Yanking the Chain - Applying SE Principles to an Organisation’s Value Chain

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Overview

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1. The Problem

• ‘Should we attend the ACME Conference this year?’

• ‘E-Corp want another meeting. We’ve already had three and got no work. Should we bother?’
The Problem

• Knowing where to apply limited resources for the most return is difficult
• Having a healthy sales funnel is vital
• BUT ... what is the best way to use a limited marketing budget?
2. The Solution

• Apply Systems Engineering principles to understanding our **value chain**
  – Developing the Value Chain Framework (VCF)

• Designed to allow us to:
  – Make informed business decisions through understanding of our value chain
  – Analyse business activities within a business engagement
  – Understand relationships between business engagements
  – Analyse the value chain for a business activity to see and understand its associated reputation and financial values
  – Analyse business activity traceability
3. The Approach

• Model-based approach adopted
  – VCF defined using the Framework for Architectural Frameworks (FAF) and its associated process (ArchDeCon)

• The FAF forces the modeller of a Framework to
  – Define an Ontology that captures the main concepts and their relationships
  – Define a number of Viewpoints which use the concepts and relationships from the Ontology

• The FAF model of the VCF was used as a basis for generation of a VCF profile in our SysML tool
4. The Concepts

- Engagement
  - 0..1 introduces
  - 1..* quantifies
  - 0..* contributes to
  - 0..* directly leads to
  - 0..* indirectly leads to
  - 1..* initiates

- Business Activity
  - 1 justifies
  - 0..* contributes to

- Contact
  - 1 directly leads to
  - 0..* contributes to
  - 0..* indirectly leads to
  - 0..* introduces

- Business Value
  - 1..* contributes to
  - 0..* 0..* justifies

- Financial Value
  - 1 delays
  - 0..* leads to

- Reputation Value
  - 1 delays
  - 0..* leads to

- Resolution
  - 0..* is raised against

- Quotation
  - 1..* contractualises
  - 1..* leads to

- Failure
  - 0..* initiates
  - 1..* contributes to
  - 0..* leads to

- Delay
  - 0..* introduces

- Invoice
  - 1..* leads to

- Purchase Order
  - 1..* 0..* justifies
value
value = SUM(Business Activity.value) + SUM(Business Value.realised amount) - cost

For Financial Value:
realised amount = SUM (Quotation.amount)

expected amount = SUM (Quotation.amount)

realised amount = SUM (Quotation.Purchase Order.Invoice.amount)
i.e. that total of all invoices raised, via Purchase Orders, for all the Quotations that quantify a Financial Value.

\[ \text{value} = \text{SUM}(\text{Business Activity.value}) + \text{SUM}(\text{Business Value.realised amount}) - \text{cost} \]

\[ \text{realised amount} = \text{SUM} (\text{Quotation.amount}) \]

\[ \text{expected amount} = \text{SUM} (\text{Quotation.amount}) \]

\[ \text{realised amount} = \text{SUM} (\text{Quotation.Purchase Order.Invoice.amount}) \]

\[ \text{i.e. that total of all invoices raised, via Purchase Orders, for all the Quotations that quantify a Financial Value.} \]
5. The Viewpoints

**Engagement Viewpoint**

- Directly leads to
- Indirectly leads to
- Initiates
- Contributes to
- Introduces

**Contact Information Viewpoint**

- Directly leads to
- Contributes to
- Indirectly leads to
- Introduces

**Business Value Viewpoint**

- Directly leads to
- Indirectly leads to
- Initiates
- Contributes to
- Leads to
- Kills off
- Quantifies

**Definition Viewpoint**

- Directly leads to
- Indirectly leads to
- Contractualises
- Is raised against

**Resolution Viewpoint**

- Leads to
- Delay
- Failure
- Purchase Order
- Invoice

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The Viewpoints

- Engagement Relationship Viewpoint
- Engagement Definition Viewpoint
- Business Value Viewpoint
- Contact Information Viewpoint

1..* shows value for business activity from
1..* shows details of engagement from
0..* shows traceability from contacts to business activities from
6. Examples

• Example Views that are instances of each of the four Viewpoints now follow
• Each View is realised using SysML
• These Views are based on an actual example but have been anonymised for this presentation
Example - Engagement Relationship View

- "engagement" ACME Conference
- "initiates"
- "engagement" ABC Cars - Supercar Project
- "initiates"
- "engagement" Inside Ltd - MBSE Development

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Example - Engagement Definition View

- **ACME Conference**
  - **ACME Conference Stand**
    - **Consultancy Work**
      - cost = £1000
      - type = PAID_CONSULTANCY
      - value = £3000
  - **Contact**
    - Sales Manager
      - email = Tools'R'Us
      - organisation = Tools'R'Us
      - phone =
        - type = LEGACY

- **ABC Cars - Supercar Project**
  - **Consultancy Work**
    - cost = £1000
    - type = PAID_CONSULTANCY
    - value = £3000
  - **Contact**
    - Technical Lead
      - email =
        - organisation = ABC Cars
        - type = NEW

- **Inside Ltd - MBSE Development**
  - **MBSE Training**
    - cost = £300
    - type = PAID_TRAINING
    - value = £8700
  - **Contact**
    - Engineering Manager
      - email =
        - organisation = Inside Ltd.
        - phone =
          - type = NEW

- **Financial Value**
  - Expected Course Value
    - expected amount = £8500
    - realised amount = £9000
  - Expected Workshop Value
    - expected amount = £5000
    - realised amount = £0
Examples - Business Value View

«engagement»
Inside Ltd - MBSE Development

«business activity»
MBSE Training

cost = £300
type = PAID_TRAINING
value = £8700

«financial value»
Expected Course Value

expected amount = £8500
realised amount = £9000

«quotation»
2015-08-21_INS_001

amount = £8500
reference = 2015/PDF/2015-08-21_INS_001.pdf

«invoice»
2015-09-30

amount = £9000
type = ISSUED

«purchase order»
PO2015-12345

amount = £9000
reference = INSIDE/PO2015-12345.pdf

«justifies»
«quantifies»
«contractualises»
«raised»
Example - Contact Information View

- **Technical Lead**
  - email =
  - organisation = ABC Cars
  - phone =
  - type = NEW

- **Consultancy Work**
  - cost = £1000
  - type = PAIDCONSULTANCY
  - value = £30000

- **Engineering Manager**
  - email =
  - organisation = Inside Ltd.
  - phone =
  - type = NEW

- **MBSE Training**
  - cost = £300
  - type = PAIDTRAINING
  - value = £8700

- **ACME Conference Stand**
  - cost = £1000
  - type = NONPAIDEXTERNALEVENTEXHIBITION
  - value = £37700

- **Consultancy Work**
  - cost = £0
  - type = PAIDWORKSHOP
  - value = £0

- **Framework Consultancy**
  - cost = £0
  - type = PAIDWORKSHOP
  - value = £0

- **MBSE Training**
  - cost = £0
  - type = PAIDTRAINING
  - value = £0

- **Framework Consultancy**
  - cost = £0
  - type = PAIDWORKSHOP
  - value = £0
7. Next Steps & Observations

• Value Chain Framework being implemented as a profile for our SysML modelling tool of choice
• Some automation tasks started to enhance the implementation of the Framework:
  – Importing of historical data
  – Addition of new data.
  – Automation of calculations (but see “Observations”)
  – Model integrity
  – Interrogating the model
  – Standard reports
Observations

• Double or inappropriate accounting
  – Particularly a problem for Business Activity value
  – When should values be aggregated?

• Exact rules to apply to enable automatic calculations are currently under consideration
Observations

• Impact of entire organisational overhead on the value chain needs to be considered
  – “Non-productive" workers, such as managers, are an overhead that must be mitigated across all paid work
  – They impact on the ‘cost’ of producing a quotation, for example
  – At present not explicitly considered, being rolled into the calculated cost
  – It is also worth emphasising here that the Value Chain Framework is not intended as a replacement for a full financial planning tool, but a simple way for an organisation to visualise its value chain
8. Conclusions

• Wanted to understand our business value chain
  – Had to understand what “value chain” meant to them as an organisation
  – Used good MBSE techniques to define a value chain Ontology that was the basis of a Value Chain Framework
  – Used the FAF to define the VCF
  – The resulting FAF description of the Framework was used as the basis for implementing the Framework as a profile in a SysML tool

• Revealed some surprising key Contacts and key Business Activities

• Opposite has also been true

• By capturing the value chain using a model-based approach, it now forms part of our enterprise architecture in a direct way
Further Work

• Now in the process of populating our Value Chain model with both historical and current data

• Various automation tasks have been started
  – To improve maintainability of the model
  – To easily allow useful information can be extracted through defined reports
9. Questions & Further Information

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Further reading