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SOCIAL INFORMATION SYSTEMS ENGINEERING: FROM DATA TO KNOWLEDGE NETWORKS

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Abstract

The Information System representation is moving in a conflicting direction with organisations evolution, which have to be more accessible and transparent for the external environment in order to be able to anticipate on the market moves and trends. The existing separated layers between internal users and end products or services users are harmful to the normal business process continuity. With the increasing use of web 2.0 tools and platforms, the complete Information system analysis and design approach has to be rethink in order the include this new fundamental subpart inside of it. Several approaches and disciplines are attempting to resolve this issue varying from the services approach (starting from SOA and ending by the services science) to the knowledge pattern approach (based mainly on Information systems cartography). The social knowledge pattern (SKP) is a set of common behaviour realised by a networked community and based on the knowledge that they are sharing. The SKP are useful for detecting global users trends, formalising the knowledge exchange and to define the existing interactions between the different system users. This paper considers the problem of the knowledge integration through the SKP based on services approach.

Keywords: Social network, service, Knowledge pattern, IS cartography.

1 INTRODUCTION

Along with the extensive use and deployment of Information Systems and Software tools inside organisations, the environment of these organisations have been compacted to their internal environments' with some standalone interactions with the exterior. The existing attempts targeting to make these internal systems more interacting have focused on their interoperability and data exchanges. In fact, most of these existing systems are data oriented and are focused on the business processes or business services dealing with these set of data. Moreover, with the security issues, Information systems tends to be more and more closed to the external environment and hermetic to it, in order to prevent any intrusion or malicious use (*Katherine 2007*).

On the same trend, the popularisation of preformatted ERP and their enhanced accessibilities (ex: SAP business one), has contributed actively to the shelving of major users of the information systems by confirming them as end users and excluding them from the global decision making process. In fact users are faced to a set of defined process and data encapsulated in different functional silos, that still inaccessible to be modified or rearranged for a better suitability or to integrate home made procedures. This homogenisation of information systems has engendered a lack of flexibility and by the way disabling all incoming initiatives and innovation.

The IS (Information System) representation is then moving in a conflicting direction of organisations, which have to be more accessible and transparent for the external environment in order to be able to anticipate on the market moves and trends. Even if many of these organisations have integrated different knowledge strategies and means inside of their systems, they still focused on their core environment instead of being spread and opened to external use. Moreover, many of these systems are built upon a functional multilayered approach. The major defects of such approach are system inflexibility and knowledge loose. In fact, such kind of systems locked the value creation process by making the interaction in a one-way sense. System users can hardly add functionalities, process, know how or data that are not conform to the system data layout. By the way, the integration of knowledge collected from external users is hardly done since such kinds of knowledge is usually from the outside specified boundaries and often presented as knowledge fragment that have to be assembled or rearranged to create an add value for the organisation.

In this research paper we addressed the issue of designing Social Information Systems (SIS). We briefly introduce the social networking phenomena in the first section and the existing service SA&D (System Analysis and Design) approach. Then we present the service cartography for Social Information systems design. And finally we present a first classification approach of social knowledge pattern.

2 SOCIAL NETWROK TREND

Today, with the increasing use of social networking tools, and the web2.0 users centric web applications' (blog, buzz, forum, virtual communities,..), a large community of consumers and "susceptible consumers" are forming a valuable panel of users. This panel is representing a huge amount of information and knowledge. For example, the most flagrant communities that have succeeded to exploit its knowledge and its know how, is the open source community. Due to the low level of satisfaction of some OS (Operating System) users and agreeing with an innovative idea of a free and independent OS, members of this community have been directly implicated in the creation, updating and promoting their own product, which starts today to be a serious concurrent of the

Microsoft OS. With the possibility offered today to web users to set up easily their own community federated by the same idea, the number of networks have exploded and is no more focused on IT products or services but concerns a large range of them.

Social networking is the most significant case of this expansion. In fact, in recent years online social networking has moved from niche phenomenon to mass adoption. The rapid increase in participation in very recent years has been accompanied by a progressive diversification and sophistication of purposes and usage patterns across a multitude of different sites (*Ralph 2005*). Social networks provide an online private space for individuals and tools for interacting with other people in the network. Social networks help people find others of a common interest, establish a forum for discussion, exchange information and knowledge (*Yong-yeol 2007*). The most important functionality is the offered possibility to create or to join a users community federated by the same idea, ideology or opinion. In the same social network, different trends can be detected. These trends vary depending on the federated subject or the exposed opinion. Most of the service or product's oriented communities are dedicated to collect the best practise of use or management, the general opinion about the presented subject, the improvements that can be done and experiences related to it (*Bryant 2005*). We called them Customer Social Networks *CSN*.

We easily distinguish two kinds of *CSN*: official and informal. Many organisations have adjusted their marketing in order to take into account this new way of interaction with their customer by creating their own social network around their products or services. In this case, the main goal of such *CSN* is usually the advertisement. In the case of informal *CSN,* the community composing is usually federated by an idea or an opinion about the product or the service or the brand.

2.1 Information systems and CSN integration: the services approach

The growing IS complexity and the requirement for a fast evolution and adaptability with the changing environment are the most important and recurrent issues inside organisations. The legacy systems are often made from several subsystems usually coordinated and integrated only by using technical means. Existing trends, design methodologies, urgent requirements are commonly invocated in order to justify such complex IS situation. In fact, results of such approach are often visible whenever the organisation required a combined evolution of two or more subparts. Untangling data flows, process calls, message buses, connections is usually non exhaustive and the extracted part is assimilated to the visible part of the iceberg. The hidden part is typically composed from data redundancy slots, hidden process, integrated business rules and even IS subparts. More ISs are growing and changing fast, more the complexity of making them evolving is increasing with the risk to undermine the dynamic equilibrium. In fact the business knowledge is heavily encapsulated and spread over the legacy IS. Any evolution of business process, normally require an extraction of the targeted processes and the projection of the new rules and knowledge inside of these processes. Unlikely, such extraction is actually hard to carry out, due to the different layers composing the IS.

As explained above, the system evolution that should be carried on according to the business process evolution is not always realistic or takes a long time to be settled. The evolution process has been carried on for a long time by building and adding new subparts, which has increased the system complexity and so, the system evolution. In fact, the system evolution contains a recursive impact. Considering the system as a set of processes slots is no more viable and should be urgently considered in order to avoid the global chaos.

Recently, a new design philosophy based on services concept has emerged. It aims to reduce the complexity of IS by considering services instead of data and functional silos. The services approach firstly used with web services, then evolved in an architectural approach with SOA is now gaining maturity and actually considered as a new alternative to the traditional existing methodologies. In fact, the emergence of SSME (Services Sciences Management and Engineering) that is devoted to the use of services approach for the design and implementation of IS, is a clear proof of this new trend *(Maglio 2006*).

A service in a common definition is any used or deployed mean that aims to help accomplishing a task or a group of tasks (*SpohreR 2007*). A service from the IS view is a set of operations or processes that collaborate internally and in transparency way to find, store, treat or deliver a requested data. A service approach is then the reorganisation of business processes in a set of services that are supposed to be collaborative, instead of the existing standalone functions silos.

A service is then the representation of business knowledge surrounding a particular domain. This supposes that the service is a set of rules, strategies, processes and information that are encapsulated and represented in a transparent mode for other services. The service is designed and conceived regardless of data. In fact, a service is supposed to be interoperable and enough flexible to be capable to deal with different data sets. Such service can be locally used, externally called or a mixed service. We define a mixed service as a set of complementary processes, containing some local process that need to call external processes in order to accomplish a requested task.

3 SOCIAL INFORMATION SYSTEMS DESIGN BASED ON SERVICES

Some service criteria are mandatory in order to enable further evolution and ensure that the use of services combined with legacy systems is not going to add a new complexity level inside the IS. These criteria are un-exhaustive and are:

- Granularity: a clear distinction between operation, service and business process should be established. This granularity cannot be achieved without considering the knowledge surrounding the organization environment. Indeed, what is considered as a service for an organization can be considered as a business process to another one. Mainly, all shared tasks or common activities between different business processes should be considered as services.
- Completeness: the service always produces the correct information to a query. The query can be an external service query or a direct user query.
- Autonomy: the autonomy of a service is closely linked to its flexibility. The service do not depends on existing exchanges contained in its environment. It has to be complete and entire. By that we mean that a service is conceived in order to contain to global set of process and information needed to its running.
- Continuity: the service should be able to integrate a complete continuity plan and rearrange its set of functionalities according to its environment and available data and process. What is considered in IS as a business continuity plan should be integrated inside the service module and has to be compliant with other services continuity plans.
- Flexibility: a service should be enough flexible to be integrated inside a set of other services or to run in standalone mode.

- Universality: a service should be universal. It should regroup the entire set of functionalities that can be applied in its context regardless of data requirement.
- Traceability: the frame of a service should be well specified and clear. To avoid redundancy and the functional silo problem. Any information or data delivered by a service should be easily identified and certified.
- Security: the service has to be sure and safe. Embedded business rules and security procedures have to be compliant with the global security procedures. These rules have to be presented under micro service form. This form has to obey to the above specified characteristics.

3.1 Service cartography:

By service cartography, we mean a global vision on the service data structure combined with the different functions and procedures that manage it or simply use it. The data structure is not considered only as the level of data storage but must integrate the level of data integrity constraints, the data restriction rules and the data behaviour. Functions and procedures represent the business core, business constraints, users and roles constraints and applied security rules. The result of the service cartography is a set of different views that if combined together offer a more global vision of internal data structure, access rules, procedures, integrity, business and security constraints.

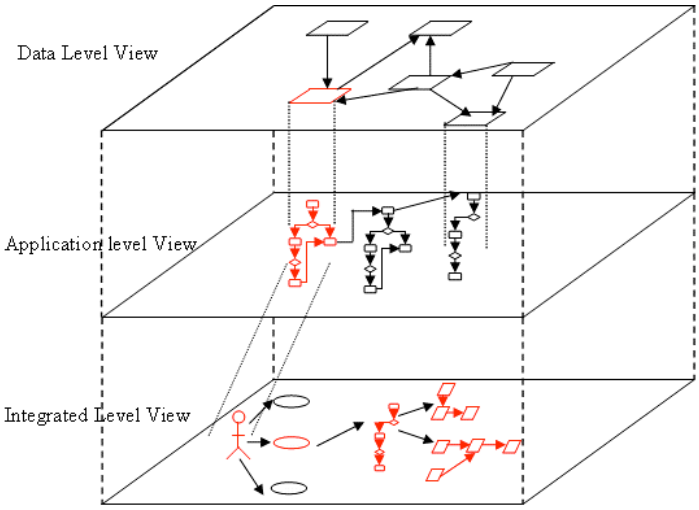

Figure 1. Service cartography

Information systems based on a services collection present a high level of end users integration. In fact, considering the users requirements, behaviours and results will enable an easy evolution of the IS from the basic and standards forms to a multilayered form. This form is more mouldable since users can enhanced it by customising it. This includes, but is not limited to, the possibility to add, modify and delete a service from/to the existing set of services. The knowledge generated from the *CSN* is then easily configurable and exploitable by the IS.

3.2 Social Knowledge Pattern:

We define the knowledge pattern as a set of common knowledge shared between the community and which is related to one or more products or services. This knowledge can be dispersed over the network or congregated under a specific community. The social knowledge pattern (*SKP*) is a set of

common behaviour realised by a networked community and based on the knowledge that they are sharing. The *SKP* are useful for detecting global users trends, formalising the knowledge exchange and to define the existing interactions between the different system users. We define the *SKP* as a set of interaction patterns between the various participants in the life cycle of services or products. These patterns initially treat the extracted knowledge from each one of these participants (*Butler 2005*). Then, these patterns will be the intermediary of communication to establish a form of formal communication between them to allow a better comprehension of the subject and thus to ensure a better continuity between the various participation level. The *SKP* will defined based the following hypothesize:

- Knowledge location: depending on the nature of the *CSN* the knowledge can be dispersed or regrouped. This network of knowledge has to be underlined and extracted from the global social knowledge.

- Permanent or temporary: the knowledge can be in two kinds. The permanent knowledge is a confirmed and approved knowledge. The knowledge is rated according to the level of approval. The temporary knowledge can be either an underrated knowledge or invalidated knowledge.

- Weighting: it represents the importance of knowledge in a network or of a subpart of the knowledge compared to the core knowledge. This subpart will be rated according to its significance and requirement.

- Use frequency: it represents the frequency of display and comment on this knowledge. This should be done in accordance with the age of the knowledge. The ratio "*use frequency / age of knowledge"* indicates the real value of the frequency. Higher the frequency is more this knowledge is used.

- Update frequency: it represents the frequency of update of the knowledge. Two ratios are examined at this level: the scale of the update which is equal to the "*sum of update * weighting / core knowledge",* and the pertinence of the update which is equal to the "*Update use frequency * scale of update*". These parameters provide us with a better understanding of the knowledge evolution and integration.

- Network performance: depending on the network performance, the value of its contained knowledge can vary. More the users are involved in knowledge upgrade and insertion more the network is influent. It depends also on the number of users registered in the network. The ratio is equal to *"insertion * participant/ registered-users*". The higher this ratio is the, more influent is the network or the sub-network.

4 CONCLUSIONS

Social networking is growing fast and still under used by organisation. The integration of knowledge generated from these networks is a hard task, and the legacy existing IS are hardly evolvable due to their lack of flexibilities. The new existing approach of design based on services is helpful for this task. The possibility of integrating and composing with this approach, new services inside of the IS, can be used to integrate and to customise the network generated knowledge. In this rapid moving business environment, where knowledge is central to survival, a better integration of customer's expectations and feedbacks is the means forward.

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