EXTENDED CORPORATE MEMORY AND WORKFLOW SYSTEMS

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ABSTRACT

While workflow management systems provide a rich framework for capturing organizational and use case data key to model enterprise corporate memory, it is considered incomplete because it fails to integrate informal communication and data that contributed to exception handling and decision making. Our research focus on providing a framework for integrating social tools like internal notes (IN) with the formal workflow system. This interface integration makes the social tool IN “workflow aware”. This leads to an extended corporate memory that is more complete for decision making.

Keywords: Workflow systems, Flex-Flow, Corporate Memory, Business Process Reengineering, Social tool.

1. INTRODUCTION

Corporate managers are becoming increasingly aware of the need of corporate related knowledge, in order to guarantee good performance. This knowledge, commonly known as corporate memory, is defined in [1], as an explicit, disembodied, persistent representation of knowledge and information in an organization. In [2], corporate memory is seen as information that a corporation (organization or business) creates which is of value for re-use. The author of [2] also argues that the management of corporate memory is a task of recycling information.

Addressing the cost of losing corporate memory, the author in [2] says that, “In addition to the expense caused by staff time spent searching for lost documents, when staff member needs information that is not readily available, entire operations may stop while that information is sought or recreated”. This shows, clearly, the necessity of corporate memory for effective corporate management.

Our research focuses on the integration of informal communication in an environment that uses workflow systems. Flex-Flow is our implementation for workflow system [3-6]. This system provides us with an opportunity to examine closely the social and informational aspects of informal communications, and explore the links that may exist between work
processes, corporate memory, and decision making. Our research provides a classification of corporate memory in workflow space which includes both formal explicit and informal data. We also show how workflow environments in general and Flex-Flow in particular, facilitate the capturing and integration of informal communication and ultimately render it relevant to decision making.

The paper is organized as follows. Section 2 presents the related works, and section 3 describes the general process. Section 4 shows how Flex-Flow can be used as a base for corporate memory. Section 5 explains the need to extend the current version of Flex-Flow to include informal communication. Section 6 shows how the augmented system, which is the traditional workflow model, plus the new social tool, becomes a richer system in terms of corporate memory and decision making. Finally, section 7 concludes the paper.

2. RELATED WORK

In [8], the authors present a workflow management application that collects information-rich business process documents, stores them in an organizational memory system, and informs staff and management in various situations. In fact, they have implemented an integrated workflow-centric knowledge management solution using R/3, SAP Business Workflow, and IXOS-ARCHIVE at a large German media company. The implemented solution helps specifically to optimize the company’s invoice verification process, to reduce the amount of paper and shelf space needed, to speed up the manual archiving procedure, and to increase the efficiency in the accounting department. Authors claim gains in organizational efficiency about 50%, and organizational effectiveness improvement through better information distribution and knowledge access.

In [9], it is suggested a combination of workflow management concepts and the notion of organizational memory information systems. In fact, they propose to create an evolutionary workflow management system using an organizational memory storage component consisting of a workflow case base to save the workflow lessons learned, and storage for the general domain knowledge of an enterprise. To illustrate the system functions, the authors used the example workflow of inquiry/proposal process of a roller bearing manufacturer.

Like [8] and [9], our previous work [4] uses a workflow approach and we presented an example of workflow based corporate memory at the Centre Régional d’Investissement (CRI) in Marrakech, Morocco [10]. In fact, we have been involved in the implementation of a platform called Flex-Flow\(^1\) for the general process at the CRI. This implementation also needed a phase of business process reengineering [5], [6], and improvement [3]. To emphasize the necessity and the utility of corporate memory, we showed how this latter can be used in decision-making [4]. However, our research in [4] was only concerned with explicit information captured and defined as organizational and use cases memories. We acknowledge that there is another type of information of informal nature that can contribute in achieving a more complete corporate memory.

Our contribution in this paper is in the context of informal notes created by users to help execute organizational processes. Informal, in this context, does not refer to the formatting or layout of the notes; rather it refers specifically to the lack of formal organizational process leading to the creation of these notes. Our informal notes fit the definition given in [11] in that they are not generated by a formal organizational process but are created by individuals

\(^1\) Flex-Flow was initially a workflow architecture allowing dynamical changes [7], proposed in 1995. The recent work [3-6] is a new architecture for a commercial workflow system also named Flex-Flow.
without managerial directive. However, our informal notes are closer to what is commonly known as “yellow stickers”, which are typically shorter and less structured and may concern how to handle exception cases, like missing information, delays, deadlines, etc.

These informal notes are explicit and can serve as complement to the formal organizational knowledge described in [4]. We were essentially inspired by the knowledge in the “sticker notes”. So we extended the workflow system [3-6] with new modules and interface that mimics the use of the popular sticker notes.

3. DESCRIPTION OF THE GENERAL PROCESS

Marrakech, Morocco, has experienced a tremendous growth in investments in the past few years; which has essentially increased the number of work cases handled by the CRI. Furthermore, the concept of ‘guichet unique’ has been introduced. The goal of this latter is to facilitate, for potential investors, all administrative procedures for investments by creating a single institution that communicates with the investor. This institution (CRI) is now entrusted to coordinate all the administrative procedures with other government entities to execute the proper administrative procedure and facilitate this process for the investor. One of these procedures, the attestation of non-agricultural vocation (ANAV) procedure, was the focus of our precedent work [5], where we emphasized the need of business process reengineering in order to increase customer satisfaction, using workflow approach.

Figure 1. Schematic representation of the general process at the CRI of Marrakech, after streamlining the procedure.

In the current implementation of the general process (see figure 1), at the CRI of Marrakech, we have created the role of “manager”; this latter is entrusted with the creation of a new project for any new investor, before triggering any procedure. This step, on which lie all the procedures, is purely internal, and streamlines the works that need to be done for any project, before executing any administrative procedure. When creating a new project, all needed data about the investor and investment are stored, and a unique² project identifier (ID) number is generated by the system. This ID can be used, later, by the investor, for inquiries

² As far as the triggered procedures belong to a same domain of activity; otherwise, another ID is needed.
and triggering of new procedures, and by the CRI, for tracking and reporting. After the achievement of this initial procedure (project creation), the investor can trigger different procedures, without need to supply again the above data. Hence, the information redundancy has been eliminated. This fact is emphasized in figure 1, where activities $A_1$ to $A_R$ are the same for all procedures. After these common steps or activities, any specific procedure is completed depending of its nature (for example $A_{1R+1}$ to $A_{1M}$, for the first procedure).

4. **FLEX-FLOW AS A BASIS FOR CORPORATE MEMORY**

The goal of this section is to explore Flex-Flow, in order to show how its architecture can serve as a base for corporate memory. We divided corporate memory into two types [4]; (1) organizational memory, and (2) work cases memory. The first one provides us general information about how an organization should work (or more precisely, how it is configured to work), while the second one emphasizes how it actually works by giving details about current work cases.

4.1. **Organizational corporate memory**

This is the type of information provided by workflow systems, in general, and Flex-Flow, in particular, before running any instance or work case. In general, it shows how an organization is configured to work in terms of its mechanisms and policies.

Figure 2 gives the conceptual architecture of Flex-Flow, showing the relationship between Flex-Flow conceptual entities. From this model, one can see that Flex-Flow allows triggering many procedures in parallel. One procedure can have many activities, as one activity can be part of many procedures. Furthermore, one role can be responsible of many procedures. Many actors can play the same role, as one actor can play many roles. One role can execute many activities, as one activity can be executed by many roles. The activities within a procedure are executed within certain precedence. An activity can use many data, as one data can be used by many activities.

![Diagram](image.jpg)

Figure 2. Entity relationship (ER) diagram for the organizational structure of Flex-Flow’s corporate memory.
Before the execution of any work case, some key information about the organization at hand, which is the CRI of Marrakech, is available. Notably, one can have access to information about roles and access rights, existing procedures, its activities, persistence of the system, traceability, alarms settings and deadlines, and relationships among procedures. Our previous work [4] discusses these data in greater details.

4.2. Work cases corporate memory

Work cases corporate memory is defined as the collection of information related to instances or use cases that were run, or are currently running, in the system. Figure 3 gives the entity relationship (ER) diagram of corporate memory use cases structure. Once a new project is created and identified by a project ID number, all data related to that project becomes available for future re-use for monitoring and decision making. Through time, we end up with a work cases memory such as average number of work cases handled by the system or roles, for a given period, time of execution of a work case, data about a specific investor and procedures triggered investments types in a specific community, industries, jobs projections, etc. Our previous research [4] discusses this data structures in greater details.

As an example, figure 4 shows a screen of information related to an investment program giving many details. Use cases memory is derived using such kind of information.

Figure 3. ER diagram for the use cases structure of Flex-Flow’s corporate memory.
Informal communications are a significant component in a work environment. In fact, these social interactions might be a key ingredient for executing formal processes as they serve in addressing unusual situations and solving problems, and coordinating exception handling. This section explores our extension of a workflow system by introducing a social space for informal communications. In our case, we developed a software module, called Internal Notes (IN)[12], to integrate informal communication in the formal workflow system.

5.1. Internal notes and workflow awareness

IN is a software module that we have implemented to interface with our current workflow system, Flex-Flow. It is essentially a communication tool which allows all the users of the system, regardless of their roles within an organization, to write up notes to any other user in the system. The notes are intended to mimic “yellow stickers”. In fact, our objective is to have internal notes replacing “yellow stickers”. IN module is integrated with Flex-Flow so that it is aware of the system organizational and use cases information. Practically speaking, when IN is invoked, it automatically knows about current use case or the project ID, as well as the roles, and procedures specified in the system. And these data provides good contextual information for the notes.
In summary, the workflow allows internal notes to dynamically pull organizational and use case information, to create a pertinence link between some informal communications and the rest of the workflow information. Figure 6 provides a summary of the above information flow.

5.2. Making informal communication relevant to the formal system

Once a note is written, a note ID is created. This note ID is determined to be relevant to the project ID and procedure ID as shown in figure 6. This essentially makes the note ID relevant to all Flex-Flow user interface instances that pull that project ID. The user can then select it, to read the note and contribute to it if necessary. Hence, our new module allows us to selectively integrate relevant informal communication to the formal workflow system, Flex-Flow.
5.3. The making of social corporate memory

Social memory in Flex-Flow is a collection of information that is detected, collected, distilled, and rendered pertinent to the processes defined by the Flex-Flow system. This information is collected from a variety of so called “social tools”.

Our implementation of social tool is IN which provides Flex-Flow users with an informal communication space. The workflow awareness provides our extended system with the ability to capture unstructured and distilled informal communication and making it part of the enterprise corporate memory. Without the relevancy link, this social memory could have been lost.

[Diagram of ER diagram for the social structure of Flex-Flow’s corporate memory]

6. How the extended corporate memory contributes to decision-making

In this section, we will investigate how the corporate memory achieved with Flex-Flow, and more precisely, how organisational data, use cases data, and social data can be used in decision-making.

Flex-Flow provides the mean for consolidating related information, which is critical for accurate information and decisions regarding a new project. In fact, when a new use case comes in, the first question that comes to mind is whether it needs the trigger of a new project, or it is related to an existing project. If the investor is new, a new project is created. If the use case is related to a pre-existing project, it is automatically added to this project identified by an ID number provided by the system. In this case, the project automatically benefits from various information already stored and decisions already made with regard to previous procedures. This historical data provides tremendous efficiencies in terms of context, classification, and decision-making.

In the event that a given investor that already has ongoing procedures or businesses, want to obtain permission for another investment. Based on the list of all procedures triggered by this investor, the demand can be accepted or rejected. For example, it can be decided that one investor should not have more than a given number of permissions, for the same demand, in
order to avoid a monopolization, which in turn can cause a problem, if this investor runs into financial difficulties. This aggregate risk assessment will not be possible without use cases data.

This aggregate risk assessment is also important for the state decision making as it needs to insure that basic infrastructures can support the cumulative projects it authorizes. At the same points the risks of imbalances can outweigh the investment opportunity. Based on the above information, the CRI can accept or reject a request. This was case of when at one time the government overlooked the aggregate risk of water consumption which results from building too many golf courses.

The investor, when he is engaged in a project and to maintain the various incentives that the state provides, must respect some specific deadlines with regard to the project execution. Sometimes, the investor encounters some extraordinary circumstances which block the execution of the investment project. For example, sometimes, there are strikes in some sectors, which present a hurdle for the investor to meet a specific deadline. In this case, we see some informal communication between project chiefs and management. In fact, this might result in a recommendation for an extension of the deadline, in the form of a paper IN. Management believes that the electronic form of IN will prevent loss of this data, provide continuity of the process and guidelines for future decision making.

Another example is when an investor makes an agreement with the state for a specific investment, and the state would provide incentives such as land for a hotel resort. Later, the state found out it is politically sensitive to move some villagers from that land to accommodate the investment project. One can imagine how many informal communications there will be between the project chiefs, and management, for providing extensions of deadline and exploring options with the investor and the state to overcome this issue.

7. CONCLUSION

Corporate knowledge is becoming increasingly critical for guaranteeing good performance and continuity of an enterprise. While workflow systems provide a rich framework for capturing many organizational and use case data for the enterprise, they are however considered incomplete because their formal framework does not provide means for integrating informal communication and data that contributes to various exception handling and decision making.

These informal data may have existed in some e-mails, verbally, or simply in some sticker notes. But for the use case handler, it is information that is not readily available when it is needed, or it is simply lost. Our research focused on the integration of internal notes, our electronic version of sticker notes. The IN application provided workflow system users with the forum to write up a note and make it relevant to a specific use case or process. This note could be a simple instruction, a guideline, an exception, or a resolution. Whatever the case is, the note become relevant to some organizational and use case data in the formal workflow system, which will ultimately allow it to contribute to decision making along with formal system.

We intend to extend our research to provide more classification for the nature of the notes. For example, we would like to help the users distinguishing between an issue, a guideline, and a resolution. We are also planning to study the actual usage of the tool by the workflow users and report on our findings.
8. RÉFÉRENCES


Mohamed El Khadiri is a system architect with a master degree (1995) in workflow systems from University of Colorado, USA, and currently a PHD student at Cadi Ayyad University. He previously worked at Gemstar-TV Guide Corporation as vice president of technologies, and at Echostar Communication Corporation as Director of system engineering. He was also a chief architect at Disney/ Americast, and R&D manager at US-WEST-Advanced-Technologies. He was also a researcher at Argonne National Labs, US Department of Energy. He is currently the director general of Applied Business Solutions. He has also published in various topics such as workflow systems, e-governance, corporate memory, business process reengineering, and agent architectures.
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