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# Service Innovation Discovery for Enterprise Business Intelligence Applications (SIDE-BIA)

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***Abstract**: Enterprises launch many business services to its clients. The business process must be effective in meeting the client's expectations for the enterprises success in the competitive business area. The job of business architects in the enterprise is to design a service process flow and provide to managers to implement the service flow. When the service is ready it is open to customer access. Customer use service process flow and gets their requirements satisfied. Being the end users of the service flow, customers have lot of queries and suggestions on the service flow. Feedback from the customers must be reinforced to redesign the service flow or identify new way of handling the service. Not many systems are present in the market for this kind of service innovation requirements from the business analyst. In this paper, we explore this problem and propose a mechanism for service innovation discovery in the domain of service redesign for enterprise.*

***Keywords**: Service Innovation, launching, customer feedback, analyst, reasoning, prototyping, redesign, repository*

## I. INTRODUCTION

Enterprise launches new services for remaining competitive in business vertical. The success of an organization depends on the effectiveness of the service in meeting the customer's requirements. Service development move through a set of planned stages consisting of establishment of clear objectives, idea generation to concept development, service design, prototyping, services launch and customer feedback. Service blue print techniques are used for service development in most enterprises. Once the service is in the market, serving the customers, many feedbacks on the services and competitive service information arrives from multiple sources. Based on this information the service has to be redesigned, identify the new service and made effective. With information arriving from different sources both in and out of an organization and with wide variety of information, the data for the service redesign would be very huge. With this vast information, it is difficult for an enterprise business analyst to go through all the\information and redesign the services. Also the challenge is in filtering the irrelevant information and aligned with organization goals and resource constraints in the organization. Prioritizing the information is also needed for service redesign. Business analysts also want to know the weak points on the current services and areas for improvement. This necessitates automated approaches for information processing and interfacing to existing Business Intelligence (BI) applications in the organizations. In this paper, we study the current approaches for service discovery from the vast information collected from different sources. We identify the problems in current solutions and propose an effective semi automated mechanism for service discovery and re-design of the services. We implement the solution and measure the effectiveness of solution in terms of quality of re-design suggestions, quality of pain points and areas indentified for service redesign. Section 2 gives the related work and the problems in the current work. In Section 3, we discuss the solution. In Section 4 performance analysis of the proposed solution is given. In section 5 conclusion and future work are detailed.

## II. RELATED WORK

Ghose et al. in their work [1] have proposed Rapid Business Process Discovery (R-BPD) tool that can query heterogeneous information resources (e.g. corporate documentation, web-content, code etc.) and rapidly construct proto-models to be incrementally adjusted to correctness by an analyst. The R-BPD tool can potentially extract a large number of (sometimes small) process proto-models from an enterprise repository. Some of these proto-models might in fact be alternative descriptions of the same process. But R- BPD cannot

identify the problems for service re-design. It cannot also identify the areas of improvement in the current service flow.

.In [2] the authors proposed an approach for constructing Business Process. Their solution has a three-layered language for representing business processes and the use of Model Checking Techniques for verifying constructed models against business requirements that are specified a-priori. They presumed the correctness of the requirements provided and evaluate correctness within and across the inter-relationships between the models constructed in this variety of languages.

In [3] the authors proposed an approach for Modeling Business Objectives using Domain Ontology. They detailed the use of tool support for the task of correlating the business objectives and service offering. Their work focused mainly on service re-alignment but the focus of our work is redesigning the services. In [4],the authors proposed GoalBPM methodology for relating business process models (modeled using BPMN) to high-level stakeholder goals (modeled using KAOS). Changes can also be made to the goal model and tested against the current business process model to identify behaviors that are invalidated. Invalid behavior may be explicitly defined, supporting further redesign to align the processes changed against organizational goals. But this approach does not use the customer feedbacks on the process to verify the satisfaction level. In [5], work flow mining from event logs was discussed for service innovation discovery. But the approach does not support handling inconsistencies in the event logs. It does not address service refinement on already existing workflows.

In [6], automated tools for auditing the business process for compliance requirements were discussed. But compliance is the goal of our paper . We focus on improving the business process to increase the customer satisfaction and improve the business process to remove the wastages and move towards more profitability. In [7], the authors proposed a mechanism for managing inconsistencies in business process using semantic annotation. But the inconsistency was mainly found by verifying the interaction between processd and no external information was taken to verify the inconsistency. This solution cannot improve the service process. In [8] models for redesign of organization work were proposed. This work closely resembles our work. But the data acquisition and processing techniques for service redesign were not considered in this work. In [9], ProcessSEER framework was proposed to mine process semantics. This framework for service design toolkit asks many questions about service flow interaction and guides the business analyst to design an effective service. But this framework does not support mining customer feedback information and use it for service redesign.

In [10], Service Align framework for automated analysis of alignment of service designs with strategy model was proposed. Service designs are specified in terms of service post-conditions (in the same underlying formal language that one might use in the context of semantic effect annotation of process models) and QoS guarantees (typically in the form of linear inequalities involving QoS measures). The alignment machinery involves a novel combination of goal satisfaction analysis, plan conformance analysis and optimization. But the work does not consider aligning services for valuable feedback information extracted from the information sources.

## III. PROPOSED SOLUTION

The system architecture of the proposed system is given in Fig.1

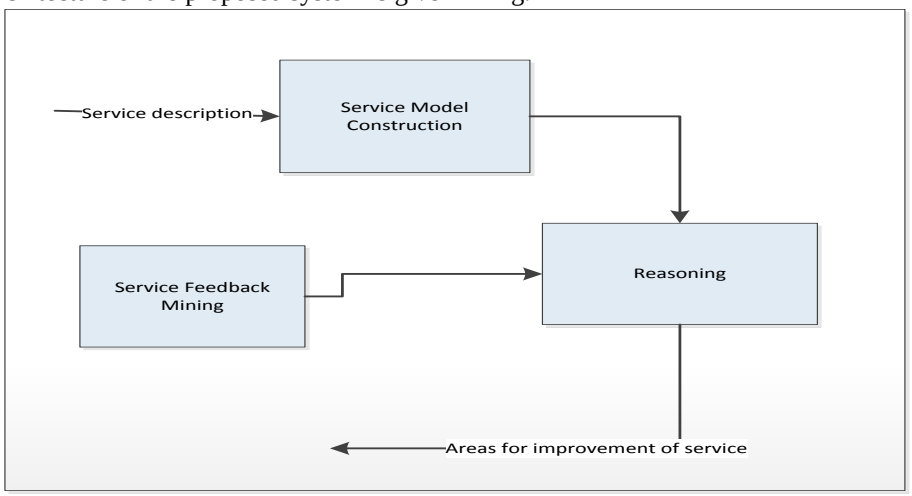


**Fig. 1 System Architecture of the proposed system**

The system has three important components.

**1. Service feedback mining**: This component will crawl for service feedback information on various sources in and out of the organization. It will filter the relevant service information and provide it to the reasoning component.

**2. Service Model Construction:** The service description expressed as SADT flow in enterprises is not suitable for reasoning. This has to be converted to a uitable form for reasoning.

**3. Reasoning:** This component will execute reasoning on the Service model and the Service feedback information mined. The result of the reasoning process is the areas of refinement on the service flow, so that service can be redesigned.

***A. Service Feedback Mining:***

Service feedback information comes from customer, critics and competitor. This information is available on web or documents. This information must be used to extract the knowledge which will be used for service redesign. For this, special crawlers must be used to mine this information from web blogs and other databases. **Hadoop Big Data techniques** are used to process such volumes of data related to services. The information extracted from the sources are preprocessed to know the relevance of concepts to the service. (Figure 2 and 3)

***B. Service Model Construction:***

Service must be modeled to apply reasoning on the service flow. We use Strategic rationale model to represent the service flow. Strategic rationale is a graph based representation method. The nodes in this model are goals, tasks and resources. These node elements are linked to each other through means-end relationship and task decomposition relationship. An example of strategic rationale representation for a Banking System Service is shown in Figure 5.

***C. Reasoning***

Reasoning component learns decision trees from the strategic rationale model. The business analyst defines the goals for the service. Based on the goals, the decision trees are constructed from the strategic rationale model. The items in the decision trees are evaluated against the data mined. From this we check the validity of decisions against the data mined. For example, say for processing the bank loan the business analyst has set the service flow that if the CRIL score is below 700 reject the application. But from the transaction reports collected from the sources it is evident that scoring patterns for applications whose overdraft history is satisfactory for the last two years have CRIL score from 640 to 680. Reasoning module will be able to check the validity of that particular decision in the service flow whether it is profitable for the organization. Reasoning module will alert the business analyst to check the validity of this decision on CRIL score because many applications have been rejected. These problem areas are identified and informed to business analyst so that service flow can be changed and service is redesigned. (See figures 2 and 3). The computations are performed using the Bex tool.

## IV. RESULT

We conducted the performance analysis on our proposed solution w.r.t **three parameters**:

**1. Coverage:** It is the measure of how much percentage of service suggestion was able to match with that of a business expert.

**2. Accuracy:** different service suggestion is given different scores by the business expert and the score for all the suggestions given by the Bxtool is measured and converted to percentile.

**3. F1 Measure:** It is measured in terms of precision & recall using the below formula.

$$F = 2 \cdot \frac{\text{precision} \cdot \text{recall}}{\text{precision} + \text{recall}}$$

We conducted our performance analyzing on the German credit application dataset taken from UCI machine learning repository [http://archive.ics.uci.edu/ml/datasets/Statlog+ (German+Credit+Data)] Based on 20 attributes of the applicant, the decision to provide loan or not is made. We formed the decision tree from the dataset & created the service model.

**Two goals** were provided to test the service redesign capability:

**1. Increased User base:** More credit card applications must be accepted without major change in service.

**2. Decrease risk:** Riskier credit card applications must be rejected without affecting the service logic in a major way.

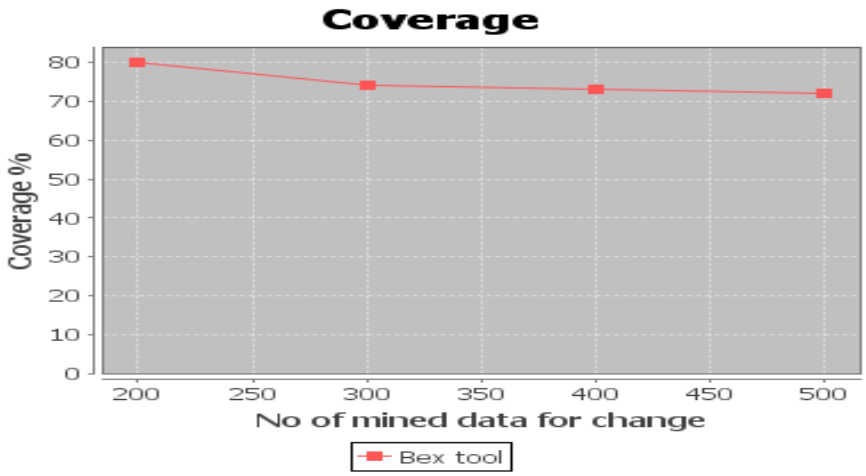


**Fig. 2 Coverage as no. of mined data for change**

**We varied the number of re**cords mined for change and measured the coverage. Coverage is overall around 70 to 80%.
The quality score is around 90% proving the effectiveness of our method with respect to score of human expert.

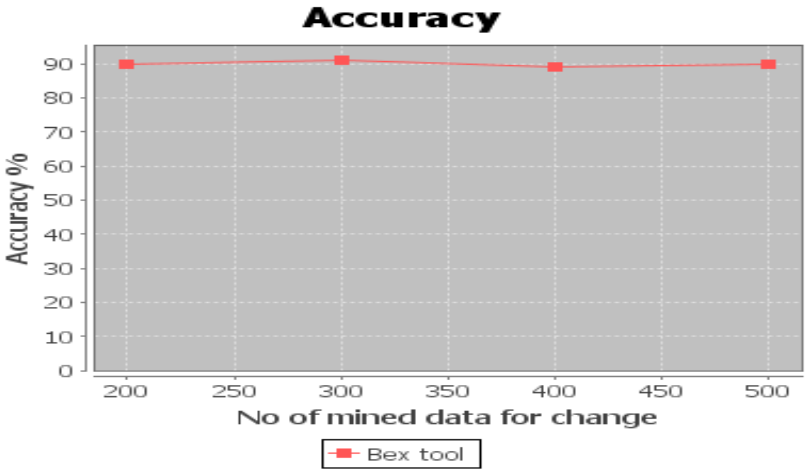


**Fig. 3 Accuracy as no. of mined data for change**

The F1 measure is taken for different dataset size for change and from this we see as the volume of data for change increases, the system precision is good compared to its recall. (See Fig. 4)

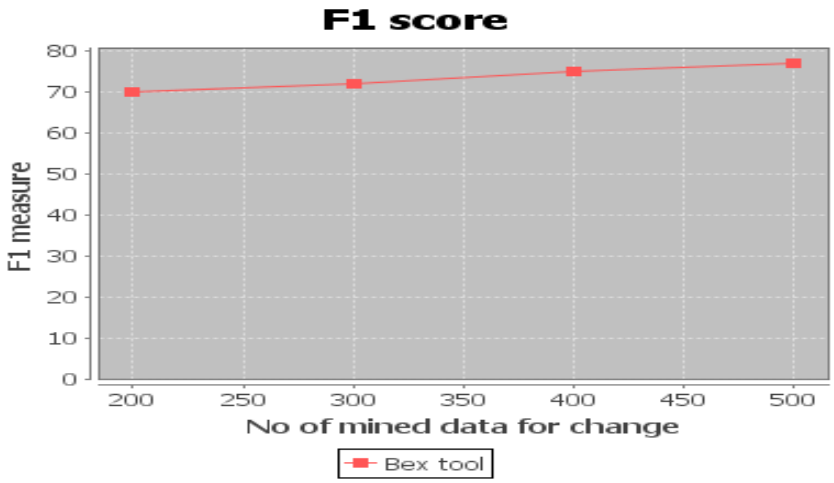


**Fig. 4 F1 Measure as no. of mined data for change**

## V. CONCLUSION

In this paper, we have proposed a mechanism for service redesign assistance by mining information from web and other sources in the organization. Our mechanism is able to effectively identify the areas of improvement in the service flow while meeting the organizational goals and constraints.

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**Figure 5: Shows Strategic Rationale Representation of Banking System Service**