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Architecture research for health care institutions

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Introduction

- PhD
- Open University – Stef Joosten
- HAN University of Applied Sciences – René Bakker, Stijn Hoppenbrouwers - supervisors
IT Architecture

http://www.platani.nl/it-architecten-zijn-slim-toch
Ampersand approach

- Practice based
  Use terminology of IT architects in practice
  Formulate concepts and checks (rules) that IT architects in practice find useful

- Ampersand model
  Concepts are modeled in relation algebra
  The rule engine performs the checks

- Rules
  Use the tool for signaling missing values and relations
  Consult the human experts for deciding if requirements are met
Ampersand as subject of research?

- Ampersand as subject of research, Ampersand as tool for research
- Supposing that the application of Ampersand will aid IT architects
- Apply Ampersand in practice
- Note all changes and use
First tentative Hypothesis

The Ampersand approach (such as used in the case study) adds value to IT architects in practice, who are (re)designing a system based on requirements, during the design phase.

- With the conceptual model
- With the functionality of consistency checks
- Existing tools do not have the functionality to implement the essential elements of the desired conceptual model
Results and findings

- Three case studies
- Resulting 5 models
- No follow up of application in the organisations
- Finding: 2 distinct types of IT architecture models, that were difficult to combine in one model
- Finding: how did we use of Ampersand for research objectives? Restrictions - GUI
3 Cases

- **Case study (1) National hospital for children oncology**
- **Case study (2) Medium sized regional centre for cure and home care**
- **Case study (3) Regional (medium sized) hospital in the Netherlands is being studied. The hospital is in the last stage of changing its paper-based operations to digital operations in the health care processes**
Number of facts in first case study

- 27 High level requirements/Business goals (Enterprise principles TOGAF)
- 12 processes
- 236 services
- 90 applications
- 133 specific requirements
- > 2000 facts
- 10 Rules (4 Fit and Gap Rules)
Model of the approach with Business rules

Requirements

Business Principles

required

confirmed

Enterprise architectuur

Information functions

Applications

Requirements
Strategic model of High level goals and applications

- **BUSINESS PRINCIPLE**
  - leads to
  - belongs to
  - consists of
  - process of
  - project
  - responsible for
  - supports
  - service
  - has
  - has_to_fulfill
  - fulfills
  - existing application
  - detailed into
  - decision
# Rule Example 1

<table>
<thead>
<tr>
<th>Rule 1: Requirements with a service are fulfilled</th>
<th>RULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>If with a service a requirement is formulated, then there must be an application with the service that fulfils the requirement.</td>
<td>service_requirements_complete : has</td>
</tr>
</tbody>
</table>

MEANING "If a service exists, and it has requirements, then there must be an application, that fulfils (all) the requirements "
**Rule 10: Always at least one business principle with a DECISION**

| If there exists a DECISION, then it is related to a BUSINESS PRINCIPLE. | leads_to :: Business principle * Decision [SUR] |

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**H A N**
# Model evolution

<table>
<thead>
<tr>
<th>Modelnaam</th>
<th>Applicatiemodel</th>
<th>Service</th>
<th>Concept</th>
<th>Relation</th>
<th>Rule description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uitwerving-35a</td>
<td>SERVICE</td>
<td>APPLICATIE-UMCU</td>
<td>BESLUIT</td>
<td>EIS</td>
<td>PROJECT unchanged</td>
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<td>Uitwerving-37b</td>
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<td>Uitwerving-34</td>
<td>SERVICE</td>
<td>APPLICATIE-UMCU</td>
<td>BESLUIT</td>
<td>EIS</td>
<td>PROJECT unchanged</td>
</tr>
<tr>
<td>Uitwerving-33</td>
<td>INFORMATIE_UINCTIE</td>
<td>APPLICATIE-UMCU</td>
<td>BESLUIT</td>
<td>EIS</td>
<td>PROJECT unchanged</td>
</tr>
<tr>
<td>Uitwerving-32</td>
<td>INFORMATIE_UINCTIE</td>
<td>APPLICATIE-UMCU</td>
<td>BESLUIT</td>
<td>EIS</td>
<td>PROJECT unchanged</td>
</tr>
</tbody>
</table>
Technical IT architecture

http://www.newway.nl/newfact-food-retail-met-newway/
Show risks

- Risk
- Component Type
- Component
- Bottleneck
- Measure
- Check

Relations:
- risk_with_type
- component_of_type
- Bottleneck_with_risk
- comp_has_bottleneck
- measure_with_risk
- measure_proposed
- bottleneck_check
- measure_satisfies
Two types of models

- **Type 1:**
  - Strategic IT models of IT architects

- **Type 2:**
  - Technical management models of IT operations and IT departments
Positive contribution of Ampersand

- Business rules for checking incomplete data sets with (unknown) violations
- High level view models are developed
- Monitoring of future system development is possible
- Checking of completeness of requirements is possible
- Ampersands supports simplicity of views when using a model based on relational algebra
Further research on Ampersand models

- Models in technical management based on "process models"
- Rules must show the influence of failing components on the system
- Difficult to model in Ampersand
Extension of Ampersand for use in research

- IT architects needed a visual presentation of all facts in Ampersand
- Real time
- Overview of existing facts in a user friendly way
- Requirements for facts to be shown in "Master/Detail" views
- Other facts to be shown as "violated/not violated"
Enterprise principles
(Uitgangspunten)

- Kind en gezin hebben waar mogelijk invloed op het eigen zorgproces. (2016)
- Kind en gezin krijgen de mogelijkheid om onderwijs te volgen. (start)
- Samenwerken met UMCU. (start)
- Geïntegreerde medische, verpleegkundige en psychosociale zorg, afhankelijk van de ontwikkelingsfase van kind en gezin.
- Er wordt samengewerkt als een multidisciplinair team.
- De gehele behandeling van een patiënt vindt plaats in 1 unit
- PMC wil zoveel mogelijk van de dossieregions uit deze UMC’s gestructureerd in het nieuwe systeem opnemen.
- Een digitale zorgproces
Processes – derived from Hospital reference architecture

<table>
<thead>
<tr>
<th>Processes</th>
<th>Research, Opleidingen en onderwijs</th>
</tr>
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<tbody>
<tr>
<td>Proces</td>
<td>Patientenportaal, Ehealth</td>
</tr>
<tr>
<td>Besluiten</td>
<td>Medicatie, apotheker, cyrostatika</td>
</tr>
<tr>
<td>Services</td>
<td>Laboratory en beeld</td>
</tr>
<tr>
<td>Service Keuze</td>
<td>Zorginrichting</td>
</tr>
<tr>
<td>Scherm</td>
<td>Bedrijfsvoering</td>
</tr>
<tr>
<td>Stamtabellen en zorgadministratie</td>
<td></td>
</tr>
<tr>
<td>Stuurinformatie</td>
<td>Infrastructuur</td>
</tr>
</tbody>
</table>
Prototype Strategic goals
DEMO
Bronnen Ampersand

Bronnen risicomodel


- NEN-ISO/IEC 31010