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Framework for Workflow scenarios in case of Federated ERP Mall as business model for Exchanging Federated ERP web services

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Abstract

A Federated ERP (FERP) system is an ERP system which its functions are provided as web services (WS) by various and independent providers. The need for these FERP systems has arisen to reduce the costs related to the installation and customization of conventional ERP systems and to increase system efficiency by continuous improvement of provided system functions. Because of the high cost of ERP systems, only the big companies can afford such systems, while some of the SMEs use more than one isolated information system to cover the required functionalities. A business model for intermediaries as a Federated ERP (FERP) mall to cover the lack of pre-defined communication channels and trust areas between the FERP WS providers and the user enterprises (SMEs) is the most appropriate business model type. One of the main products are provided by this FERP Mall is ERP workflow which combines WSs from different vendors to provide all the software functionality needed by every user enterprise (SME) as a complete process. This Workflow could be also generated by SME itself, therefore, this paper will present framework with analytical and exploratory methods that will leadasresults to two different workflow scenarios provided from FERP Mall (mediator)to benefit the SME and thatexpend the role ofmediatorbetween the FERP WS provider and SME. The validation of these result has been evaluated qualitatively through the added values for the business model actors and quantitatively through a questionnaire which has been distributed among sample of SME in Germany.

Keywords: *Federated ERP system, Framework, workflow, federated ERP web services*

1. Introduction

The most of SMEs use various information systems to cover their needed functionalities that leads to many problem related to the integration and redundancy in date and function but in same time SMEs are facing different problems when they acquire ERP systems as integrated solution, such as: [1,2].

- Not all installed components are needed.
- The usage of licenses, Administration, and maintenance of these products are too expensive.
- Normally, ERP systems are complex and overloaded with stuff, functions and options, therefore it is hard for new user to learn.
- High-end Hardware is required.
- Lack of IT stuff.

Therefor and As proposed solution for these problems, the idea of FERP system was emerged in the last few years (see figure 1). A federated ERP system (FERP system) is a proposed version of ERP system which consists of ERP components that are distributed as Web Services within a computer network. The functionalities of this system are provided by an ensemble of functions allied network

and integrated them together to appear as a single ERP system to the user enterprise. Different ERP system components can be developed by different vendors (see Figure 1) [1, 2, 3].

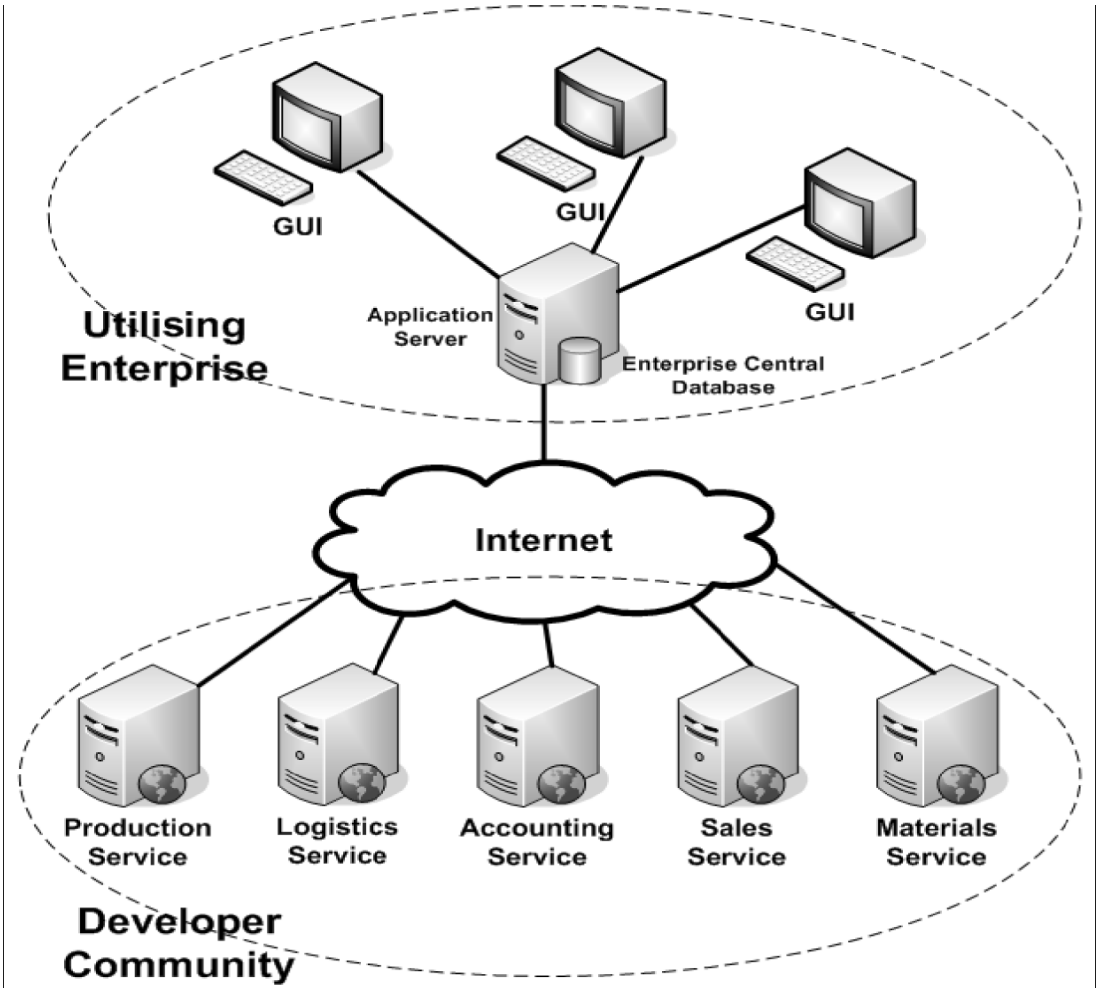

Figure 1: Architecture of Federated ERP system

Asfoura and others through Many previous researches characterized and formulized that an FERP Mall (as mediator) is the appropriate business model [6,7,8]. This mall offers FERP Web service through the online directory and work as an integrator of FERP WSs in FERP processes through workflow reference model, which provides all the possible scenario of business in an enterprise. This integrator can fulfil the needed FERP functionality as one hand and it is responsible to the user companies for the quality of ERP processes. The all FERP shops in FERP mall appear as single shop to the costumer companies, which supports all phases of transaction, but only the using of WS functionality execute directly between the FERP WS providers and the end-user. This mall also offers services (as service providers) which are needed for the marketing of FERP Web Services. These services could appear in other shops (see Figure 2). All shops in the FERP Mall have a single shopping and payment system.

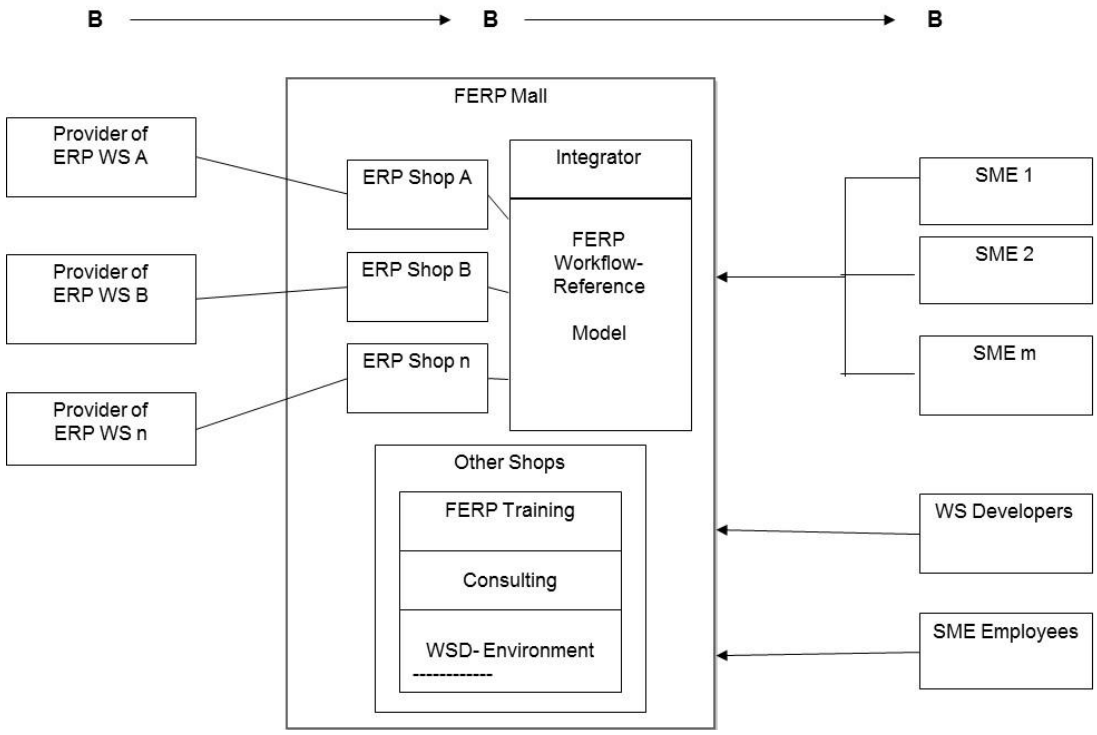

Figure 2 The character-concept of FERP Mall

Then the workflow definition is one of the main products that are provided by FERP Mall to integrate various ERP web services which cover the needed functionality from the user enterprises. Therefore, this paper will present framework which provide tow possible scenarios for generating workflow through FERP Mall (as mediator) between the web service providers and user enterprises. The proposed framework will be presented in section 3 after presenting literature review in section 2. Section 4 will include the evaluation and the conclusion will be summarized in section 5.

2- Literature review

Workflow represents plan of sequentially or in parallel chained functions as working Steps in the form of activities which lead to the creation or utilization of business“ [5]. The integration of a business process that is supported by different WSs is divided into different architectural components in the realization of an orchestration process. These components are processed at three levels (process definition, orchestration and composition levels) [10]:

- In the process definition as the first step, the desired graphical structure of a business process is described by the Business Process Modelling Language (like BPMN) [11] as the best-known standard.
- In the orchestration level as a second step, the business process structure described in the first step is implemented as executable components using the Business Process Execution Language (like BPEL) or other languages.
- In the Composition level as the last step, the process is executed by calling the selected WSs through the appropriate SOAP messages.

There are many researches focused on improving the quality of wSs integration from technical point of view with considering quality of services, efficiency and flexibility of composition like [12, 13, 14,15]. workflow in case of conventional ERP System is implicit and totally integrated with the functions in the processing layer in not separable form and differs from ERP solution to another one (see figure 2) which shows four layers :

- Standardization-layer represents initiative for Standardization of FERP Web Services (WS).
- Development-layer represents the Web services developers that encapsulate business functionality in Web services and workflow Designer, which is responsible for the specifications of the business logic.
- Marketing-layer represents the marketplace for the offerings of FERP workflow definitions and Web services.
  Utilization-layer is represented by standard software system for utilizing enterprises. This system consists of graphical user interface, database and workflow management system

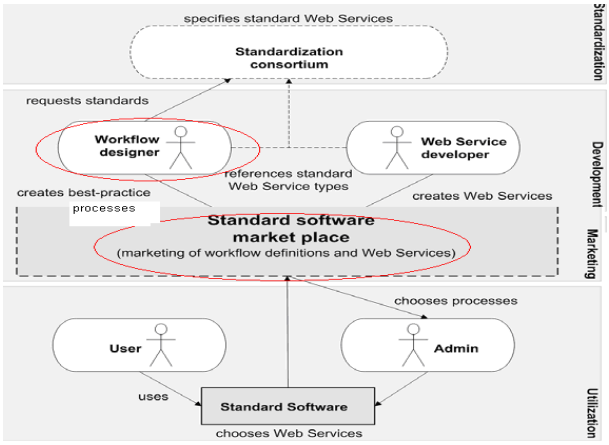

Figure 2. Marketing model for best-practice processes based on Web Services [5]

Then ERP workflow in case of FERP systems is marketable product managed (offered) separately by the mediator or any third party or can be prepared by the user enterprise itself. That will be discussed through the proposed framework in the next section.

3-Research methods

This paper presents theoretical framework (see figure 3) which shows the role of FERP Mall as mediator by creating the business processes for different user enterprises in tow scenarios, each scenario includes interaction steps between the user enterprise (SME) and the web service providers under the control of FERP Mall to provide the appropriate business process for SME. This framework comes as extending description of FERP mall role which is discussed in the previous section.

First scenario: SME has the expertise to design its own workflow manually by using Workflow platform which is provided by the FERP Mall as service.In this case, SME will describe the required processes level including functional and non-functional specifications (see [16]).Based on, the mediator (FERP Mall) will decompose the workflow to determine the needed WSs and will reveal WSs repository (UDDI) to find WSs with suitable functional and non-functional specifications to integrate these WSs in workflow which can be used by SME.

Second scenario: SME asks the mediator directly and describes its business process informally to generate the requiredworkflow.SME will parse in the repository by the mediator (FERP Mall) where the various providers publish their WSs to find the WSs with suitable functional and non-functional specifications and the mediator will automatically integrate these services to generate the needed workflow.

This framework providesallneededflexibilitiesforSMEstocreate its ERP business process through the mediator who ensures also the quality of this process because the business process and its quality are very sensitive issues in case of FERP system. Next section will provide qualitative and quantitative evaluation of the workflow scenarios that shown in this section.

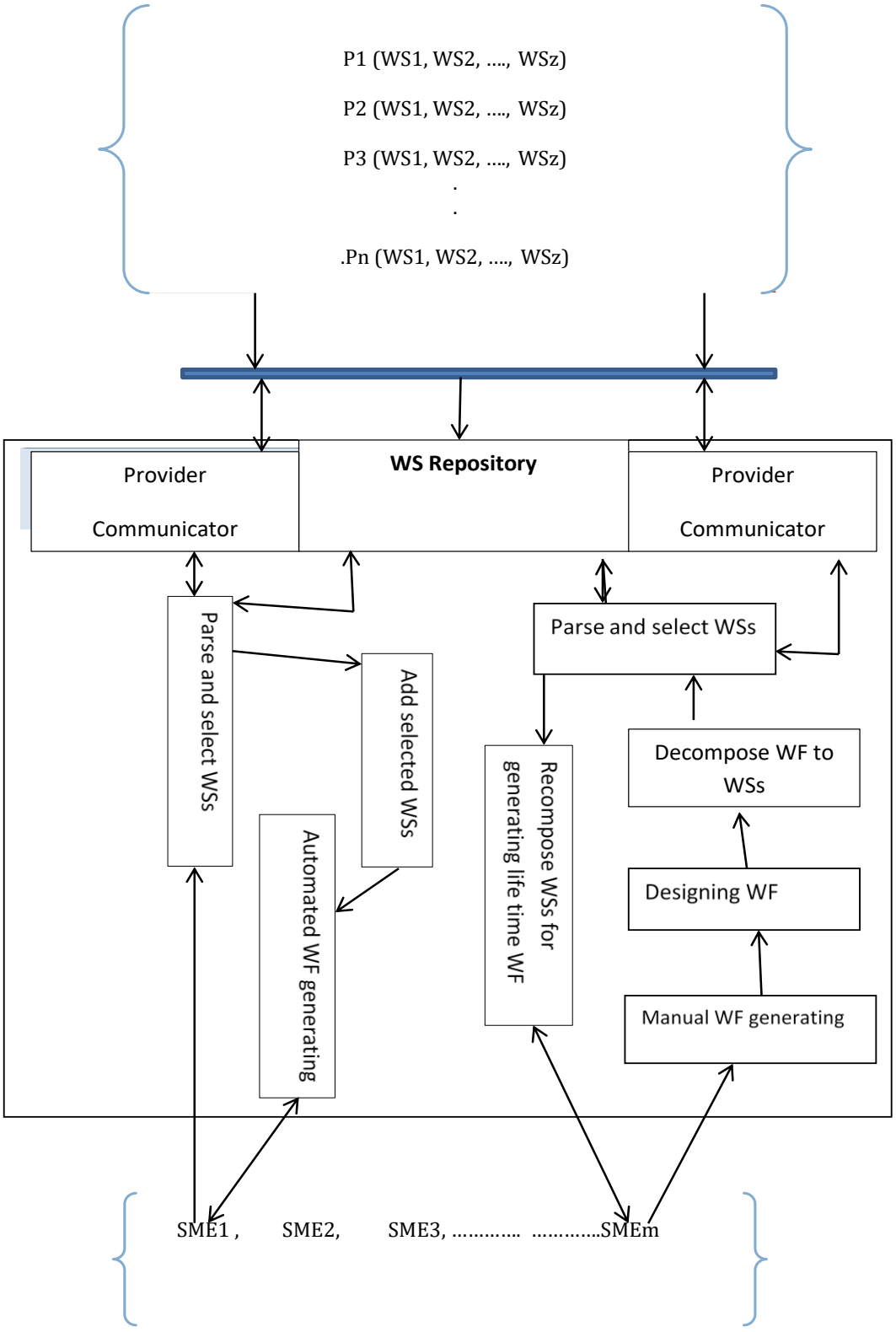

Figure 3: Framework for SME workflow scenarios in case of FERP Mall

4- Evaluation and data analysis

The evaluation of the proposed workflow scenarios will be qualitatively and quantitatively discussed in this section: Qualitative evaluation: the qualitative evaluation will be presented through discussing the advantages and disadvantages of the two scenarios for the mediator and the SMEs (user enterprises):

Table 1: qualitative evaluation of proposed framework scenarios

First workflow scenario			
Mediator (FERP Mall)		*SMEs (user Enterprise)*	
Advantages	*Disadvantages*	*Advantages*	*Disadvantages*
Less responsibility for the quality of business process	*Less revenue because business process is designed by SME*	*Less cost and less dependency on mediator*	*SME will be responsible for the quality of business process*
Receiving revenue through providing platform as services for supporting SME by designing workflow and through intermediation of WSs	*the mediator should decompose manually the business process and find understand clearly the needed functionality and WSs*	*The business process will be more suitable for SME functionality because the user know more than the other parties about what he need*	*Less business process guaranty from the mediator side*
Second workflow scenario			
Mediator (FERP Mall)		*SMEs (user Enterprise)*	
Advantages	*Disadvantages*	*Advantages*	*Disadvantages*
More revenue through designing workflow and intermediation of WSs	*Higher responsibility for the quality of business process*	*Using experience of mediator by creating business process*	*More cost*
Mediator will generate business process automatically	*Mediator will be responsible for business process reengineering when user enterprise ask*	*More guaranty from the mediator for the quality of business process*	*More dependency mediator*

Quantitative evaluation: his part will present the workflow related results (see table 2) as part of the survey that has been done among 120 SMEs in Saxony area in Germany for the evaluation of the acceptance of the FERP System and FERP Mall idea as a solution for covering the company's requirements for the ERP functionality. This survey has been sent by fax and e-mail. The invitation included a brief summary of the FERP System and FERP Mall ideas. 33 of the invited companies accepted to participate in the survey. The contacts with the surveyed companies were carried out as follows: 73% personally and 27% by e-mail.

Table 2: the acceptance rate of proposed framework scenarios among surveyed SMES

A definition of the workflow can be created by employees within the company and they take the responsibility for it.	63.6%
A definition of workflow can be made by the FERP Mall itself.	9.1%
That depends on the cost.	36.4%

Table 2 shows the result related to the answers about workflow scenarios. 63.6% of surveyed SMEs prefer the first workflow scenario against 9.1% of SME who accepted the second scenario. About 36.4% of surveyed SMEs confirmed that the preferred scenario will rely on the productioncost. That means there is possible market shares for the both scenarios.

5- Discussion

The proposed framework in this paper focussed on the managing level of appropriate workflow for the end user enterprises which intermediated by the mediator business model (FERP mall) to increase the flexibility against the those user enterprises. All the previous works that related to workflow focused on approaches for increasing the flexibility and scalability of workflow for cloud computing like [17, 18, 19, 20] and some another researches handled with the service level agreement (SLA) control model for workflow in cloud like [21, 22] also related to SLA the author of this work formulated managing approach for SLA and PLA (Process Level Agreement) in case of FERP from the mediator side (see [23] and 24]. All those related work can considered as complementary technical platform for the proposed framework in this paper which aimed to provide flexible scenarios for generating workflow for the user enterprises as extending the role of mediator (FERP mall) between the various ERP WS providers and the user enterprises to benefit the both.

6- Conclusion

This paper presents a theoretical frame work including two scenario for workflow generating in case of FERP system. These scenarios can be provided by FERP Mall (mediator) to satisfy SME preferences and to control the quality of ERP business processes. The proposed workflow scenarios has been qualitatively and quantitatively evaluated. This paper come as extending work for previous papers that aims to realize FERP system for benefits of SMEs. The future related work of the author will focus on deriving suitable pricing model which can be considered as logical base for determining the price of FERP workflow from the mediator side when this workflow designed by the mediator (FERP Mall)

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