Developing a Framework for Understanding and Measuring Quality of Business Processes

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Introduction

- Quality business processes can be considered as a foundation of high performance organizations.

- One has to understand the goals and quality requirements as articulated by different stakeholders and measure to what degree a business process meets these requirements.
What is Quality?

- Quality is meeting the customer requirements

- Quality requirements of a business process can be classified into:
  - Functional requirements
  - Non-functional requirements
Functional Requirements

- Functional requirements refer to the ability of the business process to deliver qualified product and services.

  - to deliver qualified product and services

  - the ability of the outcome to fulfill its functional expectations.
Non-Functional Requirements (Glinz, 2007)

Requirements about:

- Timing, processing or reaction speed, input set volume or throughput

- Specific quality of business process concepts or business process as a whole reflected in those ended in "-ilities" such as: reliability, and availability.
Scope of the Research

- There are *variety of products and services* available out there, each of them demanding for *different functional requirements* considerations.

- While there is diligent research made on functional characteristics of the business, the non-functional requirements of a particular business task are *merely overlooked*.

- The scope of the research is *objective evaluation of fulfillment NFRs by business processes*.

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Central to achieving this is the use of appropriate descriptive languages that enables one to map the business processes and through these maps to analyze their utility and use.

This is known as business process modeling (BPM).
Criteria for investigating the literature
Literature Review Results (1/2)

• The proposed guidelines are often too general to be applied and mostly in organizational level rather than business process level;

• Some quality properties defined in some works, but no metrics were introduced allowing to actually evaluating them;

• Some works just investigated a specific/limited facet(s) of business process quality;

• Some approaches focused on quality of model and software while quality of business processes should be considered before quality of models or software;
Some of the proposals are limited to few or just one concepts of business process.

There are works which introduced formulas for evaluation that are not generic enough to be applied universally.

Some proposals are language/notation dependent.

Some are just limited to visualization/demonstration of quality characteristics, and finally

Some works introduced frameworks, but they are too general and limited in number of elements to be applied and considered as a guideline for implementation of proposed frameworks.
Research Objective

*Develop a framework, models and techniques for understanding and measuring the quality of business processes considering their goals and objectives*
Research Questions and its Deliverables

How can quality of a business process be measured in relation to its goal and objective?

A: What are the current perceptions of business process?
   A-1: What is the current perception of business process concepts as reflected in different business process definitions?
   A-2: What is the current perception of business process concepts as captured in different business process modeling techniques?

B: What are the quality factors of a business process?
   B-1: What are the appropriate quality factors for each concept of a business process?

C: What are the criteria for measuring quality factors of a business process?
   C-1: How can quality of a business process be measured with regards to evaluating quality of its concepts?
   C-1-1: What are the quality metrics for measuring quality factors of each business process concepts?

D: How can business process goals be expressed formally with regards to their related quality factors?
   D-1: How can quality goals be expressed formally in relation to their corresponding business process concepts?

E: How can business process objective be expressed formally considering its quality factors?
   E-1: How can business process objective be refined to objective of its individual concepts?

Level 1: Managerial question
Level 2: Research questions (Business process/macro level)
Level 3: Investigative questions (Business process concept/micro level)
Level 4: Measurement Questions (Business process concept/micro level)

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Business Process Ontology

Visualization of the Research Approach

Formally presentation and integration of different business process modeling languages in form of a business process meta-model facilitate systematic communication in a single platform.

BPMN

EPC

Definition 1 concepts

Definition 2 concepts

Formally presentation of collaborative perceptions of different academics'/practitioners' on business process

Modeling techniques based business process ontology

Definitions based business process ontology

Term and definitions to find similarities/differences
Integrating Business Process Meta-Model
Research Questions and its Deliverables

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Quality metrics of business process concepts

Computation rules and methods

Goal notation rules and framework

Objective notation rules and framework
Research Deliverables (1/2)

- Quality evaluation framework,

- Business process ontology,

- Business process meta-model encompassing mainstream BPM techniques,

- Set of quality factors and metrics for business processes that enable practitioners to objectively evaluate non-functional requirements of a business process,
Research Deliverables (2/2)

- Quality-oriented business process meta-model resulting from enrichment of the business process meta-model with the introduced quality factors,

- Goal and objective notation rules and frameworks, and

- Quality evaluation software platform.
Quality Evaluation Framework (1/2)

- Research examines the interaction between goal/requirement, business process, expanding business process modelling with quality dimensions and factors and evaluation of quality.

- The quality evaluation framework as one of the contributions of the research inspired by the Goal-Question-Metric approach (GQM) by (Basili et al., 1994) originally developed for software quality management.

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Quality Evaluation Framework (2/2)

- Research examines the interaction between goal/requirement, business process, expanding business process modelling with quality dimensions and factors and evaluation of quality.

- The business quality evaluation framework represents our structured approach in evaluating quality of business processes. Not only it introduces the elements required for evaluation but also it can be considered as a guideline that assures consideration of stakeholders’ quality goal in business process quality evaluation.

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Quality Evaluation Framework (Mentioned in the paper)
Simplified Quality Evaluation Framework

1. Business Process
2. Business Process Model
3. Business Process Modeling
4. Business Process Meta-Model
   - Integrating Concepts of Different Business Process Modeling Techniques
5. Quality-Oriented Business Process Meta-Model
   - Realizing Quality Factors of Business Process Concepts
   - Introducing Quantitative Formulas and Computational Rules
7. Quality Evaluation Software Platform
8. Objective Expression
   - Introducing Goal Notation Rules and Framework
9. Goal Expression
   - Introducing Goal Notation Rules and Framework
Realization of Quality factors
Investigated Quality Dimensions and Factors

- Performance
  - Throughput
  - Cycle Time
  - Timeliness
  - Cost
- Efficiency
  - Time Efficiency
  - Resource Efficiency
  - Cost Efficiency
- Recoverability
  - Time To Failure
  - Time To Recover
  - Maturity
- Availability
  - Time to Shortage
  - Time to Access
- Reliability
- Authority

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Quality-Oriented Business Process Meta-Model
Metrics of Security Dimension as an Example

\[ S(a) = \left[ 1 - \sum_{k=1}^{n} w_k SV_k(a) \right] \times 100 \]

\[ S(a) = \text{Activity Security} \]

\[ SV_k(a) = \begin{cases} 1 & \text{if activity is performed by } k^{th} \text{ Actor who was not allowed} \\ 0 & \text{if activity is performed by } k^{th} \text{ Actor who was allowed} \end{cases} \]

\[ \sum_{k=1}^{n} w_k = 1 \]

\[ w_k = \text{Weight of } k^{th} \text{ Actor} \]

\[ n = \text{number of Actors} \]

\[ S(i) = \left[ 1 - \sum_{j=1}^{n} w_j SV_j(i) \right] \times 100 \]

\[ S(i) = \text{Input Security} \]

\[ SV_j(i) = \begin{cases} 1 & \text{if input is used by } j^{th} \text{ Activity which was not allowed} \\ 0 & \text{if input is used by } j^{th} \text{ Activity which was allowed} \end{cases} \]

\[ \sum_{j=1}^{n} w_j = 1 \]

\[ w_j = \text{Weight of } j^{th} \text{ Activity} \]

\[ n = \text{number of Actors} \]

\[ OF: S(a) = 100\% \]

\[ OF: S(i) = 100\% \]

\[ OF = \text{Objective Function} \]

Statistical qualifier = mean of (SV)s in observation time intervals
An Example
\[ C(i) = FC(i) + VC(i) \]

- \( FC(i) \) = Input Fixed acquisition Cost
- \( VC(i) \) = Input Variable acquisition Cost

\[ C(I_{\text{raw material}}) = £5.2/\text{kg} \]
Current Stage and Outlook

To be completed

Fulfilled

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<table>
<thead>
<tr>
<th>No</th>
<th>Task</th>
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<tbody>
<tr>
<td>1</td>
<td>Business Process Ontology</td>
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<td>1-1</td>
<td>Definition-based business process ontology</td>
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<tr>
<td>2</td>
<td>Goal notation rules and framework</td>
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<td>2-1</td>
<td>Literature review in goal notation</td>
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<td>2-2</td>
<td>Proposing/adopting a notation based on proposed quality evaluation framework and quality metrics and factors</td>
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<td>3</td>
<td>Objective notation rules and framework</td>
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<td>3-1</td>
<td>Literature review in objective notation</td>
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<td>4</td>
<td>Computation rules and methods</td>
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<tr>
<td>4-1</td>
<td>Reviewing adequacy of proposed quality factors and criteria</td>
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<tr>
<td>4-2</td>
<td>Proposing computation rules and methods</td>
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<td>5</td>
<td>Evaluation framework, models and technique</td>
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<td>5-1</td>
<td>Adopting an existing platform for evaluating quality</td>
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<tr>
<td>5-2</td>
<td>Proposing an evaluation framework, models and techniques</td>
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<td>6</td>
<td>Clearing conceptual model and framework, identification, planning and carrying of case study</td>
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<td>7</td>
<td>Completing case study and planning analysis</td>
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<td>8</td>
<td>Writing draft chapters, completing analysis and clearing final plan</td>
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Publications so far


Questions ?