Model-based Framework for Integrated Evolution of Business and IT Changes

Integrated Evolution of Business and IT Changes

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Abstract: This paper introduces a goal-oriented framework which consists of generic and specific model repositories, and of methodology for integrated change management of business and IT evolutions. Is based on model compositions and traceability assessments of goal-oriented and scenario models. It contains a versioning-based cooperative work environment for business analysts to generate strategy decisions and simulations, themselves. The techniques and tools used are from the User Requirements Notation standard for requirements engineering and its supporting tools. Sets of models for visual documentation of BABOK 2.0 standard for business analysis, and of ISO/IEC 27001 and 27002 standards for information security, form the model repository to support developers and decision makers. These rise the generic aspect of the framework. An instantiation of framework for B2B change management with empirical validation within an SME, has been done. In a long way, this framework will be a base on a more complex system configuration control framework.

1 INTRODUCTION

This paper introduces the BUSITEV framework for model-based integration of BUSiness and IT EVolutions. This work is an evolution of our previous proposals for re-engineering of business systems.

The business information system's evolutions need to be integrated in technological and business plans with accentuate impact analysis and security policy (ENISA, 2011).

The goal of BUSITEV framework is to support developers and decision makers in evolutionary modelling of changes. The BUSITEV framework acts as multi-model approach, which combines components of models, technologies, and standards to create a customized solution to a business problem or goal.

The rest of the paper is organized as follows: Section 2 and Section 3 introduces the backgrounds and the BUSITEV framework of multi-model approach for integrated view of business goals, problems, and generic solutions. Section 4 presents examples from an instantiation of the framework for B2B evolutions. Related work are discussed in Section 5 followed by Conclusions.

2 BACKGROUND

User Requirements Notations is a first standardization effort for user requirements engineering language that combines in one unified language goal models and scenarios from Goal-oriented Requirement Language (GRL) and Use Case Maps (UCM). URN is viewed as complementary to notations of UML2. 0 OMG methodologies (ITU-T Z.151., 2008), (ITU-T Z. 150., 2003), (GRL -OME, 2011), (GRL- KPI - jUCMNav, 2011) (UCM -jUCMNav, 2011). The URN supporting tool is the Eclipse-based jUCMNav tool, which contains simulation engine for implementing traceability relationships between functional and quality requirements. (jUCMNav 4.5, 2011) .

The unique combination of goals and scenarios found in URN enables not only to describe and analyze *what, when, who, how* and *where* aspects of business processes, but also *why* aspects as relations to business objectives. The URN allows reasoning about alternatives from intentional ambiguity and abstraction levels for scenario interactions, performance, and architecture (Pourshahid et al., 2009) .

GRL Goal Model. An example of a GRL goal model

and its abstraction capability is shown in Figure 2. The elements of the goal tree can be connected to each other via contribution, correlation and decomposition types of relationships. URN standard supports three sample GRL evaluation mechanisms: quantitative, qualitative, as well as a mixed analysis. For more semantics see at (GRL- KPI - jUCMNav, 2011).

URN has concepts for the specification of stakeholders, goals, non-functional requirements, rationales, behavior, structure, and scenarios in use case maps. Use case maps form the functional model which scenarios can be exported in UML interaction diagrams. **UCM Functional Model.** An Use Case Maps (UCM) model is shown at Figure 4 that shows UCM model components, the processing paths with responsibilities as events in a scenario with start point and end points. The colors of the structural elements can be selected and fixed for the internal standard of an organization, as visual information of a business context.

UCM allows to visualize structural and operational aspects in one functional model. Colored components are actors and organizational elements, lines are path of the flow which contains the actions of responsibilities within a process in consecutive relative times units. UCM has notations for expression of time and of organizational hierarchy.

Start point and end points and path ramifications shows a workflow style of UCM notations, as well as *And/Or, Fork, Join* points are to compose-decompose path of process variations. For more semantics see at (UCM -jUCMNav, 2011).

jUCMNav Tool. The jUCMNav (jUCMNav 4.5, 2011) is an open-source Eclipse plug-in that can handle URNs concepts for integrating functionals with quality requirements. jUCMNav provides integrated supports for model transformations. It can generate reports and can export diagrams in various formats. For more details of URN, GRL, UCM, jUCMNav see (jUCMNav 4.5, 2011) and the (300+) publications and reports available at the URN Virtual Library (URN VLIB, 2011).

3 THE BUSITEV FRAMEWORK

We built a generic goal-based framework with User Requirements Notation (URN) standards (ITU-T Z.151., 2008), (ITU-T Z. 150., 2003) and on URN supporting jUCMNav tool (jUCMNav 4.5, 2011). Technically, URN is which offers the integration possibility. Methodologically, the framework realization consists on instantiation of a set of customizable problems and solutions in the form of generic and specific

models of domains managed within jUCMNav tool and a revision control system for model releases.

3.1 The Generic Model of the Framework

Our research context fixes the solution space as generic models from an initial development for a problem space. We obtain generic models by applying goal-orientation and classifying requirements on functional, nonfunctional, and extra-functional with traceability links between them. Generic goal models serve to identify the strategies for a problem space from selecting a set of possible solutions. The identified strategies and the built goal graph help to architect functional requirements into business process model (Pourshahid, 2011). Thereby, we captured the behavioural and structural details of a strategy between problem space and solution space. Goal-orientation helps to capture goal graphs thus identify common problems and potential solution choices, as well as the forces that have to be considered. Documenting common solutions to the identified problem should be made with adequate tools forming reusable assets.
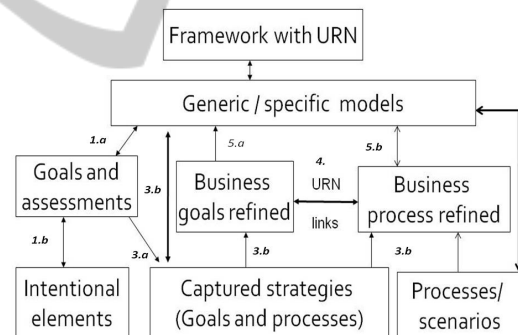

Figure 1: Generic model of BUSITEV framework.

See Figure 1 to follow how the framework creation and usage is made. The generic models form an input *(1)* to an iteration for goal-based engineering of intentions. The generic models give also the elements of a business process/scenarios intended to be built or actualized *(5.a), (5.b)*. Given the generic models, goals and assessments are identified from intentions and analysis of problem space *(3.a)*. These results in captured strategies, which forms realizations as business processes or scenarios *(3.b)*. Linking goals to realizations i. e. forming URN links from goal models to process models *(4.)*, decision makers give nodes between problem space and solution space.

A repeated analysis is done during change management. URN links give traceability links for multi-

model approach and for validation and simulation automation. Business goals and processes redefined can be added *(3.b), (5.a), (5.b)* as specific models into models repository of the framework.

The framework supports model-transformations by jUCMNav tool capabilities. These help to formalize business mechanisms as goals and scenarios, and to simulate and validate them with variations by involving business decision makers. This give an advanced conceptional design process with inclusion of business decision makers.

This framework conception supports business analysts in multi-model usage process and decision making. Business analysts can use the framework themselves: selecting generic/specific models, assessing and defining strategies, and refinements for changed models, or defining of specific models.

3.2 Supporting Business Analysis

BUSITEV framework contains generic models of recommendations of Business Analysis (BA) standard to guide business analysis. (BABOK, 2011).

A Guide to the Business Analysis Body of Knowledge (BABOK Guide) (BABOK, 2011) is a recognized standard for the practice of business analysis. The BABOK Guide defines a Requirements Classification Scheme stated as classes of Business Requirements, Stakeholder Requirements, Solution Requirements and Transition Requirements, which support the dynamics of system's evolution.

This visual documentation of business analysis standard supports aligning business analysis with requirements engineering.

3.3 Supports for Security Management

BUSITEV framework contains a collection of generic requirements of information security in reusable templates. These consist of goals and security requirements per section and subsections of the ISO/IEC 27001 and 27002 standards. They provide generic security goal models and a business view of the structural aspects of security assets, regarding its adoption this should be a strategic decision for the change management.

Figure 2 shows a part of the generic goal model of security assets clauses and references from Business Continuity section of ISO/IEC 27002 standard. See for GRL details in the Section Background.

Generic security goal models form a basis for strategy creation and for creating the set of specific security models. The framework instantiation, which is introduced in Section 4, has specialized templates for

e-trading assessments and for typology assessments of security levels as human, software, hardware and objects resources.

3.4 Repository-based Support for Collaborative Work

BUSITEV framework has implemented the SVN (SVN, 2011) subversion manager to manage the concurrent access rights and team communications for developers scattered by geography to function as a single team. In a teamwork context to avoid confusion, the word version is almost never used. Versions in the first sense we call *revisions* , and in the second sense *releases*.

This opportunity allows business analysts and stakeholders separated in space and/or time to collaborate, synchronize and negotiate conflicting changes. Revision Control Systems (RCS) manages multiple revisions of files (RCS-CVS, 2011). RCS automates the storing, retrieval, logging, identification, and merging of revisions.

4 FRAMEWORK INSTANTIATED FOR B2B EVOLUTIONS

Instantiation of BUSITEV framework for a domain it consists to follow the methodology for evolutionary modelling (see at 3.1) to create the generic goal and functional models for the domain, i.e. trading systems, followed by specific models obtained by creating business strategies and by refining generic models. We named BUSITEV-SMIWEP framework the instantiated BUSITEV framework for B2B type of evolutions.

4.1 Examples for Strategy Creation and Integration into Functional Model

Figure 2 shows a part of a GRL model. In this model are used notations for intentional elements and relationships. Here, the intentional elements are goals, softgoals and their realizations by tasks and resources, which realize security assessments. Relationships used are contributions, decompositions, *and/or* logical operators. The content of this graph is captured from the ISO/IEC 27002 standard recommendations.

4.1.1 Strategy Creation from Generic/Specific Models

Figure 3 in Appendix shows the results of a simulation in the case of reusing the same assessed template
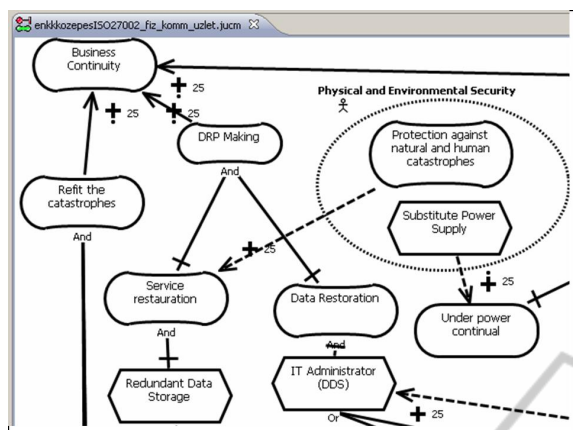
Figure 2: Generic model of security recommendations for Business Continuity information security of the ISO/IEC 27002.

(from library of specific models updated by created strategies) for creating the strategy for medium level of security goal fixed at 100. With the initial choices this alternative results in 26 units for Business Continuity security in rapport with the desired 80 unit of *medium* level of security, because as you can observe initial values for majority of resources are fixed at 0 to achieve low level of costs. It is the responsibility of system and business analysts to chose, simulate and validate solution assessments.

4.1.2 Integration of Strategies into Functional Model

A part of the resulted functional model after the integration of strategies into business processes is shown in Figure 4. It shows new components, use case paths and responsibilities marked with yellow triangle which are added with URN-links for integrating requirements realizations from goal-strategy models. Yellow triangles serve as traceability points between elements of a strategy model and its realizations. They highlights how many components and process elements can appear in functional model for satisfying security requirements. The strategy goal model used for refining the functional model in this example is from previous strategy models captured by simulation.

5 RELATED WORK AND DISCUSSION

Pourshahid et al. (Pourshahid, 2011) research results in metamodelling with URN profile and structuring pattern-based framework it support goal-based

elicitation and validation of functional models. Our framework complements their work with integrating changes management strategies into functional models based on generic model repository with possibility of involving decision makers. These strategies, resulting from quality and extra-functional requirements simulations, drive change realizations for business processes and IT features included in business units. Other work as (Medve and Kovesi, 2009) integrate goal analysis for information security and customers loyalty correlations during e-business design.

Authors of (Stark-Werner, 2011) it established model-based fault detection for strategy creation and integration into functional model starting from process mining. Our framework provides a methodology to provide recommendations and relations from standards in visual form enabling reasoning about assessments.

Based on (jUCMNav 4.5, 2011) our framework enables variability from intentional ambiguity and abstraction levels involving stakeholders in decision making. We constructed the jUCMnav-based validation steps to derive specific templates from generic models. For these steps we inspired from the refinement method of van Lamsweerde's (Lamsweerde, 2004), and Akoka's et al. (Akoka et al., 2008) mechanisms for guidance by quality supported risk analysis and cost evaluation models. Well-suited technics are elaborated at (Amyot and Mussbacher, 2009) for goal and scenario modeling, analysis, and transformation with jUCMNav.

Our framework contributes with generic models as bases for instantiation of a framework for supporting teamwork releases of business analysis, and integration of strategy realizations into functional models.

6 CONCLUSIONS

This paper introduces the BUSITEV framework for integrated engineering of business and IT evolutions. The framework has based on User Requirements Notation standard (URN) and URN-supporting tools urn1-itu. URN gives methods for traceability and variability management. The framework contains generic models as reusable visual documents of information security standards and of business analysis standard. It has already been validated empirically for e-commerce security conforming to the corporate social responsibility at Sonepar Ltd. SME.

Strong points are from linking business goals and requirements to functional models; it reuses information security standards for reasoning about security levels, assets, costs and risks; the framework sup-

ports releases between internal stakeholders for cooperating and further reasoning; portability by Eclipse and some transformation engines of jUCMNav tool. The *weak points* are the manual assessment of risk and cost estimation in the case of a greater goal-tree. *For improving* the framework we intend to introduce some generic methods in form of template collections to support communications between stakeholders and services on demand in the case of outsourcing security management.

We plan future work for applying metamodelling methods from (Amyot and Behnam, 2011) in order to establish families of framework' instantiations.

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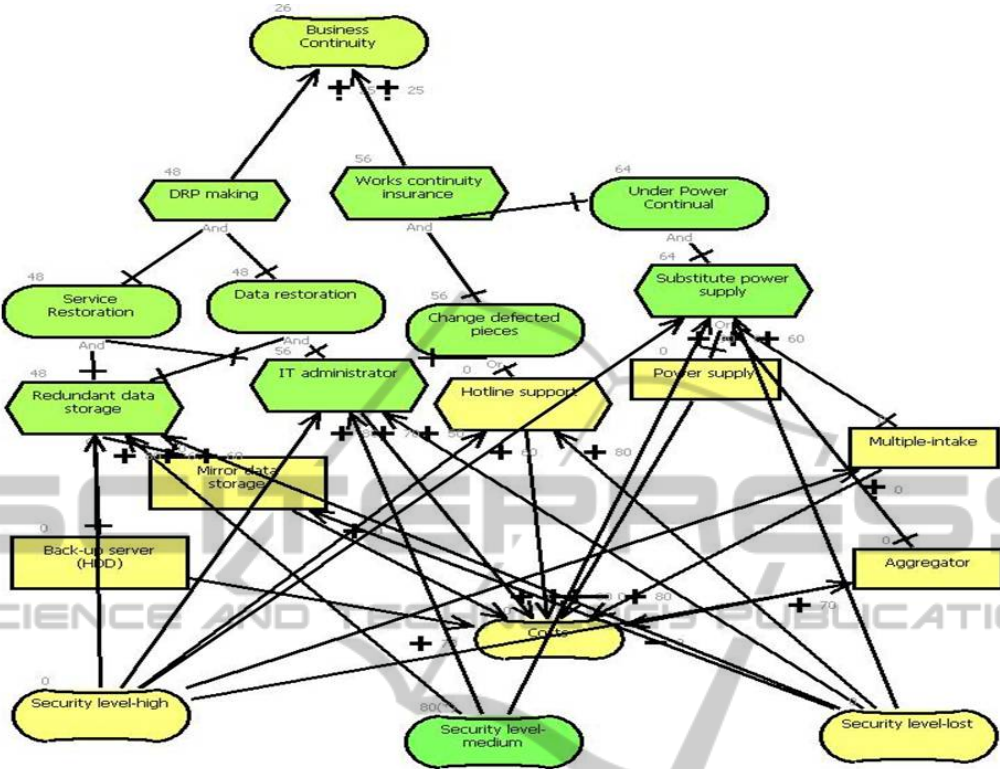
APPENDIX

Figure 3: Specific model of security recommendations from ISO/IEC 27002 evaluated for *medium level* of Business Continuity information security.

Figure 4: An illustration part of the resulted functional model after the integration of strategies. Yellow triangles are the traceability points between strategy elements and its realizations into the functional model.