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# INTERACTIVE USER-CENTERED BUSINESS PROCESS MANAGEMENTSERVICES

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For supporting process interconnection, on top of an existing open-source Business Process Management (BPM) environment oriented to Web Services (modeling module and execution engine, BPEL - Business Process Execution Language - compatible), this paper will propose a support to task-oriented, interactive decisional activities to be performed by CNO (Collaborative Networked Organizations) Actors. At the current status of achievements no standards neither existing solutions are able to provide such feature. These services aim at providing an innovative modeling and execution environments able to manage complex and compound services made of automatic and manual activities.

## 1 INTRODUCTION

Collaborative Networked Organizations (CNOs) has been considered the discipline in charge of studying all the manifestations of organizations when they work in an inter-linked and organized way (Camarinha, 2004). In order to leverage the potential benefits of collaborative networks, more flexible and generic infrastructures need to be designed and implemented enabling networked organizations to agilely define and set-up relations with other organizations as well as to be adaptive according to the business environment conditions and current organizations' autonomy levels. This is the essential motivation for the development of the ICT-I inside the ECOLEAD project (Rabelo et al, 2006). The goal of this paper is to propose a new way for improving the existing solutions of business processes management by including the human centered aspects inside CNOs.

The current state of the art does not provide any tools or standard language able to manage the two separate domains: human and automatic. Currently, what exists is a support for human based activities, supported by the concept of workflows, and the automatic execution activities, namely business processes. Two different languages are broadly adopted and recognized as standards: XML Process Definition Language - xPDL (Wfmc, 2005), for workflows definition and management, and BPEL (BPEL4WS, 2003), for business process execution and orchestration. What is missing is a combination of the two languages, in order to allow the next generation processes, which involves both human and automatic activities. The aim of this paper is to report the research performed and the preliminary results achieved for introducing an innovative way for modeling and executing complex services made by either automatic or manual activities.

### 2 RESEARCH STATEMENTS AND INNOVATION

This section introduces the research performed in this paper, analyzing the current state of the art in the two main domains, workflows and business processes.

### 2.1 Research

The ongoing work on the Web Services Business Process Execution Language, version 2.0 (WS-BPEL 2.0, or BPEL for short) focuses on two parts.

The former is the model for executable business processes used to specify automated business processes that orchestrate activities of multiple Web services, and which may be interpreted and executed by compliant engines. The latter is the observable behavior of Web services. The language encompasses features needed to describe complex process control flows, including error handling and compensation behavior. Those constructs are seen and used in multiple process models and are needed to build complex processes, which can be executed by underlying software. However, business processes go beyond the orchestration of activities exposed as Web services. In addition to the orchestration of Web services, the process definition typically incorporates people as an additional possible type of participant, since they can also take part in business processes and can influence the execution of processes. The aspect of how people interact with business processes must be properly modeled.

The BPEL specification focuses on business processes, the activities of which are assumed to be interactions with Web services with no additional prerequisite behavior. But the spectrum of activities that make up general purpose business processes is much broader. People often participate in the execution of business processes introducing new aspects, such as human interaction patterns. Workflow tools already cater for the orchestration of user interactions. User interactions range from simple scenarios, such as manual approval, to complex scenarios where data is entered by the user. Imagine a bank's personal loan process. This process is made available on the internet site of the bank using a web interface. Customers can use this interface to enter the data for their loan approval request and to start the approval process. The process performs some checks, and eventually informs the customer whether his or her personal loan request has been approved or rejected.

Processing is often automatic and does not require any human involvement. However, there are cases that require bank staff to be involved. An example of such a case is if the online check of a customer's creditworthiness returns an ambiguous result. In this case, instead of declining the request automatically, a bank clerk could check the request and determine whether to approve or decline it. Another example would be if a request exceeds the amount of money that can be approved automatically. In this case, a manual approval step is required, in which a member of the "approvers" group either approves or declines the request. User interactions in business processes are not limited to approval steps. They also may involve data. An example of a user interaction that involves data is when an e-mail from an employer is manually attached to the process instance, or when the summary of an interview with an applicant is keyed into the process via a simple form or custom-built application.

On the other hand workflow processes are able to manage just human activities.

The xPDL standard (Wfmc, XPDL) has reached the version 2.0 of the specification, which combines the version 1.0 and BPMN (Business Process Modelling Notation). The XPDL and the BPMN specifications address the same modelling problem from different perspectives.

- XPDL provides an XML (eXtensible Markup Language) file format that can be used to interchange process models between tools.
- BPMN provides a graphical notation to facilitate human communication between business users and technical users, of complex business processes
- It is used for Business Process Modelling activities, where:
- An activity represents work, which will be performed by a combination of resource (specified by participant assignment) and/or computer applications (specified by application assignment). Other optional information may be associated with the activity such as information on whether it is to be started / finished automatically by the process or workflow management system or its priority relative to other activities where contention for resource or system services occurs.
- It also includes (optional) graphical information.

To support a broad range of scenarios that involve people within business processes, a BPEL extension is required.

Currently only a whitepaper had provided some specifications for the merging of the two above approaches. The suggested language, called BPEL4People (IBM-SAP, 2005), introduced a general idea for supporting the identified problems, but the definition process seems now in a suspended state, because no implementation versions have been released at this paper writing time.

### 2.2 Innovation

The proposed work aims at providing features for managing existing different paradigms.

This issue is recognized as main innovation point of this paper. The result is the definition of a new language specification able to support process interconnection with interactive decisional activities (Ratti, 2007). This means the ability in managing Workflow-oriented decisional tasks with the orchestration of WS (i.e. xPDL with BPEL). The proposed language CBP (Collaborative Business Process) is the extension of the current xPDL and BPEL standards, while waiting for the BPEL4PEOPLE specifications implementation.

The "Figure 1" shows this concept.

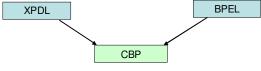


Figure 1 – New paradigm

The analysis performed has highlighted the need of maintaining anyway the semantic of the two languages. This means that the new proposed language shall manage both paradigms without changing radically the structure. For this reason,

one language has been chosen as basic (and reference) language, complemented with the tags of the other. So it has been decided to use xPDL as basic language, improved by BPEL constructs which are needed for managing the new approach.

During the integration phase (of the languages) some semantic elements are still the same in the new schema: for instance, transactions, process and basic xPDL activities with BPEL ones. The inherited tags are not changed through the porting process from one language to the other. In the following "Figure 2" the fusion between the two languages is shown.

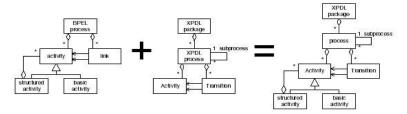


Figure 2 - CBP

As the "Figure 2" shows, the new language contains both the constructs. This is an important issue because the way to access the information tags inside each language will not be changed. In this way the information provided by each standard is still accessible by any parser or by any XQuery (XQuery, 2007) statement, and the existing solutions which currently use xPDL and BPEL remain valid and working.

An example of the resulting schema will contain the above paradigms: it is shown in the following "Figure 3".

```
<WSDLs>
  cs/
cwSDL Id="newpkg_wp1_1" WSDLpath="wsd1.wsd1"/>
<WSDL Id="newpkg_wp1_2" WSDLpath="wsd12.wsd1"/>
</WSDLs>
<partnerLinks>
  <partnerLink</pre>
            name="assessor
            partnerLinkType="riskAssessmentLinkType"
partnerRole="assessor"/>
</partnerLinks>
<Activities Bpel="true">
  <flow>
    </invoke>
    </Activity>
    </receive>
    </Activity>
```

Figure 3 – CBP example

## 3 THE PROPOSED SOLUTION

This section introduces the identified requirements, functional specifications and developments made for the user centered Business Process management services (iBPM) (Ratti et al., 2007).

### 3.1 Specifications

From a conceptual point of view, these services consist of two main services: a modeler and an engine. It has to be reminded that some preliminary activities should be performed, for instance the offline creation of the BPEL processes. After this preliminary step a CNO user can start modeling its own iBPM process, by running the editor. Such editor shall provide features for modelling xPDL processes, but it should be also extended in order to include (by means of importing) BPEL processes. The editor shall be able to manage the mapping between the input and output data which goes to / comes from a BPEL process. This is a crucial topic to be considered in the editor, because in this way the complete management of the new generated process will be granted.

Such editor shall provide typical features available for such kind of tools, namely a set of functionalities for managing the storage, retrieval, import and export of processes. The most important feature is the export (and import) into the new format CBP.

In the following, a set of minimal requested functionalities is summarised:

- Import the BPEL process.
- Model manual activities.
- Model the CBP process.
- Save and export the generated CBP file to the engine.
- Once an iBPM process is saved and exported into the new format, it can be invoked by an engine for its execution. The engine should therefore provide at least the following features:
- Load the CBP: it will load the CBP file inside the engine, ready for being executed and managed by the applications which it will interact with.
- Instantiate the CBP process: once the CBP file has been uploaded inside the engine, it shall be instantiated; this means that the process can be invoked by the external applications, in terms of its execution governing.
- Start, pause and stop the process execution: a typical usage of an instantiated process is to start the process and then execute its activities. This means that each activity (either manual or automatic) can be started, paused or finalised through an invocation of the related features.

### 3.2 Architecture

Two kinds of services should be provided: an editor and an engine. As stated in the previous sections the iBPM services need an environment for modeling the new CBP files and one for executing such processes.

Considering also that a lot of solutions already exists for managing xPDL and BPEL languages, it is not requested to develop from scratch either editor or engine, but it is just needed to extend existing solutions for supporting the here-defined new

functionalities. For this reason the iBPM architecture will depend on the extended tools. The proposed solutions are based on two existing software, Jawe and Shark (Together, 2006), two open source editor and engine.

All the original features will still be available: the new architecture will just include the ad-hoc features for supporting and managing CBP file.

## 3.3 Design

This section reports the use cases which these services should support. The following "Figure 4" shows the main use case, which represents the typical usage of such services.

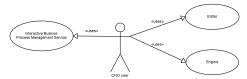


Figure 4 – Main use case

A CNO user will use mainly the features provided by both editor and engine. In the next "Figure 5" the editor use case is shown.

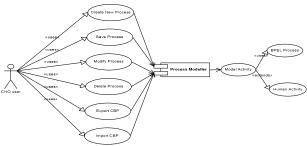


Figure 5 – Editor use case

A CNO user can create new process, save / modify /delete them, and can import / export the generated process into / from CBP language. During the modeling phase the user can model human activities as well as can import BPEL processes: this is required for supporting the automatic execution. In the next "Figure 6" the engine use case is reported.

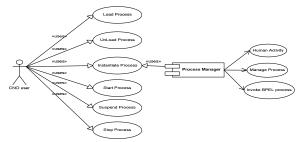


Figure 6 – Engine use case

## 3.4 A prototype

The research performed in this paper finds a real implementation in a developed prototype (Ratti et al, 2007). This has been based on the extension of two existing tools (Together, 2006), by applying requirements and features suggested by this research, maintaining all the existing functionalities. The two modules are Java client-based applications, which stores information inside XML file (for CBP processes), and are able to store local data inside any relational database management systems. When the editor is loaded the modified version of the Jawe tool is loaded and running. In this way the user can model a normal workflow process (with all the functionalities provided by the tool itself and available inside its user manual), and can improve it by using the new developed features. The main feature is the BPEL import, which allows the user to import a BPEL process inside the workflow. The "Figure 7" shows this new feature and the related box.



Figure 7 - Editor

The engine is an extension of the existing open source software called Shark, an xPDL engine. The main extension made has just been the possibility to load and execute CBP file. The engine is made by a set of panels where the user can see which are the loaded processes, see the current activities, run and execute the processes.

The "Figure 8" is a screenshot of the proposed engine.



Figure 8 – Engine

## 4 CONCLUSIONS

The work presented one service provided by the ICT infrastructure (ICT-I) that is being developed in the ECOLEAD Project for supporting CNOs in collaborating and doing businesses. In this scenario, new generation of services should provided and should be managed and dealt with both human and automatic processes. This new discipline requires the definition of new languages, standards and tools able to support both workflows and business processes. The work carried out in this paper

presents a roadmap for the definition of a new language and tools which will consider these recommendations.

While also the leading companies in the field of business processes are analyzing this topic (see the BPEL4People specification) the CBP specification could be used as a starting point for the future research activities. This report is intended to provide suggested specifications and a prototypal implementation of this preliminary work. As a next step, similar activities will be analyzed and further researches will be performed. This process could hopefully start a standardization process, this is why it's important to study all aspects involved in such a particular domain.

## 4.1 Acknowledgments

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