and by whom [17]. However, a CMS content should be authored and in this case it was imperative to utilize existing resources.

The actual process and variables attributing to the selection process were mapped on a balanced scorecard which was used to rate the available options. Almost all systems in the Gartner Magic Quadrant for Enterprise Search [19] and the "Top" Open source Big Data Enterprise Search Software [20] were addressed (see Figure 2 & Figure 3) in identifying the systems to be further investigated and POCed.

The Investigated Systems
A Proof-Of-Concept (POC) was implemented and the following aspects were evaluated:

- Product Installation
- Product Features
- Interoperability (Back-End)
- Extensibility
- User Interface (Front-End)
- Support

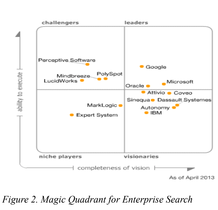

Figure 2. Magic Quadrant for Enterprise Search

1.Apache Solr
2.Apache Lucene Core
3.Elasticsearch
4.Sphinx
5.Constellio
6.DataparkSearch Engine
7.ApexKB
8.Searchdaimon ES
9.mnoGoSearch
10.Nutch
11.Xapian

Figure 3. Top 11 Open Source Big data Enterprise Search Software

Conclusion

In implementing an enterprise wide Knowledge Management system the organization adhered to the fundamental rule of Strategic Information Systems Planning (SISP), which is to identify a prominent system and cater for implementation [29]. Although the system encompasses state of the art technologies, the project was a solution to promote corporate welfare by disseminating knowledge.

By utilising a combination of Waterfall and SCRUM, all corporate, compliance and governance policies were followed and agility was also added. With the use of SCRUM the project team managed to have continuous control over frequently changing requirements. Additionally, an early-warning system was set in place to identify project bottlenecks and dead ends. With the independent multidisciplinary teams implementing, testing and evaluating the outcomes constantly, the team was able to adjust and align the system to the user requirements.

The technical infrastructure challenges were significant due to integration and cutting-edge technologies employed. Nonetheless, the team was mostly engaged in resolving business issues such as which sources should be used, resolving quality of Data issues and data classification and presentation. Furthermore, in managing interdepartmental involvement, higher-management sponsorship and involvement played a crucial role.

Another non-technical issue was "resistance to change." People tend to be reluctant to use new systems even if the new systems "make their lives easier." In this case the organization involved a substantial number of personnel in the UAT process thus enabling easier adoption to the system along with the important employees' involvement and feedback.