A Transformation Framework Proposal for Managers in Business Innovation and Business Transformation Projects - The role of transformation managers in organizational engineering

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Abstract

In order to restructure or transform an e-organization in the optimal manner, there is a need for a specific organizational engineering pattern to support abusiness integration strategy that is based on standards, mapping concepts and interoperability. Many standards and methodologies exist;today they are very advanced and can support the organizationaltransformation processes of the actual business transformation projects, to become part of a larger eco-system. Transforming atraditional business environment into an innovative and efficient e-business service-orientedenvironment is a great challenge, because transformation initiativesoften fail because of the monolithic nature of the monolithic organization. Many monolithic organizations and their correspondent business information systems fail to be transformed and to adapt to the new business requirements.These facts make it difficult to follow frequent changes and thisfact might cost many companies a fortunewithout obtaining the return on investment. A well-planned organizational transformation process and a reorganized business environment should be basedon a platform offlexible business microservices and functionsthatcan support the future changes to the business environments. In order to reach the optimal organizational transformationmodels an organizational engineering pattern must be designed to improve the functions of the existing business services. This article's goal is to present an organizational engineering pattern that would support frequent change initiatives.

Introduction

Enterpriseor e-businessarchitecture serves as a methodology and tool to provide the link between the organizational requirements and its organizational characteristics;using e-technologies and the underlined business services, in order to attain the definedbusiness agilityby using an Organizational Engineering Pattern (OEP) [1]. Unfortunately, e-Business Transformation Managers often might overlook or miss to developa solid e-business architecture and a corresponding transformation plan for their future e-system. This reflects intheir incapacityto manage various business transformation artefactsneeded for the integration ofthe new e-systems. This article's aim is to influence theattitude of BTMregarding a coordinated e-business organizational and architecture transitions. To achieve this article's goal, the authors offer to future BTMsor organizational change managers'efficient managerialand technical recommendations and an OEP that would cover the e-business scope and objectives, without incurring high production, maintenance and implementation costs [2]. This article's purpose is to deliver OEP recommendations and is a part of a long series of articles on business transformation projects (BTP) that deal with the organizationalchanges. The applied research methodology is based on literature review, a qualitative methodology and on a proof of concept used to prove the related hypotheses. The implementation of such BTPs' OEP requires the knowledge of a large set of technologies and methodologies. The authors have based their research on the main fact that only around 12% of business

organizations successfully terminate innovation-related business transformations projects[3].The eventual successes of BTPs depend on how organizations can adapt to business transformation and dynamically change their structures. Adapting just the underlined technologies is not enough and the main problem arises due to lack of business systems' agility. Such an agility approach, as shown in Figure 1, can be built on basic elements called microartefacts [4].

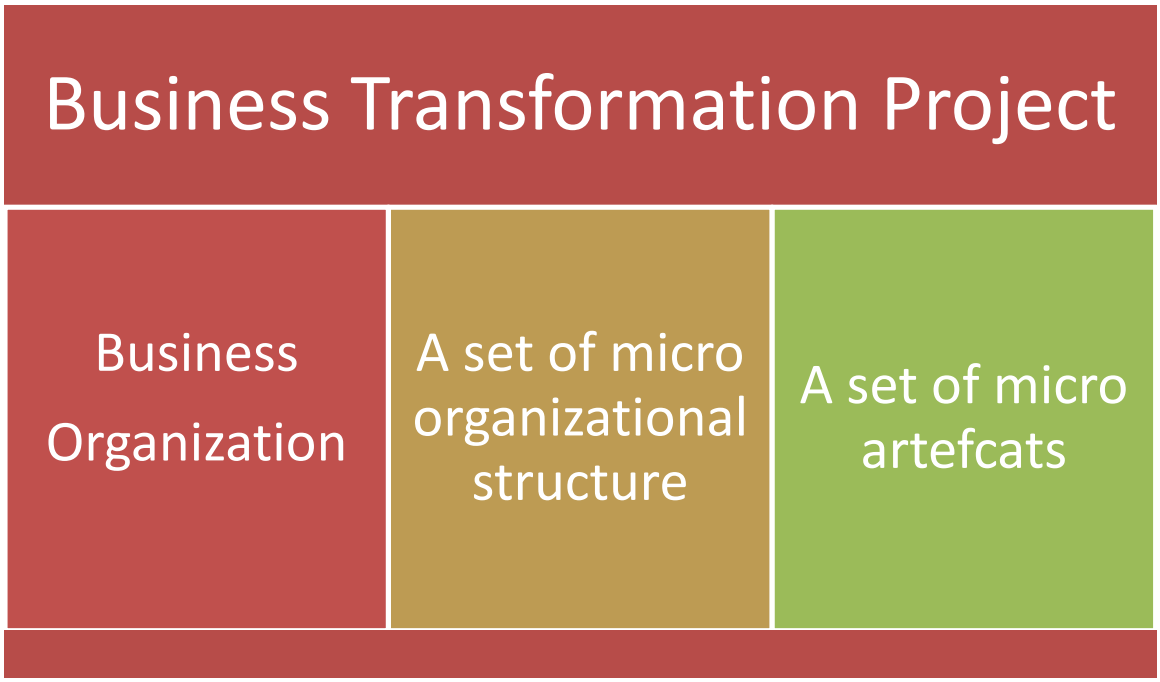

Figure 1. The microartefact concept.

The organizational change depends on how a business organization is decomposed into a set of micro organizational structure that is setup of microartefacts [5][6].

Research methodology and design

The OEP is a component of the Organization change module (Om) that in turn is a part of the Selection management, Architecture-modelling, Control-monitoring, Decision-making, Training management, Business managementand Organizational change management Framework (SmAmCmDmTmPmBmOmF; for simplification reasons, in further text it will be referred to as the *Environment*), supporting the BTP architecture activities. The global research topic's and final research question (hypothesis #1-1) is: "Which Business Engineering transformation manager characteristics and which type of support should be assured in the implementation phase of a Business Engineering transformation project?" The targeted business domain is any business environment that uses: 1) Internet technologies; and 2) frequent transformation iterations. For this phase of research the sub-question (hypothesis #7-1) is: "**What is the role of organizational engineering patterns in business engineering transformation projects**?" In this research phase the authors are targeting the organizational engineering pattern's integration that is a part of the Om impacts of the mechanistic enterprise's integration and uses a mixed hyper-heuristics based methodology.

As already mentioned, the *Environment* is represented by the acronym SmAmCmDmTmPmBmOmF and is composed of the following modules[7][8]:

- **"Sm"**: for the selection of the BTM (based on the set of hypothesises #1-x).
- **"Am":** for the architecture and modelling strategy that can be applied by the BTM (based on the set of hypothesises #2-x).

- **"Cm"** for the control and monitoring strategy that can be applied by the BTM (based on the set of hypothesises #3-x).
- **"Dm"** for the decision making strategy that can be applied by the BTM (based on the set of hypothesises #4-x).
- **"Tm"** for the training of the BTM (based on the set of hypothesises #5-x).
- **"Pm"** for the project management strategy that can be applied by the BTM (based on the set of hypothesises #6-x).
- **"Om"** for Organizational change management strategy that can be applied by the BTM (based on the set of hypothesises #7-x).

BTPs are the main sources for investments in organizational engineering and the related methodologies [9][10].Organizational engineering is a very complex domain and a BTP can become a nightmare and that should be avoided using the right unbundling strategy in order to give the transformed business companyan important business advantage [11].The *Environment* delivers: 1) a real business transformation framework in the form of reusable concepts; 2) various patterns including theOEP; and 3) a corresponding set of organizational engineering managerial recommendations.This phase's main blocks are:

- The interfaces to different standards.
- The micro architecture concept.
- The holistic microartefact.

A holistic agile view on organizational engineering

The BTM must achieve an agile holistic view of the BTP and this agility must be integrated in the enterprise's architecture development method through the use of various agile organizational engineering methods [12]. Agility is established by anorganizational engineering concept and OEPs where the integration of various micro architecture artefactsisdone by the design of a BTP organizational meta-model, as shown in Figure 2.

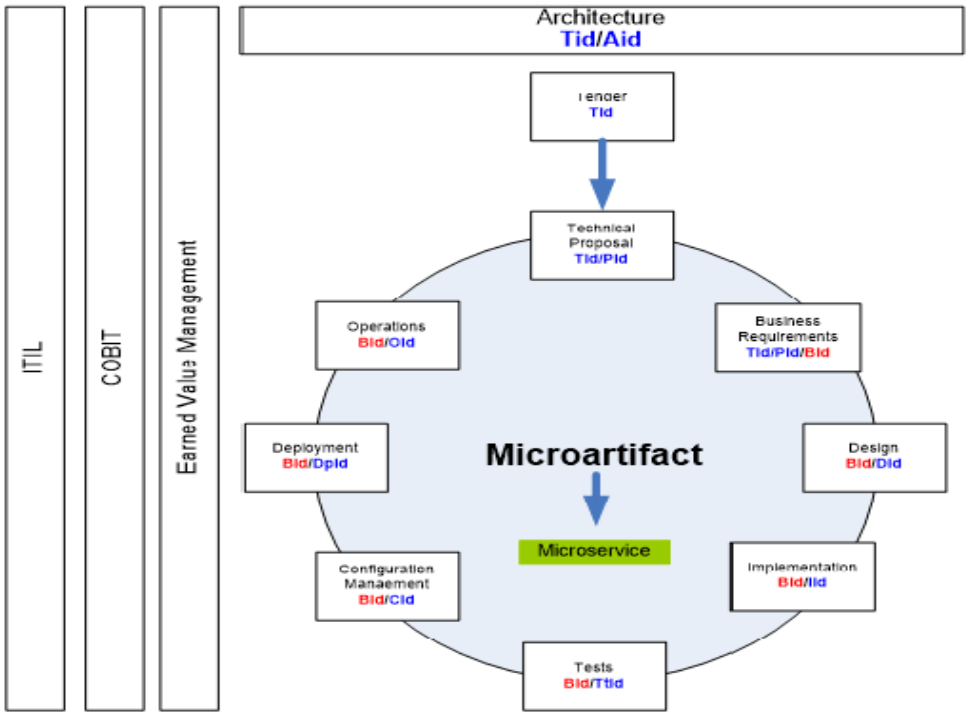

Figure 2. The microartefact technical model.

The evolution of communication and informationtechnologies have encouragedfrequentorganizational changes where the knowledge of organizationsengineering is the holistic approach that bridgemany domains. Managing organizational changesis very difficult to manage and organizational engineering helps in gatheringorganizationalknowledge that are stocked in microartefacts [13].

Standards

Today many standards like TOGAF, MODAF, DODAF, UPDM, CMMI, COBIT, ITIL, UML, BPMN, BMM, SysML, …; exist. They are well established and they are all operational, in fact there are too many standards and we can even talk of a standard proliferation [15]. These standards and the corresponding tooling environments can help in unbundling of the actual traditional business environments through the application of a spiral iterative pseudo-bottom-up approach for BTPs. Microartefact is the smallest element that can help in bridging all the standards and create a micro architecture concept that can be used by the BTP as a development method.

Architectural concept

As shown in Figure 2,microartefactincludes: 1) business functionality and attributes that are represented by a microartefact; 2) business services' linkage; 3) application services' linkage; 4) security capabilities; 5) microartefacts manageability; 6) microservices interfaces definitions; 7) related microartefactsbuilding and solution blocks; and 8) a mapping table of microartefacts to business, organizational entities and policies. Business engineering focuses on both organizational design and enterprise architecture. The main element is business choreography or business process that is based on a microartefact. Business processes include: 1)business engineering; 2) business process optimization;3) enterprise architecturemicroartefacts; and 4) organizational engineering. An OEPestablishes a common ground between organizational specialists and BTP team members andthis articleproposes the breakdown of the monolithic organization into a collection of classified microartefacts that promotepatterns to be used bythe BTP and organizational managers [14].The *Environment* uses a light version of the enterprise architecture framework (TOGAF) in which there is a detailed method for the development of anOEP that includes the concept on how to integrate various existing standards, as shown in Figure 2. In the OEP'smicroartefacts that are based on service oriented architecture and microservices,form a Lego style on which an agile and light Architecture Development Method (or simply the microADM) is built [16].

Micro architecture development method

The micro Architecture Development Method's (microADM) integration in the BTP promotes the usage of controlled business micro transaction, known as microservices, throughout the phases' iterations. During the preliminary phase, the organizational engineeringpattern(s) are defined to meet the global BTP's needs. In this phase, the BTM must implement the principle of microservices' based orientated business transformations; that start with the 1) population of a service oriented architecture (SOA) repository, like the SOA Reference Architecture [17]; 2) defining services for building microartefacts; 3) defining services solution blocks; and 4) defining services building technical components. In the business architecture phase that is essential for the OEP's integration; where in this phase the microartefact instance(s) are createdto include the: 1) mapping of the organizational structure; 2) achievement of business goals and objectives; 3) refinement of the requested business functions; 4) business data microservices' definition; 5) business processes and the unified modelling languages diagrams development; 6) definition of business actor's roles; 7) correlation of organization and business functions; and 8) enterprise data model development [18].Complex OEPs based on microartefactmanagement can cause failures because of the following types of problems [19]:

- BTMs and architects have little control and lack of the needed skills for the BTP's organizational engineering activities.
- Many OEPs are duplicated in the business environments using different architectures.

- The BTP does not have an architecture capability framework that uses the OEPs.
- Inconsequent document and design diagrams.
- No classification of microartefacts.
- Bad architecture resources mapping to various types of applications.

Mapping concept

The OEPis based on the "1:1" concept and it helps in the integration of: 1) differentmicroartefacts; 2) monitoring and trace activities; 3) information technology alignment; 4) the reusability of traditional business environments' artefacts and gap analysis; and 5) following change of requirements [20]. Such a concept is enabled by the establishment of a real world iterative model that can map all the BTPs microartefacts in a linear "1:1" manner [21] that supports the following:

- The alignment of the organizational aspects and the BTM through the use of organizational engineering.
- The knowledge needed for managers to manage business and organizational transformation projects.
- The optimal architecture for organizational engineering.
- The role of business and organizational processes.
- The management of dynamic organizational changes.
- The mapping of the organizational artefacts to other BTP microartefacts.
- The role of agile project management.
- The role of decision making and the use of critical success factors.

Conceptual view

The business and organizational transformation managers must insure an approach that unites all parts of the organization to collaborate together to enable an efficient change management process. It seems evident that e-business and organization transformation managers require support to design a robust and complete concept for BTPs;itis important to have the required support to build consensus among all BTP stakeholders.A conceptual view on a BTP can be built to simplify the implementation. Such a view can be used to develop the mapping model that links various enterprise parts to concrete microartefacts that are linked to microservices using "1:1" relationships.

Microservices'and their granularity

The microservices' control approach helps in the process of controlled unbundling of the monolithic or old model by breaking it down into a set of classified microservices [22] used by microartefacts that in turn contain the flow control [5][6]. From the microservices model architecture's point of view, a microservice can be of any size and it depends on the BTP's (or enterprise architect's) vision on how microartefacts and microservices are classified. These microartefacts and microservices are classified into specialized repositories, granularity depends on the microservices' classification depth that in turn depends on the type of business. Microservices architecture governance focuses on the life cycle of a services' architecture from its inception through modelling, assembly, deployment, management and eventually exclusion.

Services' registries and integration

Universal Description, Discovery and Integration service catalogues and business processes' metadata-repositories could be integrated with the operation's Configuration Management Data Base that enables a cross platform services' management. Such integration links the level of business services and combines them with

Business Activity Monitoring tools. Italso allows an overall insight of microartefacts and their related microservices and the level of individual infrastructure components' usage.

Service life cycle

The complexity lies in managing business services and microservices; at the same time it is managing their life cycle and how to operationally monitor the complex and interrelated microservices' compositions and their interaction with microartefacts to insure business availability. Services' life cycle is based on the services oriented architecture governance that defines:

- Service strategy defines the service portfolio and ownership and the related financial model.
- Service design processes that use architecture, technology, people and processes.
- Service transition includes the management of change, configuration, releases, plans and tests processes.
- Service operation manages the services availability and manages incidents, problems and accesses.

Microartefacts

The OEP is built onmicroartefactschoreography scenarios that are stored in the BTP's architecture continuum and are the basic elements to be handled through the microADM iterations. Characteristics of the proposed microartefact are [5]:

- A concrete BTP identifier.
- It is related to the BTP's requirements or functionalities.
- Requirements capture both business and technical requests.
- Contains an autonomous technology solution based on microservices.
- A microartefact directs and guides the development of the choreography of microservices.

Microservices and microartefacts must have the following implementation characteristics: 1) to unify the implementation and usage of service's models; in order to adopt standards; 2) a microartefact can be an aggregation of other artefact including microservices; 3) a microartefact is a reusable template and can be easily replaceable; 4) a microartefact can have many instances; 5) a microartefact has a unique identifier; and 6) a microartefact enables business services interoperability and integration.

Components and interfaces

Enterprise service bus and enterprise application integration

BTPs must use Enterprise Service Buses (ESB) to glue the various microservice containers of the business environment, through the use of the technology stack and bus connectors, which permits a holistic services management [25][26]. In avant-garde BTPs' related technologies, business service plays a role in interconnecting the company's various business processing models and services. That is fundamental for the BTP's implementation and business integration activities. This activity isinterconnecting the company's various business processing nodes that areneeded for the unbundling using enterprise architecture integration techniques. Such implementations are extremely complex and can cause the BTP to fail [11].

The micro model view controller

The micro Model View Controller (microMVC) is dynamically built for each microartefact where the microADM's phase inputs the microartefactthen the BTP team develops this phase's outputs that are: 1) the update of the activity diagram with the services' flow characteristics; 2) the development of the business and technical microservices; 3) the development of the needed service oriented architecture support; 4) the class diagram; and 4) the development of the services centric microMVC concept. When finalized, the microartefact's resources are stored in the enterprise architecture continuum.

Security

Business environment's roles are orthogonal to security requirements where the business environment main roles define the responsibility for enterprise's businessmicroartefacts. Management of the enterprise's business artefacts, implementation resources, governance procedures, support, usage and reporting of access activity, should be managed by the BTP's security concept. Therefore the business environment's securitydepends onOEP's assertion, governing, control, access management and monitoring of microartefact's security that is based on the microMVC pattern. The microartefacts security uses the following standards: 1) the security policy framework [27]; and 2) (e)business messaging is needed for domain-specific assertion languages and it defines assertions for declaring reliable-messaging policy [28][29].

Enterprise control and monitoring mechanisms

Enterprise logging servers are designed to collect and store business data from various microartefacts and theirmicroservices; they can also provide an extended status report and insure that the microservices' flows should comply with the defined OEP [30]. The logging from various types of microartefacts involves issues causing that data can differ in: 1) flow's logic; 2) quality; 3) formats; and 4) reliability of interaction. The OEPusesthe logged data that are a part of the enterprise's meta-model [31].A transformed business system must have various categories of logging sub-systems.

Decision log

Business environments generate big data volumes influence greatlyorganizational engineering concepts; where the BTP'smicroartefactsoutput to a decision log: This log is a log of all architecturally important final BTP. This includes: 1) data tools selections; 2) justification for data architectural features for the BTP; 3) explications for data standards deviations; 4) data standards lifecycle modifications; 5) data architecture change requests statuses; and 6) microartefacts (re)usage assessments [32]. Decision logs are the base of a robust decision logging system.

Decision making, risks and support

The hyper evolution of business engineering forces various industries to implement risk management mechanisms into their business transformation frameworks. Such frameworks must incorporate business riskfactors into microartefacts.Microartefacts based decision making module contains a set of autonomous critical success factors and their behavioural functions. The success of such BTPs influences the way decision making services are managed and integrated, what consequently forces business enterprises to continuously transform. In this research project the authors introduce a complex methodology for the integration of an OEP in order to successfully finalize the implementation phase; that should fully support the company's strategic and business decision making needs. The decision making module is a part of the proposed business transformation framework that uses microartefacts to promote an iterative concept for developing risks evaluation concept using risk factors. The decision making interlinks to other risk management frameworks.

Control objectives for information and related technology framework

The Control Objectives for Information Technology (COBIT) is a business framework for the governance and management of business environment's information system, andit can be used to insurethat (TOGAF, 2013):

- Accepted principles, practicesand models are used to support the BTP.
- Generic processes are used to manage the BTP's activities and support its objectives.
- Governance of BTPs is managed by defining and aligning their goals with technology goals.
- The linking of BTP goals to technology usage and offers metrics to weight the success rate.

The integration of critical success factors or risks for BTPs and the alignment with standards such as Information Technology Infrastructure Library (ITIL), International Organization for Standardization (ISO), Project Management Body of Knowledge (PMBOK), PRINCE2 and TOGAF.

Information Technology Infrastructure Library

The standardized Information Technology Infrastructure Library (ITIL) contains a well detailed description of a seven-step improvement process that provides the capabilities to: 1) measure; 2) plan; and 3) implement business services and microservices improvementswith their needed assertions. This seven-step improvement process is not only used on an operational level but it also provides support for all the microADM's phases [33]. In this seven-step improvement process the BTP team implements the needed Service Level Agreements (SLA) that can be incorporated in the operational phase.ITIL focuses on business services or application software services where the top level of the configuration tree in ITIL is the business system. The OEP decomposes the business system into microartefacts thatcontain a set of microservices, the governance model of ITIL can be used to govern microartefacts.

Maturity model

Architecture Maturity Models are heavily used in the area of maturity models. Capability models include the following: 1) CMMI (Capability Maturity Model Integration); 2) IPD-CMM (Integrated Product Development Capability Maturity Model); 3) P-CMM (People Capability Maturity Model); 4) SA-CMM (Software Acquisition Capability Maturity Model); 5) SE-CMM (Systems Engineering Capability Maturity Model); and 6) SW-CMM (Capability Maturity Model for Software).The available diversity of models is a problem of how to integrate different models in one metric for the BTP's process maturity, the Capability Maturity Model Integration (CMMI) is recommended for managing this complexity.CMMI models propose best practices enabling organizations to:

- Explicitly link management and business engineering activities to global business objectives.
- Expand the microartifacts' scope of and its visibility into the BTP's lifecycle and engineering activities to ensure that the business servicessupport the microADM.
- Incorporate successful microartifacts integration as best practice to become an OEP.
- Implement robust high-maturity microartifacts scenarios.
- Makes OEPs comply with standards

Project management

The *Environment's* Project management (Pm) module is used to refresh the microartefact's project data into the project management tool data store. This module provides an interface for a just in time project information manipulation using standard implementation language and supporting many project management formats [34].

Proof of concept

The used resources and tools

The proof of concept was built using the following resources and tools:

- The *Environment* research framework.
- Sparxsystem's Enterprise Architect tools.
- Java Extended Edition.
- AngularJS.
- Microsoft Visual Studio .NET 2015.
- Microsoft windows operating system.

The user interface

The proof of concept's user interface, as shown in Figure 3, links the Tender's identifier (or the BTP identifier) to the list of business requirements where each requirement has a design document. A design document defines an implementation scenario that is choreography of microservices. The previously defined user interface interaction defines the management of a microartefact.

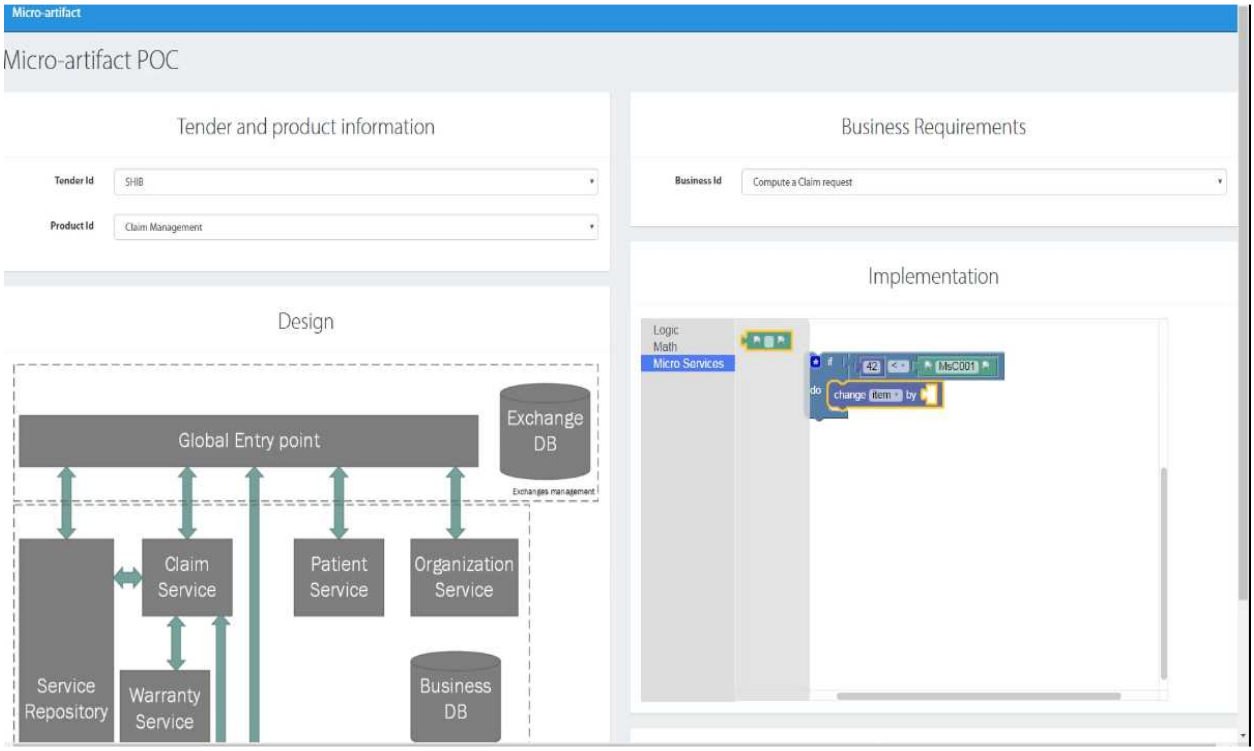

Figure 3. The proof of concept's user interface for managing microartefacts.

Conclusion

In order to restructure or transform an e-organization in the optimal manner, there is a need for a specific organizational engineering pattern to support a global integration strategy that is based on standards, mapping concepts and services interoperability. This article,the *Environment* and the proof of concept defined a set of technical and managerial recommendations for the OEPintegration. OEP can be used for the very difficult and

technical implementation phase of BTPs, knowing that the BTPs' implementation phase is the major cause of very high failure rates.Enterprise or e-business architecture serves as a methodology and tool to provide the link between the organizational requirements and its organizational characteristics; using e-technologies and the underlined business services, in order to attain the defined business agility by using an Organizational Engineering Pattern (OEP). In this research phase the authors target the OEP's integration impacts on the enterprise. This phase's main blocks are: 1) the interfaces to different types of microartefacts; 2) standards integration; 3) the micro architecture concept; and 4) the holistic microartefact concept.

Today many standards and patterns exist; they are well established and are operational, in fact there are too many standards and that is an issue for dynamic BTPs.BTPsmust have an agile holistic view on its resources and its agility must be supported by the enterprise's architecture development method. Agility is also supported by an organizational engineering concept in the form of an OEP where the integration of various microartefacts is itsbase. The micro Architecture Development Method's (microADM) integration in the BTP promotes the usage of controlled business microservices. The microADM and OEP are based on the "1:1" concept that helps in the integration of: 1) different microartefacts; and 2) monitoring and trace activities.

The microservices approach helps in the process of unbundling of the monolithic model by breaking it down into microservices used by microartefacts that in turn contain the business flow control. From the microservices model architecture's point of view, a microservice can be of any size. The OEP is built on microartefacts scenarios that are stored in the BTP's architecture continuum and are the basic elements to be handled through the microADM iterations.

The authors introduce a complex methodology for the integration of an OEP in order to successfully finalize the implementation phase; that should fully support the company's strategic and business decision making needs. The decision making module is a part of the proposed business transformation framework that uses microartefacts to promote an iterative concept for developing risks evaluation concept using risk factors.

Acknowledgment

In a work as large as this research project, technical, typographical, grammatical, or other kinds of errors are bound to be missed. Ultimately all mistakes are the authors' responsibility. Nevertheless, the authors encourage feedback from readers identifying errors in addition to comments on the work in general. It was our great pleasure to prepare this work. Now our greater hopes are for readers to receive some small measure of that pleasure.

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