Research Roadmap for the Enterprise 2.0 – Issues & Solutions

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Abstract: This paper describes a research roadmap for the Enterprise 2.0 aka Social Enterprise. This roadmap consists of issues that hinder the Enterprise 2.0 adoption and identifies some solutions that could overcome these issues. In response to these issues, three research directions are developed and focus on how to design, coordinate, and monitor an enterprises business processes from a social perspective. The social design injects social elements into business processes. The social coordination addresses conflicts that affect these processes successful completion. Last but not least the social monitoring tracks the messages that are exchanged during this completion.
Keywords: Business process, Enterprise 2.0, design, coordination, monitoring, and Web 2.0

1 Introduction

Enterprise think tanks warn continuously decision makers of the negative consequences of the informal world on their businesses. Examples of consequences include the emergence of new work practices that make tracking "who does what" a challenge. The informal becomes omnipresent when the formal (associated with structured business processes) turns out to be inefficient (e.g., slow) and/or unusual/unforeseen situations (e.g., market fluctuations) require quick attention.

Today's enterprises struggle with the increasing number of events, stakeholders, regulations, etc. that they have to wrestle with in a highly competitive market. Subject to capturing the informal successfully, which is a challenge by itself, enterprises should think of tapping into the informal to develop new business models, understand market trends, and open up new communication channels. Social analysis techniques seem suitable for capturing and analyzing the informal. Two research trends discuss this suitability [7]. The first trend uses sociograms to represent graphically informal network (i.e., pattern of relationships between individuals in a group that express who prefers to be with) and also applies graph theory to identify a network's sociometric features (e.g., density and centrality). However, this graph-based representation is syntactic lack of semantics and limited use of the relations between people like trustworthiness. The second trend stems from Web 2.0 emergence and

is exemplified by social networks and wikis, for example, with rich structured data that incorporate semantics.

Building upon the second research trend that advocates for Web 2.0 (e.g., social networks, blogs, and wikis) social software platforms have become one of the preferred communication means between people. The social "fever" has caught every single activity of people's daily life ranging from sharing live experiences online to seeking feedback on any matter like what to wear for a special occasion. Web 2.0 technologies are helping set the stage for the Enterprise 2.0 (or social enterprise) that represents a fundamental change in how today's enterprises should operate. Contrary to traditional enterprises with a top-down command flow and bottom-up feedback flow, these flows in the Enterprise 2.0 cross all levels and in all directions bringing people together for the development of creative and innovative products and services.

Despite this social "fever" and growing interest in Web 2.0, enterprises are still unsure about its return-on-investment [21]. A recent study by Gartner reveals that "...*many large companies are embracing internal social networks, but for the most part they're not getting much from them*" [6]. Social software does not work like an enterprise-resource-planning application where procedures are defined and employees are told to comply with them. Employees' commitments to using social software are a critical factor to success, i.e., employees must opt-in rather than forced.

This paper suggests a research roadmap on the issues and solutions that Enterprise 2.0 might face and should seize, respectively. McAfee was the first to introduce the term Enterprise 2.0 as the use of emergent social software platforms within or between companies and their partners or customers [16]. According to blueKiwi, although enterprise social software is the fastest-growing software market (24.4% growth according to Gartner's Forecast Analysis [5]), it should work hand-in-hand with regular business processes to ensure Enterprise 2.0 success [2]: "*Enterprise 2.0 only works if it is part of a business process. It's great to work in new ways, but it's not enough. To make it real, it has to be very practical*".

2   Issues hindering the enterprise 2.0

From a social perspective the management of an enterprise's Business Processes (BPs) requires looking into how Web 2.0 impacts the design, coordination, and monitoring of these BPs. Each of these aspects raises different issues that need to be addressed in order to ensure a smooth integration of Web 2.0 technologies into the enterprise operation. Fig. 1 illustrates these aspects and their potential links.

BPs social design: The lack of design approaches that could assist process engineers capture and model how BPs should connect to (or interface with) Web 2.0 applications is not helping enterprises adjust their processes in response to these applications' requirements nor capitalizing on these applications' capabilities as well (e.g., reaching out to more customers, collecting customers' online comments, and profiling customers). A recent study of 1,160 businesses and IT professionals reveals that "*only*
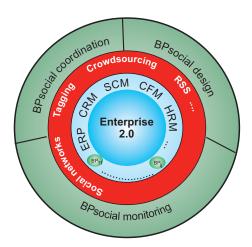
Fig. 1. Enterprise 2.0

22 percent of organizations believed that managers are prepared to incorporate social tools and approaches into their processes. Moreover, two-thirds of respondents said they were not sure they sufficiently understood the impact these technologies would have on their organizations over the next three years" [23]. Web 2.0 applications are open (not restricted to any specific community), loosely controlled (anyone can contribute and challenge existing content accuracy), and dynamic (members sign-up and sign-off without prior notice). Since Web 2.0 applications are usually managed independently from an enterprise's assets, their smooth integration into BP design and execution is a challenge. Describing a BP's tasks and their data dependencies is not enough to achieve this integration. Indeed enterprises cannot respond to employees' expectations by letting them first, engage in interactions over social platforms anytime and anywhere and second, include these interactions' outcomes in the decision making processes. There must be a way of highlighting who executes tasks (i.e., persons and/or machines), who works jointly with whom, and how persons and/or machines interact so that enterprise processes can be transparently analyzed and monitored.

BPs social coordination: Agility of today's enterprises to respond to continuous changes (e.g., political, economical, and social) is a must. Indeed several enterprise information systems do not impose a certain task flow on users, allowing them to couple some tasks on-the-fly on a case-by-case. However the lack of guidelines for how this coupling should happen forces users to act randomly. Agility is not confined to the organizational borders of the enterprise but needs to take into account other vital aspects of the enterprise such as re-engineering business processes, revisiting the practices of those executing these processes, and also redefining the nature of resources that are made available for these processes at run-time. Since resources (e.g., data, power, and CPU time) do not sometimes last forever and are not unlimited and/or shareable, tasks and persons/machines need to coordinate the consumption and use

of these resources. Besides regular conflicts in terms of data and policy incompatibilities between enterprise systems, additional conflicts exist due to time constraints and/or simultaneous access to limited and/or non-shareable resources. Coordination is the best way to address these conflicts. According to IDC, "*enterprise social offerings are also adopted to improve the coordination of work across teams. Often, this coordination involves virtual teams working together on projects and decision making. Several types of social technologies are used in social products, including activity streams, blogs, communities, discussion forums, profiles, recommendation engines (content or people), tagging, bookmarking, and wikis*" [10]. However these enterprise social offerings restrain coordination to communication/exchange between people instead of managing dependencies between tasks [15]. When performing BP's tasks persons and/or machines use resources. This performance, whether successful or failure, also leads into consuming resources as well. Therefore resource consumption/use is deemed at upmost importance when establishing these dependencies.

BPs social monitoring: As stated earlier Web 2.0 technologies support those in charge of BP design and execution by giving them the opportunity of tapping into details that networks of tasks/persons/machines contain. Persons and/or machines in a BP are coupled together in organized and/or ad-hoc ways in order to perform collectively tasks and hence, achieve the enterprise's goals. Either way affects the actual/expected BPs' outcomes in terms of effectiveness (i.e., *are we doing the right things?*) and efficiency (i.e., *are we doing things right?*). Gartner reports that "*efficiency-oriented sales processes tend to address more tactical pain points, while investments in sales effectiveness tend to target more strategic concerns, like increasing average deal sizes, and overall sales growth and profitability*" [6]. Monitoring seems to be the commonly-used technique for tracking the execution progress of BPs. Besides providing a real-time and end-to-end view of this progress, monitoring should also offer an organizational and social view over this progress in terms of who executes what, who delegates to whom, and who sends what, to whom, and when. Obstacles that hinder BP successful completion are multiple (e.g., lack of necessary machines that can execute tasks) and hence, will impact the enterprise effectiveness (e.g., delay in delivery) and efficiency (e.g., costly machine re-allocation). The difficulty of measuring intangible and ad hoc exchanges between people when executing tasks represents a major barrier to social interaction pattern recognition like collaboration and delegation, as well as the role of these patterns in BP improvement. The way these exchanges should happen can be part of a social monitoring framework in which specialized flows connecting these messages are developed to detect anomalies.

3   Suggested solutions for the enterprise 2.0

The future solutions that will address the aforementioned issues should be more than plugs-in that can be anchored to existing enterprise applications. In fact they should be woven into the BPs that these applications implement in order to make their use transparent and

straightforward to users. In the following we shed the light on some research directions that we are pursuing to develop these solutions.

BPs social design: To ensure a perfect alignment of Web 2.0 technologies with the enterprise development strategies, we would like to build a social view of the enterprise. This view should encompass elements from the three perspectives that can be used to analyze an enterprise namely, organization, management, and technology [14]. The organization perspective includes people, structure, and procedures that are deemed necessary to produce outputs (i.e., goods/services). The management perspective brings together business objectives (what goods/services to develop), organizational strategies (how to achieve these objectives), and supervision strategies (how to ensure that work is done efficiently and effectively). Last but not least the technology perspective includes the set of technologies that are necessary to support the enterprise's activities (e.g., cloud, mobile, and Web services). The three perspectives tend to assume that daily work is packaged into structured BPs. However, today's challenges impose a new way of doing and thinking that requires a closer coordination and interaction between the enterprise's stakeholders. From a social view an enterprise should encourage its employees to be proactive by tapping into their networks of contacts to develop solutions. A recent report from McKinsey & Company argues that 41% of the U.S labor force is now composed of jobs where interaction (e.g., talking, e-mailing, presenting, and persuading) is the primary value-added activity to enhance productivity, quality, and innovation [18]. Grim-Yefsah et al. stress out the existence of informal networks that people at work use to complete their duties [8]. These networks co-exist perfectly with regular networks where formal relations (e.g., supervision) are already established. It is also largely accepted that the official executor of a job seeks informally help from peers in the enterprise. As relations between persons (e.g., delegation and partnership) happen to exist in enterprises at different levels (e.g., strategic and operational), it would be interesting to extend these relations to other components of a BP namely task and machine with emphasis on the social dimension of these relations. Informal work practices lead into some form of social relations between persons (e.g., persons form ad-hoc groups), between tasks (e.g., tasks can replace each other) and/or between machines (e.g., machines backup each other). Developing dedicated networks upon relevant social relations will help first, capture the various interactions between the components of a BP and second, analyze the value-added of these relations to the enterprise operation. Cross et al. report that "*the most effective organizations make smart use of employee networks to reduce costs, improve efficiency, and spur innovation*" [3].

To integrate smoothly Web 2.0 applications into BP design and execution our suggestions are summarized as follows. First, we interconnect a BP's components using networks that capture collaborative situations. Second, we use these networks for helping BP designers identify the most appropriate tasks to include in BPs as well as the most relevant ones to enrich these BPs. Third we capitalize on these networks for coordinating work during BP execution.

BPs social coordination: A number of conflicts on resources could arise at BP run-time and thereby could delay task performance. These conflicts could be addressed through social coordination that draws solutions from the dedicated networks suggested earlier (BPs social design). Several studies report that social tools (e.g., social networking and micro-blogging) can be coordination means between tasks and between teams (e.g., [17] and [20]). According to Malone and Crowston *"coordination is managing dependencies between activities such as shared resource constraints, producer/consumer relationships (i.e., prerequisite constraints, transfer, usability), and simultaneity constraints"* [15]. They also advocate for a *"coordination theory"* that should help set up the necessary principles and ideas for how coordination can occur in diverse kinds of complex systems. Relying on this coordination theory, Crowston and Osborn look for and represent dependencies within BPs and investigate appropriate coordination mechanisms to manage those dependencies [4]. They highlight the three key components in a BP: activities (i.e., events or tasks that constitute the process), actors (i.e., persons/machines who carry out tasks), and resources (i.e., items that are produced or consumed by activities). They also focus on task-resource binding and examine the consumption of resources (e.g., do multiple tasks produce resources and are these resources consumed by other tasks?) in order to identify potential dependencies between tasks (e.g., shared resource constraints). However Crowston and Osborn do not categorize resources when analyzing task dependencies. As these dependencies could raise conflicts on resources at run-time we suggest refining the resource model in different categories so that specific conflict types are identified. A category would focus on a resource's nature (e.g., physical or logical) and basic properties (e.g., limited, renewable, shareable, and non-shareable). An exhaustive conflict analysis would also consider task dependencies in the BP (e.g., prerequisite, parallel, and parallel-prerequisite) and actor-resource binding as well. Indeed the actors usually use resources produced by others when performing joint tasks. These resources are different from those that tasks consume. It would be interesting to consider additional resource dependencies between persons/machines. Storms and Grant consider that coordination success depends on selecting a proper coordination strategy [22]. They identify four strategies: implicit *versus* explicit strategy is either communication-less or communication-based; dynamic *versus* static strategy either allows to fine tune the coordination policies or sticks with the same policies regardless of the changes; cooperation *versus* competition strategy considers the nature of the stakeholders (i.e., with joint or conflicting interests); and centralized *versus* decentralized strategy either limits the coordination to a single element or engages multiple elements together. Although these coordination strategies offer a comprehensive view of how to address potential conflicts at run-time, a fifth strategy built upon social relations and used in conjunction with these strategies could offer additional solutions to conflicts. For instance, implicit strategy can be reinforced if a supervision social-relation exists so that, who delegates to whom and what to delegate, are known. The fifth strategy would constitute the cornerstone of a social coordination approach.

To manage resources during BP execution our suggestions revolve around the Malone's *coordination* theory as follows. First, we categorize resources that bind tasks to executors. Second, we identify potential conflicts on resources. Third, we capitalize on various networks to resolve some of these conflicts.

BPs social monitoring: Monitoring continuous (and sometimes unexpected) changes that affect enterprises leads commonly into the re-engineering of BPs. re-engineering means analyzing "as-is" *versus* "to-be" processes, redesigning "as-is" processes if the analysis shows a major deviation from "to-be" processes and then, weeding out "as-is" processes progressively until the new "to-be" processes become effective. Approaches like those discussed in ([1] and [19]) advocate for the following phases when re-engineering BPs: (i) the "as-is" phase identifies the processes that could be changed based on criteria like poor performance, customer dissatisfaction, and acceptable efforts in terms of cost and time; (ii) the "to-be" phase develops "to-be" process models using inputs such as enterprise's stakeholders and best practices; (iii) the "deployment" phase produces a list of changes required and aligns the re-engineered processes to the organizational structure and existing policies; and (iv) the "continuous improvement" phase means monitoring the progress of the re-engineered processes for adjustment purposes. Doing things right from the beginning is challenging [12]. The BP community relies on business models to analyze the "as-is" processes and monitoring the re-engineered ones. These models focus on the *communication flow* more than the *control flow* due to its ease of generation and use, completeness, and accuracy [13]. The former represents messages that convey details between a BP's stakeholders while the latter describes temporal and logical dependencies between tasks in a process. However the *communication flow* is confined into the borders of a "rigid" organizational structure and is tightly related to the *control flow*. Any minor change in the *control flow* requires reviewing the *communication flow*, which is against the separation of concern principle. Moreover monitoring both flows would be insufficient when re-engineering social BPs compared to regular (i.e., no-social) BPs due to the intrinsic features of Web 2.0 applications (e.g., social networks and wikis) like open nature and limited control. These applications raise concerns that business models cannot handle smoothly and transparently such as employee unexpected unavailability, peering persons together, and seeking advices. The use of Web 2.0 applications stresses out the need for additional flows like coordination between persons/machines responsible for executing joint tasks and collaborative for resolving conflicts on resources, for example. We would like to consider new techniques for building these additional flows on top of communication and control in order to address some of the aforementioned concerns. This requires answering the following questions: how are these flows structured, how are they operationalized, and how are they connected to each other? The dedicated networks could help track the BP execution progress. For instance, a task that is suspended because of a machine sudden-breakdown triggers the search for another backup machine using a dedicated network of machines.

To monitor BP execution progress our suggestions are summarized as follows. First, we identify additional flows on top of communication and control. Second, we study the operationalization and interconnections of these flows. Third, we drill into these flows to establish execution patterns. Finally, we identify some emergent work practices from these execution patterns.

4　Conclusion

In this paper we drew up a novel research roadmap for Enterprise 2.0. This roadmap presents an integrated view of some new research challenges, and of the opportunities that they entail. It represents a shared vision between academia and business world to converge at the same interdisciplinary research field. This research roadmap also constitutes a useful tool for providing support and guidelines to business process modeling and management. We identified three research directions to study how Web 2.0 would and/or should impact the design, coordination, and monitoring of BPs. The first direction consists of integrating smoothly Web 2.0 applications into BP design and execution. The second direction capitalizes on these applications during BP completion and conflict resolution. Finally, the third direction studies how to capture and analyze different flows in BPs.

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