Delivering business processes to customers by integrating mobile technology with Business Process Management Systems

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***Abstract* — The number of users of mobile technology is growing on a daily basis. Many organisations seek out new ways how to reach their current and future customers through mobile channel. Applications like mobile banking showed true potential of this technology by providing customers with access to their money anytime, anywhere. This paper presents the approach that enables customers to directly interact with the organisation on a business processes level. Based on the concept of mobile processes standard WfMC reference model is extended in order to enable customers to interact with BPMS in a mobile manner using mobile technology. A case study from financial services industry is presented to show the potential of proposed approach.**

***Key words* — Business Process Management Systems, Mobile Processes, Customer satisfaction, Service Quality**

I. INTRODUCTION

To efficiently and effectively manage their business processes many organizations deploy Business Process Management Systems (BPMS) [1]. By controlling execution of business processes with BPMS organizations gain access to plethora of information related to process execution [2]. The collected information can and is used in many different ways like controlling and monitoring of process execution or performance improvement initiatives. Another way to use that information is to improve performance of customer service officers who can provide up to date information about the status of the particular process to customers in real-time. For example when a customer asks for information about the status of their loan application the customer service officer will consult the BPMS to check the current phase of the loan approval process for that particular customer. This will of course result in increased customer satisfaction since no longer will they get a famous reply from customer service officers: "We'll check and get back to you".

The next step is to involve the customers directly in the execution of the processes. This means that external customers are treated as resources within the process. Naturally the only reasonable way to involve customers is to treat them as mobile resources. However a distinction must be made between internal resources and external customers since external customers have little or no knowledge about internal processes of the organization in question. Thus external customers must be recognized as a special kind of mobile resources different from employees of the organization.

This paper analyses various aspects of mobile processes and mobile customers focusing on integration points with BPMS. Based on the findings of conducted analysis a generic approach for customer focused execution of business processes is proposed. The central point of the proposed approach is definition of the extensions to the WfMC (Workflow management Coalition) reference model [3] that enables mobile customers to interact with BPMS by using mobile technology.

The paper is organized in the following manner: section 2 provides overview of mobile processes and mobile customers. A component called Mobile Process Handler (MPH) and the way of integration into WfMC reference model is introduced in section 3. Section 4 describes a case study from the financial services industry. Finally Section 5 gives a conclusion and describes possibilities for future research.

II. MOBILE PROCESSES AND MOBILE CUSTOMERS

Process mobility is a significant factor that must be taken into consideration when dealing with external customers. Definition of mobile process has been given by several authors reflecting the specific context of their research [4] [8]. For the purpose of this paper the following definition of mobile process is most suitable.

Mobile business process is a process for which the location of the execution of at least one activity is uncertain. Process is mobile for two basic reasons: (i) mobility of the resources and (ii) mobility of the process itself. For the first case the process itself does not have to be mobile i.e. the process can always be executed in single location but the resources responsible for execution are dislocated and mobile. On the other hand the process can be mobile by definition i.e. it must be executed in different locations to deliver required outcome. This makes location one of the most important properties for this kind of mobile processes. A good example of a mobile process is car towing service or mobile parking.

For mobile business processes concept of location uncertainty is crucial. Thus a business process is considered to be mobile when at least one of the following statements hold true for at least one partition of the business process [5] [6]:

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1. There is uncertainty of location
2. Uncertainty of location is externally determined
3. A cooperation with external resources is needed in the execution of the process

The next question is at what stage of the process life cycle mobility should be addressed i.e. in the process design phase or process execution phase [5]. Research has shown that mobility should be addressed at both stages. Process modelling methodology called Process Landscaping was proposed in [12]. This methodology is focused on addressing mobile aspects of processes but it is based on existing process modelling notations. On the other hand Kunze et al. claim that current notations and languages are not sufficient for definition of true mobile processes and propose extensions to XPDL (XML Process Definition Language) called DPDL (DEMAC Process Description Language) which resolved shortcoming related to mobile processes [8].

The approach presented in this paper is focused on the execution stage and find existing process modelling notations adequate. Usage of any process modelling approach and methodology like Process landscaping that will take mobile aspects of processes into consideration is desirable and recommended.

Customers must be enabled to execute activities assigned to them in a mobile manner i.e. they need access to execution environment of BPMS. Customers can remotely access BPMS environment using three different channels i.e. configurations: (i) Standard internet, (ii) Short Message Service (SMS) and (iii) Mobile internet. The Standard internet assumes a configuration which combines broad-band internet connection with a large screen terminal device like desktop or laptop computer. Mobile internet configuration combines a mobile terminal device like smart phone with special purpose application and data transport services i.e. mobile internet. Finally SMS is well known protocol for exchange of short text-only messages using only a basic mobile phone. This paper will only cover true mobile configurations i.e. 2nd and 3rd configurations as 1st configuration has only limited mobility due to limited availability of broad-band internet access and limited mobility of the terminal devices.

Customers participate in the execution of the process in two different modes: (i) passive and (ii) active mode. Passive customers do not influence the execution of the process i.e. they only receive information about the phase or status of the execution of particular process. On the other hand active customers execute tasks i.e. directly participate and influence execution and outcome of the process.

Mobile customers realize interaction with BPMS in two modes: (i) push and (ii) pull mode [9] [10].

In push mode customers are only receiving information which is triggered by occurrence of certain events like changing of the phase or status of the process being executed. The push mode therefore can only support passive customers. In pull mode customers can both send requests for delivery of information or execute a task which will steer the execution of the process. Task execution requires possibility to send various command messages which will be interpreted and executed by BPMS.

Generally both SMS and Mobile internet can be used in pull mode however research shows that SMS is not best suited for pull mode due to [7]:

- Limitation of SMS message length up to 160 characters
- Lower usability and higher possibility of mistakes
- Message delivery is not guaranteed
- Security issues

Some of the shortcomings of SMS can be resolved with newer messaging protocols like MMS (Multimedia Message Service) however usability and delivery issues still remain.

Having that in mind and the fact that SMS does not require data transport services the optimum solution is to use SMS for push mode and mobile internet configuration for pull mode. With such a setup customers would receive various notifications via SMS which would also be available in the mobile internet configuration and task execution would be exclusively available in the mobile internet configuration as shown in Figure 1.

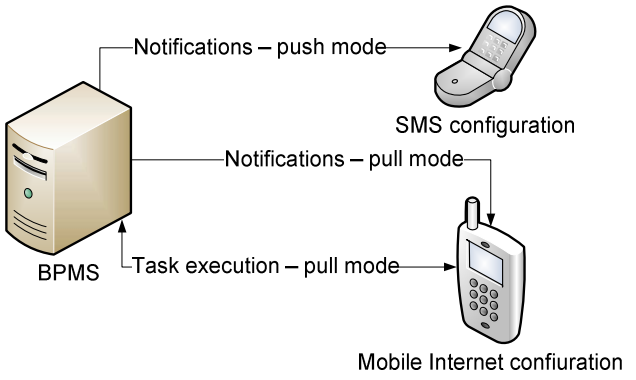

Figure 1 Proposed setup for mobile customers

Another approach is given in [11] where mobile process forms are used as a unified messaging interface however the technology has not matured to be considered as an alternative at this time.

III. Extension of WfMC reference model

In this paper the vendor neutral WfMC reference model is used to describe how BPMS must be extended to ensure customer focused execution of business processes. As shown in Figure 2 the standard reference model is extended with the component called MPH (Mobile Process Handler) and Interface 6. Mobile network infrastructure is standard infrastructure of mobile network operator. It is included only for illustrative purposes since it is not a part of the extension.

MPH is responsible for management of mobile aspects of the process i.e. task. Figure 3 shows sub components of MPH responsible for transformation and management of data related to mobile processes i.e. mobile customers.

Interface 6 is responsible for communication between Process engine and MPH. Communication through Interface 6 is bi-directional which means that both MPH and Process engine initiate communication. MPH will send requests to Process engine to retrieve the status of the process including the Work list i.e. the list of tasks while Process engine will send notifications to MPH for delivery to customers.

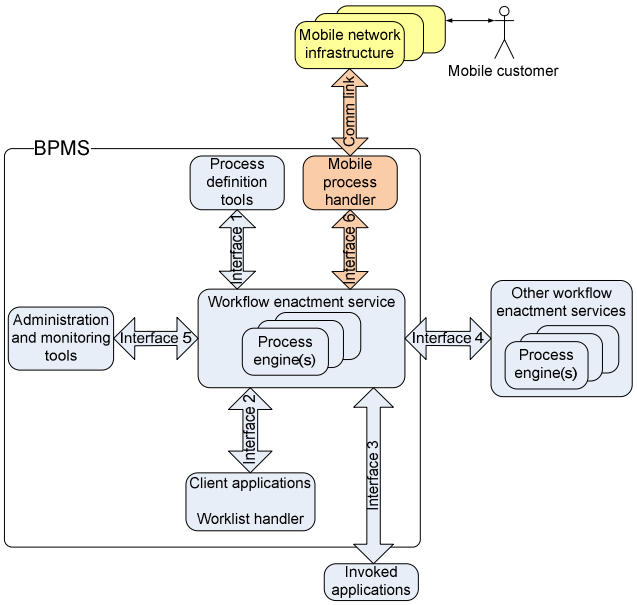

Figure 2 Extension of WfMC reference model

Essentially MPH is a pipeline of components i.e. all tasks and notification coming from Interface 6 are processed by each component starting with top component (Infoset manager) and finishing with bottom (Dispatcher).

Infoset manager – responsible for definition of information set that is sent to customers as part of the task or notification. Original definition can be adequate for internal resources however this might not be suitable for

Location resolver – any specific information related to location is managed by this component.

Configuration manager – this component manages the configurations defined in section II i.e. defines and resolves which message will be sent through which channel.

User interface manager – all tasks have a user interface associated with a task. This component is responsible for management of all user interfaces in case they are different from the one used by the standard BPMS definition.

Device handler – the goal is to be device independent i.e. to support as many devices as possible. This component would adjust and configure any attribute or property specific to some of the devices.

Dispatcher – at the end of the pipeline message must be formatted, packaged and dispatched according to the format defined by receiving point in Mobile network infrastructure.

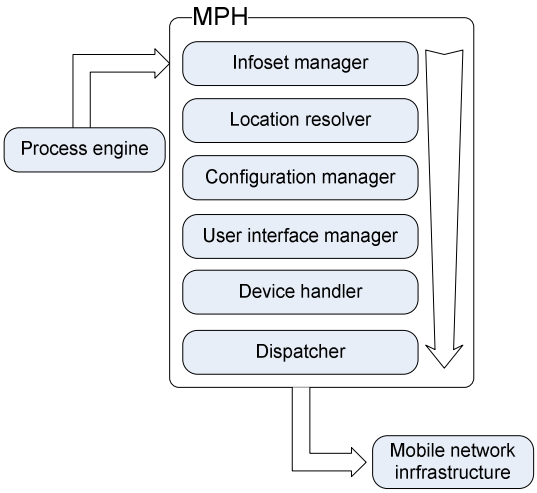

Figure 3 Sub components of MPH

IV. CASE STUDY – LOAN APPROVAL PROCESS

The purpose of presented case study is to show potential of proposed approach on two scenarios from financial services industry. Financial services industry is anyhow one of the early adopters of mobile technology in the form of mobile banking solutions. The case study covers loan approval process from customer perspective. One example of the loan approval process is shown in Figure 4.

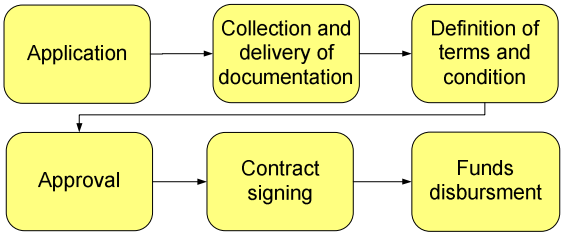

Figure 4 Example of loan approval process

Taking a loan can be very stressful and quite time consuming endeavour. The process itself is very complex and many more activities sit behind the high-level model presented in Figure 4. The presented case study will only describe two scenarios how proposed approach can enhance customer experience. First scenario is related to enhancement of phase Collection and delivery of documentation which will help and guide customers during the collection and delivery of necessary documents. The second scenario is related to phase Approval which is one of the longer phases especially when amount of the loan is higher.

Scenario 1 – Collection and delivery of documentation

From customer perspective Collection and delivery of documentation is one of the most time consuming phases. Traditionally collection of documentation is a very simple process from the perspective of financial institution. All that is necessary is to wait for the customer to deliver the required documents. That is not the case for customers since a lot of effort is needed to acquire all needed documentation. This means that the collection process must be redesigned and extended to provide information that will help customers to collect required documentation.

The customers are provided with the list of all documentation with detailed instructions on how to acquire listed documentation. Figure 5 shows user interface template used by customers during collection process.

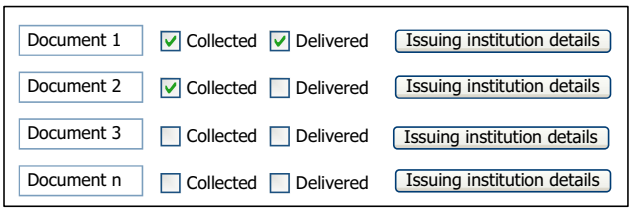

Figure 5 Example of user interface template used for collection process

Available information includes location (address and map) of institutions that issue needed documents (available by selecting Issuing institution details for a particular document). Customers can track what documents they have acquired and what documents are already delivered. Delivery will of course be tracked by the loan officer at the time of documentation delivery. The list of issuing institutions depends on location i.e. branch where the loan application was submitted. For example a customer that applies for a loan in Split will receive different information on how to acquire documentation from one in Zagreb.

Scenario 2 - Approval

Approval process can take a long time, sometimes more than a month. Approval includes rating calculation and depending on requested amount a Credit Committee can be involved in the approval. To inform customers on the current status the information about current and next activity would be available (e.g. Credit Committee proposal under development) and the date of the Credit Committee (accessible via "View Credit Committee details" button) as shown in Figure 6 a).

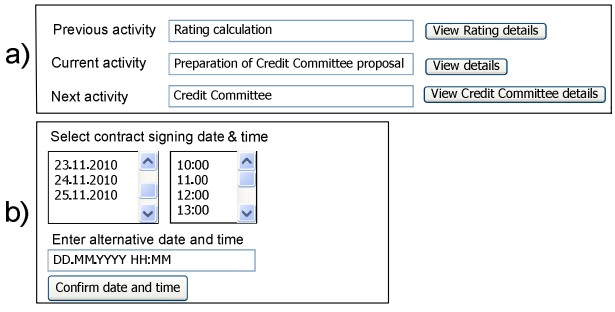

Figure 6 Example of user interface template for Approval phase

After a loan application has been either approved or declined an SMS message would be sent to customer. In case the loan was approved the customer would be able to select and confirm the contract signing date and time. The customer can choose from the several proposed dates or can propose another date in case none of the proposed dates is suitable as shown in the form shown in Figure 6 b).

V. Conclusion

The approach proposed in this paper enables customers to be directly involved in the execution of the business process. In order to achieve this BPMS as foundation technology needed to be enhanced with components responsible for integration with mobile technology and requirements of mobile processes and customers. Providing customers with access to information about process execution and allowing them to be a real-time actor in the process execution regardless of their location can significantly enhance quality of service provided to customers. Presented case study showed the potential of the proposed approach. Essentially there are no limits how business processes can be enhanced to provide customers with the right information at the right place and time. There are several options for future research. One of the options is analysis and specification of message format exchanged via Interface 6 which would standardise communication between Process engine and MPH which is the purpose of the WfMC reference model in the first place.

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