Always stay agile!

Towards Service-oriented Integration of Business Process and Business Rules Management

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***Abstract*— To keep their competitive edge, enterprises need to change their operational processes in a flexible and agile manner. A Service-oriented Architecture (SOA) may help to meet these needs. One key feature of a SOA is the externalisation of business process logic. However, process logic is often complex, hard to understand and difficult to adapt. This issue is due to a mingling of process and decision logic. In order to ensure flexibility and agility, decision logic should be moved to a separate service. There are several approaches to realise such a "rule" service conceptually. In this paper, a decision framework to select the appropriate rules execution approach is developed, based on a set of "factors". The decision framework is applied to an application scenario from the insurance domain.**

Keywords - Business Process Management (BPM); Business Rules Management (BRM); Business Rules Management System (BRMS); Service-oriented Architecture (SOA); Workflow Management System (WfMS)

I. INTRODUCTION

Workflow Management Systems (WfMS) support companies in the management and execution of business processes [1]. Nowadays, the latest challenges for insurance companies such as the dynamic business environment and compliance with legal requirements highlight the need for business agility [2][3][4]. Business agility requires the individual, quick, and flexible composition and adaption of business processes [5][6]. This can be done in the context of Business Process Management (BPM). As a result of the composition and adaption, the number of decisions may rise within the processes. Hence, the complexity of the business processes can lead to a lack of business agility [4][5].

Business rules provide an opportunity to reduce the complexity of the processes, whilst the complex decision logic is encapsulated. The necessary changes with respect to agility often relate to the complex decision logic and not to the process or business logic. Thus, the separation of decision logic and process logic on the modelling and implementation level is a useful approach to reduce complexity [4].

Comprehensive service-oriented approaches have potential to create business agility [7]. Thus, a Service-oriented Architecture (SOA) can help to address challenges like the dynamic business environment. The service-oriented integration of BPM and Business Rules Management (BRM) provides potential to change business processes in an agile manner [4]. The results of interviews with experts of the insurance service sector emphasised the issue to choose an adequate approach to automate the execution of business rules with respect to a missing decision support. Considering the dynamic business environment in the insurance services sector, the topics of the presented work are of potential value for several insurance companies in Germany [2][3].

The aim and the major contribution of this paper is a decision framework for choosing an adequate business rules execution approach. The result of the application is based on a characteristic application scenario for companies operating in the insurance services industry.

The subsequent research activity is to develop a prototypically service-oriented integration of BPM and BRM based on the results of the applied decision framework.

Thus, the paper illustrates the work in progress related to the current research activities of the Competence Center Information Technology and Management (CC_ITM).

The remainder of the paper is structured as follows. In the first part (section II), the prior and related work are presented. The main sections (III to V) refer to the description of the service-oriented approach based on a workflow engine, followed by an introduction of the application scenario as well as a description and an application of the developed decision framework. Finally, the paper ends with a conclusion and looks upon some future research activities (section VI).

II. PRIOR AND RELATED WORK

Potential application scenarios regarding the combination of BPM and BRM were analysed in accordance with the requirements of the CC_ITM collaboration partners [8]. As a result, the application scenario "handle a goodwill request" was selected. The scenario, introduced in this paper in section IV, is inspired by the insurance application architecture of the General Association of the German Insurance Industry. The insurance application architecture describes inter alia reference process models for the insurance services in Germany [9]. The application scenario was already implemented in prior research projects. The scenario was used for the evaluation of the prototypic implementation regarding a

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service-oriented approach based on a workflow engine [10][11][12].

In addition, the elements, which are to be implemented with a rule-based approach, were determined within the scenario. In the process, the business rule "set goodwill adjustment" was identified. [13] suggests an extraction process for business rules identification from business process models. This process is useful, because business rules are often not explicitly included in the process models. A decision guideline for distinguishing between business process and business rule is presented in [14]. Requirements concerning business rules technologies are defined in [2][3]. [15] illustrates variables for determining suitable solutions for business rule implementation. As a result of the literature review, the decision guideline, the requirements and the variables provide a contribution to the decision framework. Since no previous research allows a simple choosing of an adequate business rules execution approach this decision framework is the first to extend the current state of research through the linking of factors, indicators and business rules execution approaches. The determination of the specific business rules execution approach depends on the elements, which are to be implemented with a rule-based approach.

III. SOA APPROACH BASED ON A WORKFLOW ENGINE

Figure 1 illustrates the simplified concept of an already implemented SOA. The architecture comprises several components, which were developed in the context of Business Process Management, Business Activity Monitoring, and Service-oriented Architecture within the prior research projects and implements the application scenario "handle a goodwill request". Based on the results of this research activity, the architecture is extended towards the service-oriented integration of BPM and BRM by a corresponding business rules execution approach.

The workflow engine is used for the coordination and execution of workflow models. Thus, the engine is responsible for ensuring that every activity within the workflow definition is executed in the defined order and that the data flow between the workflow client and the invoked service is routed correctly.

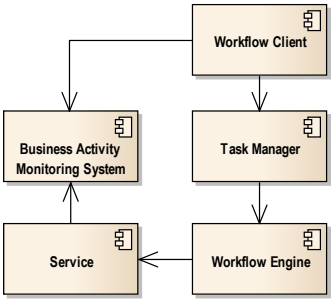

Figure 1. Overview of the architecture

The workflow client presents a user interface to call and activate the workflow. Users take their individual tasks from a "task list". Some activities require input from the user. Therefore, the engine will request the input from the client as a result of a client call.

The task manager is used to decouple the workflow engine and the workflow client. Thus, the task manager is a software component, which abstracts from a specific workflow engine. The decoupling is necessary because the technically tight coupling to a specific workflow engine limits the opportunity of flexibility in the event of an enterprise merger or acquisition [11].

The invoked service implements the business logic necessary to execute the activities specified within the workflow model. In accordance with the defined process model, the workflow engine invokes the service to execute the activity. The invoked service performs the activity and returns the result to the workflow engine.

The Business Activity Monitoring System (BAMS) represents the software component, which is used for the real-time monitoring of critical performance indicators to improve the speed and effectiveness of business functions. The required data are collected within a data warehouse by the performance of extract, transform, and load processes. Based on these data, the BAMS generates complex events to build critical performance indicators. The complex event processing is realised by triggers and stored procedures in active databases. The events are analysed and reported by the BAMS [10][11].

IV. APPLICATION SCENARIO

Figure 2 illustrates the application scenario "handle a goodwill request". The scenario constitutes a part of the simplified insurance process "claim processing" and is required to apply the decision framework to choose an adequate business rules execution approach. In the future, the scenario will be used to evaluate the prototypic implementation.

With the handling of the process "handle a goodwill request", insurance companies check whether and in what amount the customer claims are to be satisfied without obligation of the insurance companies. The task "check goodwill" checks whether a claim without obligation of the insurance company should be regulated in order to not compromise the business relationship. In particular the privity of contract and the relation with the customer are checked. The amount of goodwill will be determined within the business rule "set goodwill adjustment". The last task checks whether a contractual alteration is appropriate for the policyholder. As a result, it may also be determined that no contractual alteration is necessary or that a reasoned recommendation to contractual design shall be given [9].

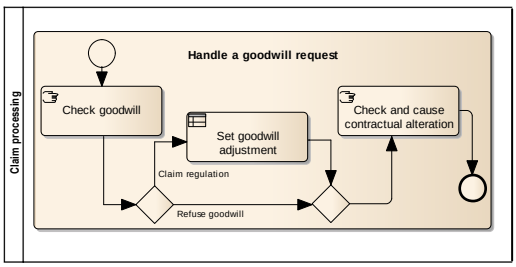

Figure 2. Application scenario "handle a goodwill request"

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V. DECISION FRAMEWORK

To define the corresponding execution approach for the identified business rule "set goodwill adjustment" a decision framework was determined. A decision framework was created based on factors gained by the performed literature review. Table I describes the used factors.

TABLE I. FACTORS OF THE DECISION FRAMEWORK

Factor	Definition
Frequency of rule change	The volatility can be seen as a measure of flexibility in terms of changing business rules. To determine the expected volatility of a business rule, changes in the past can be considered.
Understanding of implications	Understanding of implications regarding a business rule modification describes whether the potential impact can be safely predicted or not. The risk level of changes is reflected by this factor.
Distribution time	Distribution time defines the time the business rule needs to give effect. Thus, the time between the release and the business rule provision is defined.
Transparency	The factor "transparency" specifies the need for justification of decisions regarding the execution of a business rule.
Transaction volume	The factor "transaction volume" defines the required volume of facts for rule execution.
Versioning	Most business rules are revised after some time. Here it is important to determine whether the old version of the rule must continue to be present, or whether the business rule is simply overwritten and only the new rule has to be available.

There are several approaches to provide the needed business rules execution approach. [2] identifies an inference machine, a database management system, a business application, and configurations as possible approaches to execute business rules. The decision framework can help in choosing one approach by considering several application scenarios and the factors. Due to economic restrictions in this exemplary implementation only the described application scenario is considered. Every rules execution approach has advantages and disadvantages in regard to the adopted factors.

Inference machines enable the efficient and flexible execution of business rules. The encapsulation of complex decision logic allows an easier and faster implementation of necessary adjustments. An inference machine enables transparency if the engine includes an explanation component. For business rules execution the inference machine requires all relevant facts. This can lead to increased transaction volumes. Most of the inference machines allow rule versioning.

Database management systems are not developed for frequent changes in their structure but triggers, constraints, and stored procedures allow depicting rules. There has to be a high understanding of the implications when changes to databases are made. This leads to a long distribution time. The firing of triggers is often not transparent and changes are often not trackable. Databases are built for data processing and so allow high transaction volumes.

Business applications are built for long-lasting business cases and not for frequent changes. A high understanding of the implications is needed for changing a business application. So, the distribution time for changes made in business applications is long. Business applications need to be built to allow transparency in their decision logic if necessary. Providing several executable versions of business applications is difficult to handle.

Configurations often allow fast modifications but are not designed for frequent changes. As configurations often only allow adjustments in a defined range the understanding of implications is medium. If the configuration is not accessible by the user it may take hours to provide a change. Transparency in the configuration decision logic is only possible through implementation in the business application that accesses the configuration. Versioning is hardly possible for configurations. Table II presents the mapping of indicators to the business rules execution approach.

TABLE II. DECISION FRAMEWORK

Factor	Indicator		
	Business rules execution approach		
Frequency of rule change	High (hourly to weekly)	Low (monthly to annually)	Never
	Inference machine	Configuration / Database	Business Application
Understanding of implications	Low	Medium	High
	Inference machine	Configuration	Database / Business Application
Distribution time	Minutes	Hours	Days
	Inference machine	Configuration	Database / Business Application
Transparency	Yes	n/a	No
	Inference machine	n/a	Database / Configuration / Business Application
Transaction volume	Low	Medium	High
	Inference machine	Business Application / Configuration	Database
Versioning	Yes	n/a	No
	Inference machine	n/a	Configuration / Database / Business Application

The requirements for choosing an adequate business rules execution approach results from the presented application scenario "handle a goodwill request". In this context, a low frequency of rule change is assumed on average. The understanding of implications is high. A distribution time of minutes is expected and there should be transparency. Only a low transaction volume is assumed but there has to be versioning of business rules. The decision framework provides the opportunity to weight the factors. Depending on the respective application scenario the importance of the factors has to be determined. Table III presents the weighting of the factors concerning the application scenario "handle a goodwill request".

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TABLE III. IMPORTANCE OF THE FACTORS

Factor	Importance
Frequency of rule change	20%
Understanding of implications	10%
Distribution time	40%
Transparency	10%
Transaction volume	5%
Versioning	15%

The importance of the factors is not generally valid and depends on the individual application scenario. Table IV shows the rating regarding the appropriate business rules execution approach. The rating results from the requirements and the importance of the factors. For example the rating for the inference machine is 70%. Based on the requirements for choosing an adequate business rules execution approach concerning the factors distribution time, transparency, transaction volume, and versioning the inference machine is the result. Regarding the rating result of the inference machine the importance of the factors distribution time (40%), transparency (10%), transaction volume (5%), and versioning (15%) were cumulated.

TABLE IV. RATING RESULTS

Approach	Result
Inference machine	70%
Database	30%
Configuration	20%
Business Application	10%

As explicated above, an inference machine is suggested by the decision framework. The application of the decision framework can be considered as a decision-making aid. In addition to the illustrated factors within the decision framework further factors were identified. To reduce the complexity for choosing an adequate business rules execution approach only factors that are relevant to the application scenario were considered.

VI. CONCLUSION AND FUTURE WORK

The combination of technologies and concepts such as SOA as well as business rules processing / management is a promising approach for companies operating in the insurance services industry. As the key contribution of this article a decision framework for choosing an adequate business rules execution approach was developed and applied. By applying the decision framework one gets a criteria list, which decides when to use a particular concept to implement the business rules approach – especially an inference machine, a DBMS-based approach, a configuration or a hard-coded application. Applying the decision framework to the "handle a goodwill request" scenario results in an inference-machine-based (BRM-based) approach to be most useful. Since the decision framework is so far work-in-progress it will be extended in future work. The future work has to include the evaluation of the usefulness, applicability, and validity of the decision framework and the corresponding results. This could be done by applying the decision framework in practice and determining framework extensions in the context of interviews with experts. Our subsequent research activity is to develop design decisions for the prototypical service-oriented integration of business process management and business rules management regarding the application scenario "handle a goodwill request".

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