

Adopting Collaborative Business Process Patterns for an Enterprise 2.0 Banking Information System

Antonio Capodieci, Giuseppe Del Fiore, Luca Mainetti

Department of Innovation Engineering

University of Salento

Lecce, Italy

{antonio.capodieci, giuseppe.delfiore, luca.mainetti}@unisalento.it

Abstract—The use in the workplace of Web 2.0 tools by knowledge workers has changed companies' operational practices by introducing new collaborative processes. This paper presents the application of a set of “cross-domain” collaborative business processes applied to a model of the Enterprise 2.0 Banking Information System. The case studies presented use collaborative business patterns. The aims are to resolve emerging organizational issues to support the activities of knowledge workers, to increase their productivity and their ability to find the information they need, and to enable collaboration with colleagues. All this is made possible using Web 2.0 tools, without changing their habits and by integrating the knowledge generated within the corporate information systems. In this article, we use the previously presented collaborative patterns in a different application context, to model an Enterprise Banking Information System.

Keywords: *Business Practices; Business Process Patterns; Collaboration; Coordination; Enterprise 2.0, Knowledge Workers.*

I. INTRODUCTION

The “knowledge worker” [1] is a form of employee, that, in the last fifty years, has become more and more important to companies. The knowledge worker is “a person who works primarily with information or a worker who develops and uses knowledge in the workplace”. They are people who can manage multiple tasks all together working in different contexts and having different channels to deliver information [2]. They must manage different parallel “knowledge processes” [3]. These processes may not be codified in formal procedures but could be unstructured or semi-structured and could change continuously. Thanks to the advent of Web 2.0, we can see that there are knowledge processes, which are not coded in formal structures. This is because knowledge workers collaborate using many basic tools at work but they are not checked by traditional information systems. To keep knowledge processes (unstructured) and business processes (structured) coherent is very important at this time; moving from tacit to explicit knowledge [4][5] to be involved in shaping a new kind of information system known as Enterprise 2.0 [6]. To understand the information demand and the different roles in the organizational field we have to have a formal definition of business practice. Researchers, such as Henkel et al. [7], said that enterprise models and business models have

adequate tools for the design and maintenance of processes, which require collaboration in agile and flexible networks.

We tried to understand the business process management (BPM) approach in order to solve the modelling issues involved in business practices. Our first goal was to describe the processes that involve knowledge workers in collaboration and coordination. To achieve this we integrated them into the information system and so we obtained efficient (i.e., without waste of resources and time) and effective (i.e., with high quality to meet specific needs) process models. Then we worked to reduce the impact on the overall organization, shaping just the recurring business practice atoms, i.e., patterns.

A pattern-based approach is important both in re-designing processes [8] and for the design of information systems from scratch. The idea of patterns has already been useful in practical contexts and it will be suitable in others [9]. This idea started from the traditional business process design method [10] and from the software engineering field [9]. The use of workflow patterns has been shown in different studies as a solution in modelling business processes [11], to manage collaborative work [12] or, in other cases, to categorize recurring problems.

In this paper, we apply a pattern-based approach to knowledge processes as a key factor in quickly identifying and rapidly applying business practices to support the activities of knowledge workers, increasing their productivity in the networked workplace without changing their habits. The paper presents a case study highlighting the issues related to the modelling of knowledge processes, demonstrating the difficulty of managing tacit knowledge. To address these issues, we used a set of business patterns, which can be useful in modelling collaborative and cooperative activities within business practices.

The paper is structured as follows: the next section reports on key related work in the areas of analysis, description, identification and application of business practices, mainly to address knowledge workers' emerging needs. Section III provides readers with an overview of the methodological approach used to identify collaborative processes. Section IV describes the first case in the banking industry and how it has been modelled using a pattern-based approach. Section V describes the second case in the banking industry and how it has been modelled using a pattern-based approach. Finally, Section VI

summarizes our key messages and sketches future research directions.

II. RELATED WORK

In this section, we study the explicit modelling of business practice to try to give support to collaborative and cooperative semi-structured processes. In [13] the authors clarify the relationship between information, knowledge and competitiveness by introducing the model of the “knowledge ladder”. Based on the knowledge ladder, the terms, fields of action and the maturity model of KM are explained. In addition, the authors demonstrate, with a case study, the conversion of tacit and explicit knowledge according to the SECI model.

Business practices are the most useful practices used to organize internal company processes. Therefore, identifying better practices is really important to achieve efficient and effective business practices, but also for there to be the possibility of reusing knowledge and expertise [14]. Each company should find methods to provide the necessary level of abstraction while modelling daily practices. However, at the same time, companies must manage and preserve social capital through knowledge workers [15].

Knowledge workers can be classified into different categories reflecting what he/she does in the work process in which he/she is involved [1]. Every day, each knowledge worker is involved in different unstructured activities that are information intensive but without technology support. For this reason, there is rapid information overload that has a negative impact on performance. To date, there have been few studies on this topic. Andriole [16] attempts to demonstrate how new technologies enable companies to cost-effectively increase their productivity and their competitive advantage if properly deployed. If a company wants to increase its productivity, it must integrate emerging technologies (first of all from Web 2.0) in traditional business processes [17]. In this way, the information system can allow the knowledge worker to use the right information, in the right format, at the right time. Nevertheless, we must understand that processes are made up of people, and that people will use the technology to improve their work. To achieve this goal, knowledge workers should be provided with an integrated space where they can retrieve all the information and tools they need.

Some research has been carried out in this area. Authors, Jennings et al. [18], propose analysing specific possible lightweight ad hoc processes, known as “micro workflows”. By using gestural analysis of human agents within such flexible micro workflows, in combination with social analysis techniques, a new flexibility in business processes can be identified. Thus, the authors want to better define how people work in companies and how they can use Web 2.0 tools in their daily activities to get better results. Stephenson et al. [19] present business process patterns in order to enhance the design of the public health care business process.

In this context, the main technological areas, through which Enterprise 2.0 is carried out, are social network/community, unified communication/collaboration and enterprise content management.

Cook introduces the concept of the collaboration process in addition to the traditional business processes. It is the way in which a company organizes its work [20]. Collaboration processes have the characteristic that there is collaboration among the participating stakeholders to achieve a common goal. This collaboration takes place through the combination of communication tools, both traditional (e-mail, telephone, direct conversation) and Web 2.0 oriented [21].

Harrison [22] argues that it is necessary to amplify human-driven processes in order to understand how to describe such work formally, then to capture this knowledge in a software tool. This requires changing both business process modelling and information systems. The author analyses the nature of work and explains how information systems can support it in the future. In order to describe human work and the interaction between humans and technology, the identification of patterns can be a useful approach allowing for fine-grained modelling support, as Gschwind et al. [23] point out. However, the modelling tools currently available do not fully support the application of patterns, although, as these authors demonstrate, it is possible to use an approach through which business users receive help in understanding the context through design patterns.

The concept of pattern [9] has been useful in practical contexts and will probably be useful in others. A pattern-based approach has been exploited for many years in the software engineering field but, over the last decade, the concept has been inherited by the business processes area. Some authors [10][11][24]-[28] point out that most of the analysts, who have actually worked on simplifying business processes, have focused on reusing or identifying some process elements from one process that can be re-applied to another, or at least identifying when similar processes are encountered. Our solution, which comes from the methodology of business process patterns, is very helpful in the information systems field and is an important step towards creating a structured and systematic way of managing business practices both in real [27][28] and in virtual environments [29]. The next sections address this issue presenting the reuse of patterns identified in different application contexts, to model an Enterprise Banking Information System.

III. THE METHODOLOGY USED

In this section, the methodological approach used to identify collaborative processes is described. The Introduction shows how the adaptive and unstructured nature of knowledge generation processes could become an obstacle to the formalization of business practices on a large scale.

In order to identify and apply the patterns of collaborative processes, an approach that considers the needs of the organization and the best currently available

practices for the identification and application of model patterns has to be adopted.

The approach to be followed to identify and apply the patterns of collaborative business processes is divided into six phases:

1) The first phase is characterized by the analysis of the business environment with much attention given to identifying some of the processes and areas that are characterized by both intense collaborative activities among the workers and the need to use Web 2.0 tools. One of the first steps in this preliminary stage will be to identify competence areas of the company and how the employees are involved in various projects. In this situation, it can be seen that the workers are used to working and collaborating with each other. The interactions among the actors are not very often pre-defined, some activities are carried out manually and many others through the use of unstructured communication tools (chat or e-mail), so all the different professionals, who collaborate with each other to achieve common goals, need to be identified.

In this stage, we have to identify the various case studies through:

- “Focus groups” with business leaders and heads of business units;
- A questionnaire.

2) The work continues in the second phase: modelling the business processes detectable within the case used, selected in the previous step through the use of BPMN. A number of processes need to be studied, taking care to analyse both the business practices that are codified and all the activities used every day that are not already encoded or pre-determined. In other words, first of all, all the collaborative practices should be highlighted and modelled.

3) In the third step, the study and comparison of the BPMN diagrams of all the modelled processes starts; to identify new patterns, it is necessary to focus on all repetitive common and atomic “segments” which are in the modelling performed in the previous phase. Particular attention should be paid to collaborative and cooperative activities, where we found a number of practices that have considerable repetitiveness. Each pattern that may be identified must shape typical situations in Enterprise 2.0 and, if they are properly applied, they will provide concrete support to the actors involved in such situations.

Typical situations, into which actors can fall within an organization, are characterized by strong collaboration among them, that contributes to performing a particular task, and intensive use of Web 2.0 tools (such as wiki, blog, chat, etc.) to assist the activity’s progress. So, the identified patterns respond to two fundamental needs: on the one hand to managing the collaboration among different actors that are called to work to accomplish a given task without a pre-defined and pre-structured sequence, and on the other hand, they allow the best use of the typical Web 2.0 tools within the enterprise.

In conclusion, the approach to be used for the identification of design patterns requires the modelling of processes related to three types of activities:

- Activities related to cooperation among workers in order to achieve a specific goal (collaboration activity);
- Activities that require the cooperation of different people with different roles, that are not encoded in the traditional information systems, and for which it is useful to keep track of the messages exchanged in order not to lose information (coordination activity);
- Activities that are repeated many times and for which there is a risk of losing useful information from the enterprise (know-how elicitation activity).

4) Some of the “repetitive segments” detected in the previous step may already be known, so at this stage, it is necessary to verify the existence of patterns similar or identical to the segments identified. In such a case, it is better to use the known solutions that have already been applied and validated in different contexts. Otherwise, these segments can be considered new, such as new patterns.

5) During the fifth phase, the design patterns identified in the third step start to be applied to model and realize a prototype of the collaborative information system. The purpose of this step is to verify the validity of the approach adopted in the identification of the patterns and to apply those patterns in the realization of a collaborative information system. The identified patterns should be used both in the design of the conceptual model of the platform, and in its implementation in order to achieve a development framework that allows:

- Structured and unstructured information flows to be managed together;
- A portfolio of solutions to support unstructured business processes to be incorporated;
- The creation of a workspace focused and customized to the needs of the individual worker.

6) Following the experimentation, in order to verify the usefulness of the use of the patterns in the context of collaborative information systems, the data of the trial (sixth phase, evaluation of design patterns) needs to be collected. The experimental checking of the activities must be conducted by administering questionnaires to the knowledge workers to evaluate the system. The testing must be preceded by a training session targeted at users involved in the identified processes, with the goal of explaining the project and to show the main functions of the system and its areas of use. Once the trial is ended, the users need to meet again in order to give feedback on:

- The potential of the tool and the benefits associated with its use;
- Level of usability;
- Areas of intervention for subsequent improvement;
- Possible extensions to other features.

Finally, the evaluation data should be subsequently reworked.

IV. DESCRIPTION OF THE CIRCULARS CASE

A bank circular is a communication sent to multiple recipients to give orders, to advise on provisions, or to transmit information. The creation and approval of a circular follows a particular well-defined process that includes the engagement by multiple actors involved at various stages. Every actor in the process must perform his function within his field of competence and responsibility.

The process is started by the Head of the Central Office, who requires the distribution of a circular to the various editors that are part of the office in order to submit it for the attention of Organization and Quality, which has the power to authorize the circular. Some refusals should transpire thereby giving the editor the opportunity to modify the circular and resubmit it to Organization and Quality through the Head of the Central Office. The process of revision may require more comparisons between the Head of the Central Office and Organization

and Quality, at each time refining the characteristics of the circular. Upon the approval of the latter, the process may follow different paths according to the type of circular. For example, some may require the signature of one or more competent structures, others may require a compliance opinion, and others may require both or neither of the two mentioned stages. All these stages become mandatory and essential for the completion of approval. Finally, a positive opinion by the Chief Operating Officer and General Manager is necessary to allow Organization and Quality to publish the circular.

A. Modelling of the Case (TO-BE)

After the preliminary phase characterized by careful analysis of the business practices that are not codified and of all the possible collaborative processes that currently do not meet the needs of knowledge workers, was made the modelling of the process using the BPMN notation. This activity has led to the definition of the process “Circular” that is shown in Figure 1. This highlights the presence of a number of sub-processes that will be detailed below.

This process involves several actors including:

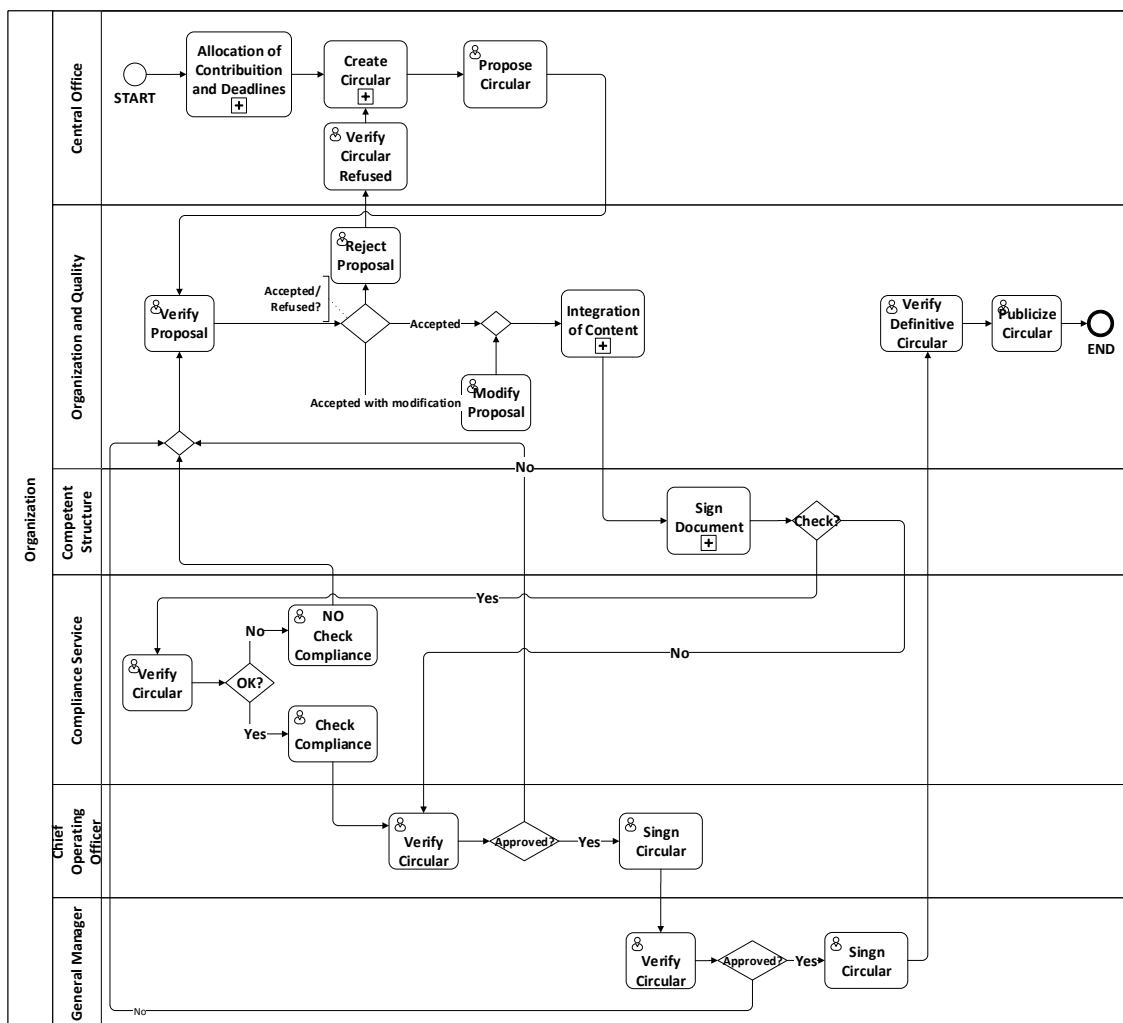


Figure 1. BPMN process design “Circular”.

Responsible for Central Office; Editor; Organization; Competent Structure; Compliance Service; Chief Operating Officer; General Manager.

All these actors are strictly necessary to take care of every aspect of the definition, approval and publication of a circular.

1) Secondary Process – Allocation of Contributions and Deadlines

Figure 2 shows the BPMN sub-process “Allocation of Contributions and Deadlines”. The sub-process is started by the Head of the Central Office in order to coordinate the contributions and the deadlines of the individual collaborators (editors), who will take part in drafting the Circular. This task ends when the various collaborators finalize their decisions. This sub-process has been modelled using the pattern Deadline Agreement, already published in [27]. This pattern aims to create a model according to which the deadline agreement activity can be performed efficiently, taking into account the different needs of the people involved. Two classes of actor characterize the pattern: the Requestor, who is responsible for the whole activity completion, and one or more Providers, who must provide the required contributions. To agree on the assignment of the work and the internal release date, the Requestor, first of all, defines the date by which any contribution must be provided. Then he/she

carries out an initial assignment of work activities; so two collaborative activities (“Work Partitioning” and “Deadline Collaborative Definition”) begin. Each of them involves a Requestor and the Providers.

These collaborative activities deal with assigning the work (“Partitions the Work” task) and agreeing the internal release dates for each Provider (“Defines Deadline Date” task) respectively. The two tasks are sub-processes modelled through the collaborative editing pattern.

A Decision Team is made up of the Requestor and the Providers who, using collaborative tools, agree on the assignment of the work and the internal deadline definition. When the Work Partitioning and the Deadline Collaborative Definition are finished, the Requestor, through the “Finalizes Decision” task, formalizes the decisions made and he/she defines the latest date, against the dates agreed with the Providers, as the deadline for the conclusion of their activities. If these deadlines exceed the date defined initially by the Requestor, a new iteration of the two collaborative activities can be carried out.

2) Secondary Process – Create Circular

Figure 3 shows the BPMN sub-process “Create Circular”. The sub-process is started by the Head of the Central Office in order to achieve a draft Circular to be proposed to Organization and Quality. The process ends when the various collaborators (Editors) finish submitting their contributions. The secondary process “Create

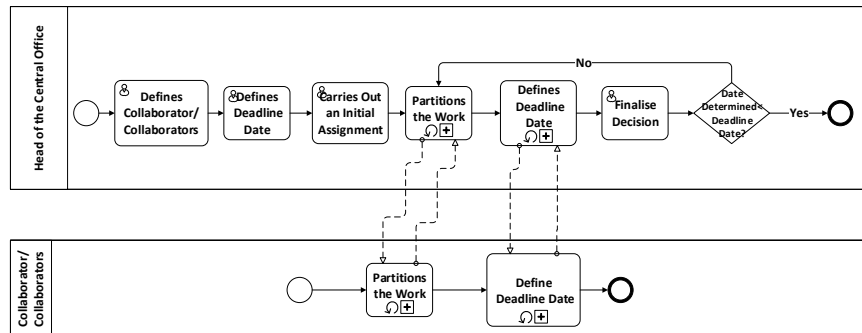


Figure 2. BPMN sub-process design “Allocation of Contribution and Deadlines”.

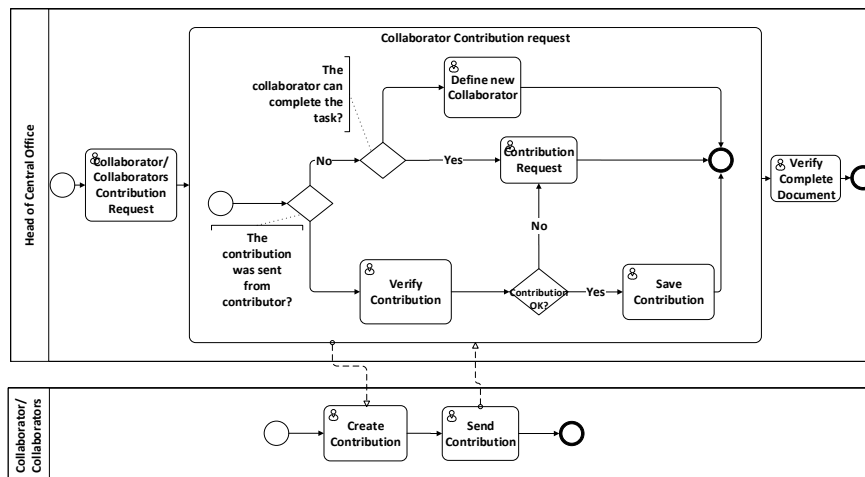


Figure 3. BPMN sub-process design “Create Circular”.

Circular” was modelled using the pattern Retrieve Contributions, already published in [27]. This pattern aims to model situations in which the contributions that each actor must provide need to be collected in order to achieve a common goal and aims to solve the problem of retrieving contributions produced by knowledge workers. It takes into account the need to collect the contributions by a pre-defined date in order to have time to elaborate them. The Retrieve Contribution Pattern foresees the involvement of a Requestor and one or more Providers. The Requestor identifies the resources that will have to provide the contributions, while the Providers produce and submit the required contributions. The use of the following pattern involves the use of the pattern/sub-process “Coordinates Enhanced Contributions”. This pattern aims to verify and evaluate the received contribution. It allows for coordinating the contributions of other actors. First of all, the system checks whether a Provider has delivered the contribution assigned to him/her. If the contribution has not been received, the system requests the contribution from the Provider. Otherwise, the received contribution is evaluated. It is then registered if it matches quality attributes or, if it does not meet the requirements, the system asks the Provider for a new version.

3) Secondary Process – Integration of Content

The sub-process is started by the Manager of Organization and Quality in order to define contributions and request them from some of the relevant structures. The process ends when all the structures embody all the contents that are within their competences. The figure is omitted because even the sub-process “Integration of Content” was modelled using the pattern Retrieve Contributions, already published in [27], described in the previous paragraph.

4) Secondary Process – Sign Document

Figure 4 shows the BPMN sub-process “Sign Document”. The sub-process is started by the Manager of Organization and Quality in order to request the signature from all the relevant structures that have participated in the integration phase of the content. The process ends when all the structures sign the document or on reaching a default deadline. In the latter situation, the principle of tacit consent will be applied. The secondary process “Sign Document” has another internal sub-process called “Send Reminder”, which makes use of the pattern Reminder, already published in [27]. This sub-process is started by

the Manager of Organization and Quality in order to solicit all the relevant structures that have not already signed the document by a certain time.

V. DESCRIPTION OF THE NEW BANKING PRODUCT CASE

The definition of the products of a bank, or in general of a credit institution, follows a well-defined process that starts from the analysis of the market and ends with the marketing of the product. Every actor in the process is called upon to perform his function within his field of competence and responsibility. The actor that starts the process is the Business Unit that, based on a careful analysis of the market, defines the type of product to be marketed, the target customers to whom it can be offered and the strategic opportunities arising. The prototype of the defined product is subjected to the Organization Unit, who examines the solution by providing feedback to the Business Unit. The Organization Unit, based on the parameters of the product, will execute a plan of simulations by calculating the indices of synthetic cost, comparing them with the thresholds of usury, highlighting some anomalies. The product analysis phase will give the Organization Unit the opportunity to express an opinion on the feasibility of marketing the product. If some conditions and/or fundamental principles are not respected, the prototype will achieve review status and will be referred back to the Business with some suggestions and corrections. The process of revision may require more comparisons between Business and Organization, each time honing the characteristics of the product. Once it has received a positive opinion, the definition of the information content to be included in the information pack and the pre-contractual information provided by legislation concerning banking transparency proceeds. At this stage, the layout and content are defined according to the format of the Bank of Italy. The actors involved at this step of the process are: Legal Advice function, which provides support for the preparation of contractual clauses; the Compliance function, which evaluates its compliance with standards; and Operation Unit, that provides for the creation of documents, inserting the regulatory information and examples in the defined models.

The Operation Unit will perform the activities of “merging” the template shared between the Legal and Compliance functions and the function prototype

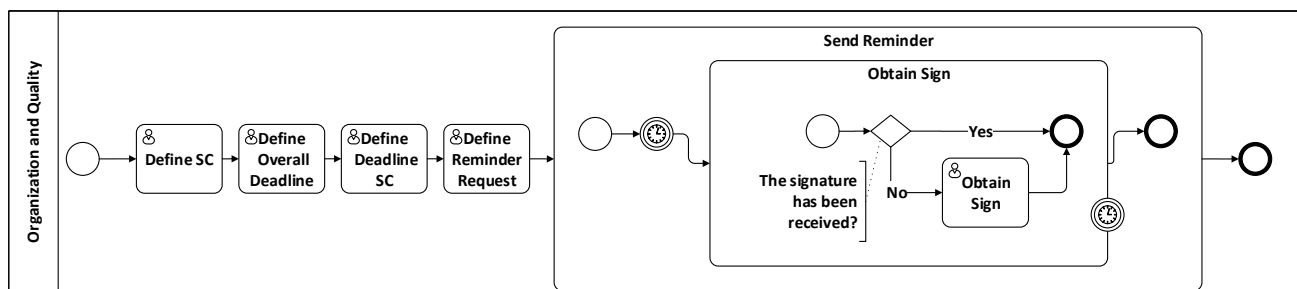


Figure 4. BPMN sub-process design “Send Reminder”.

document approved by the Organization. The final validation is delegated to the bodies with executive resolution powers (Board, Executive Committee) that officially approve, unless otherwise specified, the new product, establishing its effective date. With the official resolution, the bank circular, which informs the sales network of the availability of a new product, is drawn up. On the start day for the new product, all of the information and communication platforms will have the necessary documents required by the regulations for Bank Transparency. The disclosure will also reach the third-party brokerage company that distributes institute products.

A. Modelling of the Case (TO-BE)

Completed the analysis phase of the process described above, the modelling of the same proceeds through the BPMN notation. This activity has led to the definition of the process “New Banking Product”. This process involves several actors including: Business Unit; Organization Unit; Operation Unit; Legal Function; Compliance Function; Executive Committee.

All these figures are strictly necessary to take care of every aspect of the definition, approval and marketing of a New Banking Product. Figure 5 shows the design process of the BPMN New Banking Product. It can be seen that the process follows a well-defined path that starts from the analysis of the market and ends with the marketing of the product. The presence of some

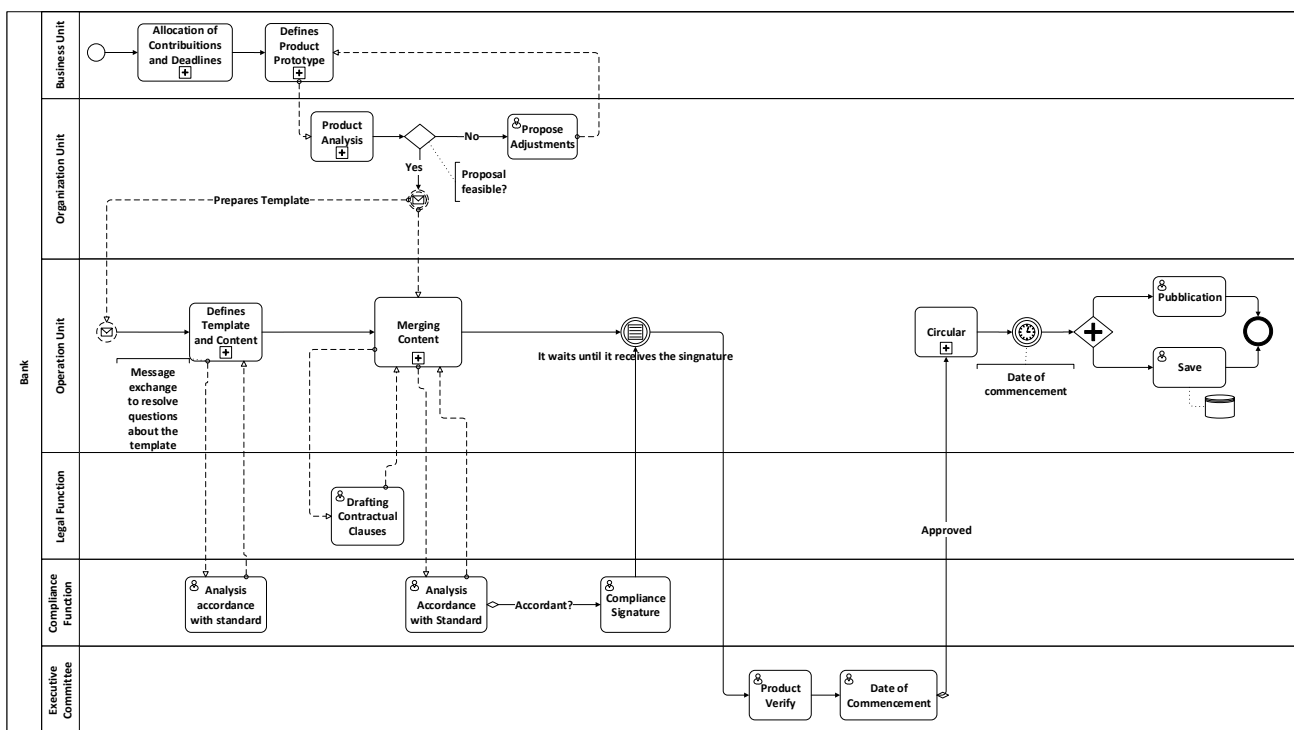


Figure 5. BPMN process design “New Banking Product”.

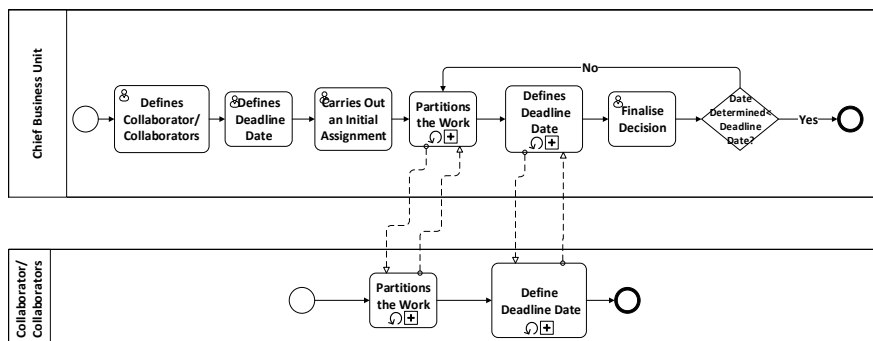


Figure 6. BPMN sub-process design “Allocation of Contribution and Deadlines”.

secondary processes, which will be detailed later, can also be seen.

1) *Secondary Process – Allocation of Contributions and Deadlines*

Figure 6 shows the design of the BPMN sub-process “Allocation of Contributions and Deadlines”. The sub-process is started by the manager of the business in order to coordinate the contributions and the experiences of the individual contributors who will take part in the drafting of the prototype of the new banking product. This task ends when the various collaborators finalize their decisions. The secondary process “Allocation of Contributions and Deadlines” was modelled using the pattern Deadline agreement, already published in [27] described in Section IV paragraph 1.

2) *Secondary Process – Define Prototype of the Product*

Figure 7 shows the design of the BPMN sub-process “Define Prototype of the Product”. The sub-process is started by the manager of the business in order to realize a prototype of a new banking product to be proposed to Organization Unit. The process ends when the various collaborators finish submitting their contributions. The secondary process “Define Prototype of the Product” was modelled using the pattern Retrieve Contributions, already

published in [27] described in Section IV paragraph 2.

3) *Secondary Process – Merging Content*

The sub-process is started by the Head of Operations in order to define contributions and request them from some of the relevant structures. The process ends when all the structures embody all the contents of their competences and the Operation Unit merges them. Even the secondary process “Merging Content” was modelled using the pattern Retrieve Contributions, already published in [27] described in in Section IV paragraph 2.

4) *Secondary Process – Define Template and Content*

Figure 8 shows the BPMN design of the secondary process “Define Template and Content”. The sub-process is started by the Head of Operations in order to request information useful in defining the template and content for the definition of the new banking product. The process ends when the template and the content are well defined. The sub-process “Define Template and Content” was modelled using the pattern Aggregate Activity Loop, already published in [26]. This pattern is used in contexts where there is a need to extract structured information from activities carried out with tools, such as Skype, e-mail, MSN, etc., which allow unstructured information to be conveyed.

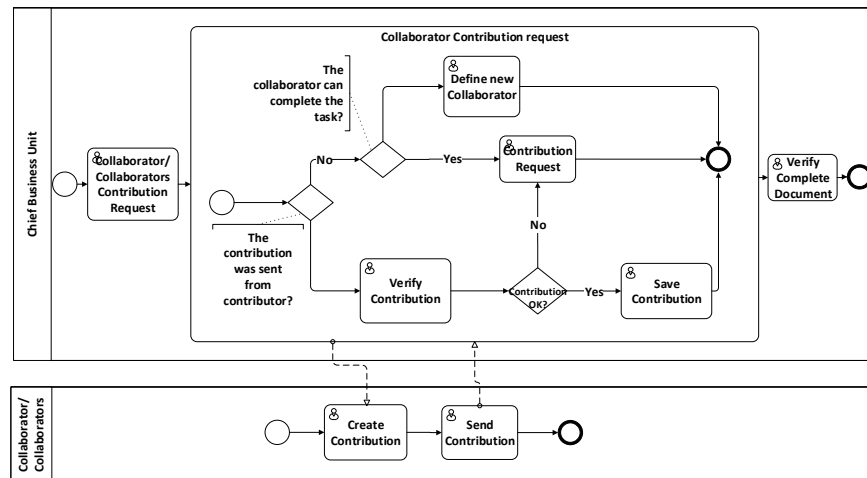


Figure 7. BPMN sub-process design “Define Prototype of the Product”.

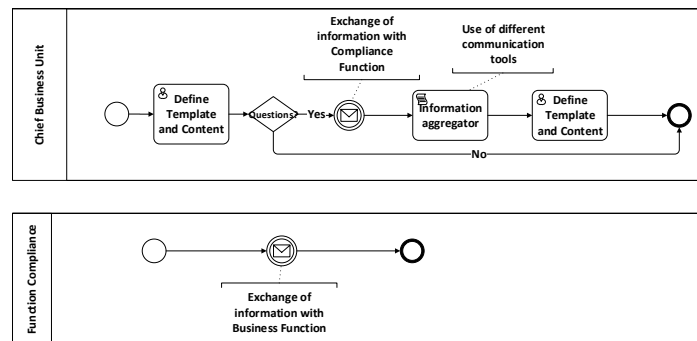


Figure 8. BPMN sub-process design “Define Template and Content”.

VI. EVALUATION CONCLUSION AND FUTURE WORK

In this paper, we presented the application of a set of “Cross-domain” Collaborative Business Patterns applied to a model of the Enterprise 2.0 Banking Information System.

We also presented a pattern-based approach to re-designing business practices, which involves knowledge-intensive activities, in order to meet the challenge of providing a conceptual tool to organize knowledge activities and integrate them within business processes. We originally exploited the method of workflow patterns in knowledge processes as a key factor to quickly identify and rapidly apply effective business practices to support the activities of knowledge workers. By using a real case study, in an ICT company, we presented a set of design patterns able to model collaborative activities that readers can find [26][27][28]. Its aim was to resolve emerging organizational issues to support the activities of knowledge workers, to increase their productivity and their ability to find the information they need, and to enable collaboration with colleagues. The patterns previously presented [26][27] were extracted from a case study completely different from the one shown here, in fact the subject of the case study was the collaborative processes of an ICT company. The case studies presented in this paper use collaborative business patterns, to model collaborative processes in the banking sector. The patterns were applied without any modification and the results were immediately usable in the modelling of collaborative bank processes. In this way, it was possible to test the generality of the identified patterns that can be defined as cross-domain patterns.

Moreover, the proposed approach allows companies to identify and design collaborative recurring activities in enterprise practices. Collaboration patterns can coexist with traditional business processes. Compared with the state of the art [19], our approach does not focus on a specific application domain but can be used in several situations where the problem of managing collaboration arises. While the state of the art mainly deals with the sociological aspects of collaboration [30], we identified new collaboration patterns and presented an example of their representation using BPMN.

Currently, an inquiry is underway with several modellers to evaluate the proposed approach. The evaluation will be described in our future work.

Future research will concern, the application of the patterns to other case studies in various fields and to the realization, using the Collaborative Pattern, of a prototype of an Enterprise 2.0 Information System.

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