An Ontology-based Method and Tool for Cross Domain Requirements Visualization

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Introduction

- Requirement Analysts / Subject Matter experts aware of intricacies of their respective domain of expertise.

- Project Requirements span across multiple domains.

- Lack of understanding of cross-domain interactions results in-
  - Incomplete Requirements
  - Wrong Estimation
  - and Schedule Slippage thereof.

- Ontologies used as a way of representing domain knowledge.
  - Vocabulary of knowledge elements
  - and Relationships between them.

Ontology-based method identifies *interfaces between multiple domains* and generate *conceptual model of requirements*

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How the customer explained it

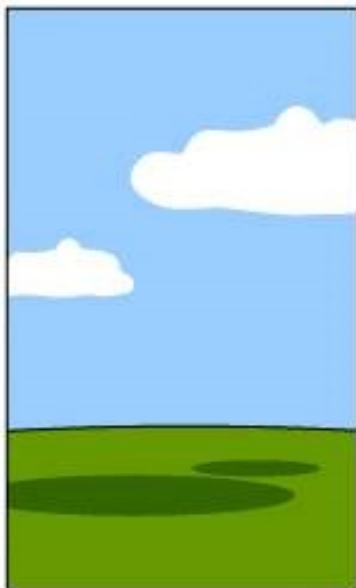How the Project Leader understood it
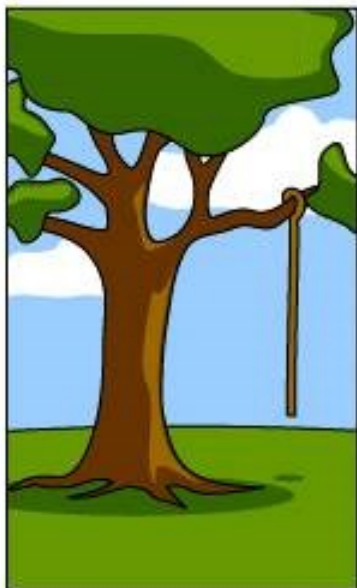
How the Analyst designed it

How the Programmer wrote it

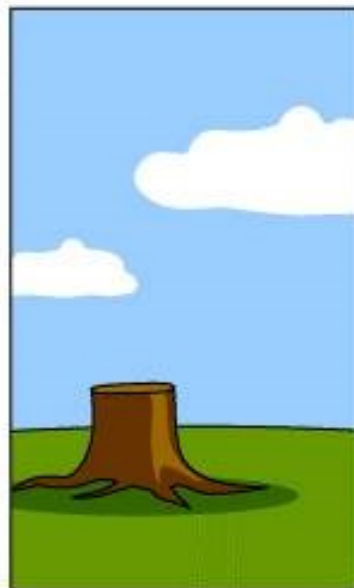How the Business Consultant described it

How the project was documented

What operations installed

How the customer was billed

How it was supported

What the customer really needed

Agenda

- Introduction
- Motivation
- Semantic Similarity Method for Identifying Interfaces
  - Syntactic Similarity
  - Sense Similarity
  - Context Similarity
- Method for Deriving Conceptual Model
- Experimental Results
- Conclusion

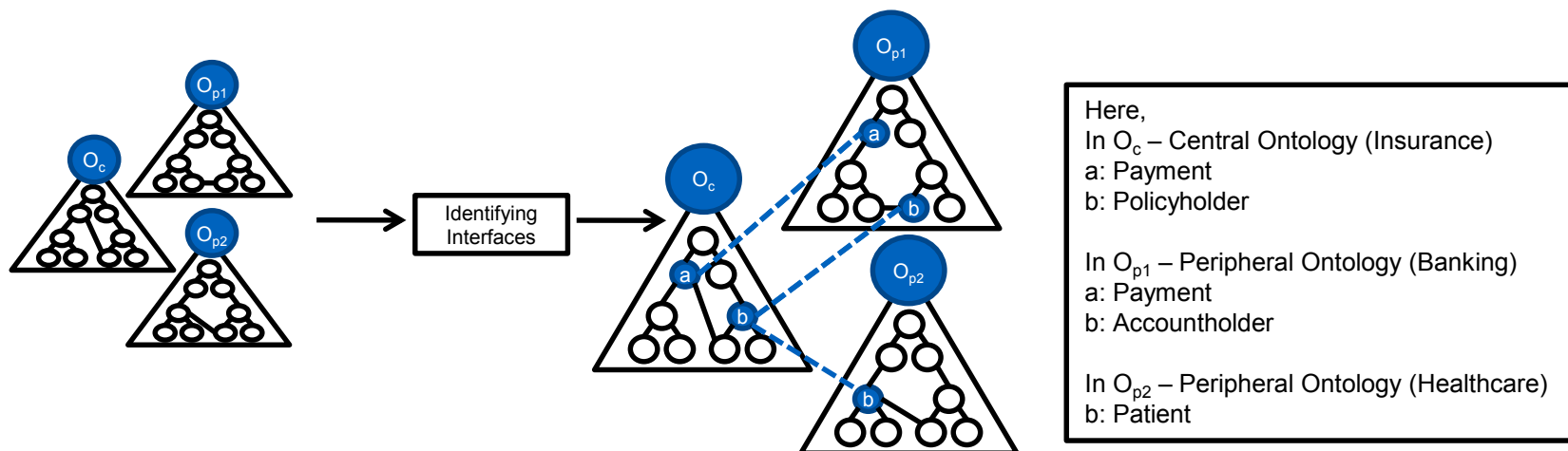**TATA** CONSULTANCY SERVICES
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Motivational Example

US_1 - As an Insurance Company, we want *health insurance **policyholder** to make **payment** for premium online through internet banking*

INSURANCE ONTOLOGY

BANKING ONTOLOGY

HEALTHCARE ONTOLOGY

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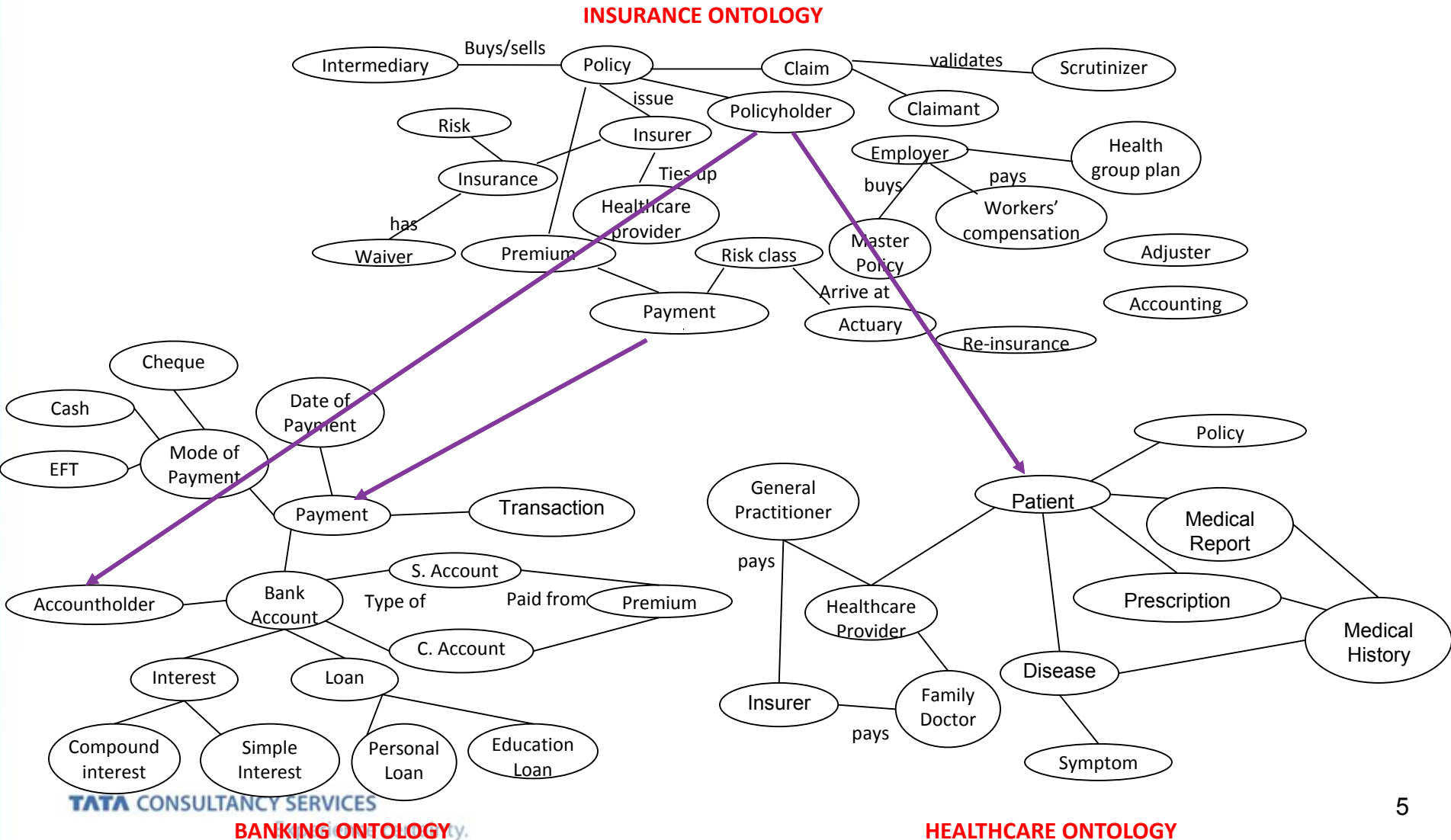
Method For Identifying Interfaces

- **Semantically similar concepts** between multiple domain ontologies defined as *interfaces*.

- Semantic Similarity is a combination of -
  - Syntactic Similarity based on the **syntactic structure** of concept
  - Sense Similarity based on **similar usage sense** of concept
  - Context Similarity based on context defined by **neighborhood** of concept

Here,
In O_c – Central Ontology (Insurance)
a: Payment
b: Policyholder

In O_{p1} – Peripheral Ontology (Banking)
a: Payment
b: Accountholder

In O_{p2} – Peripheral Ontology (Healthcare)
b: Patient

US_1 - As an Insurance Company, we want *health insurance **policyholder** to make **payment** for premium online through internet banking*

Method For Deriving Conceptual Model

Criteria

1. Identify if interface concept represent functionality?
   - check if interface concept part of verb phrase or prefixed by a verb phrase.
2. Domain of the User Story?
   - map extracted concepts of User Story with Domain Ontology.

- ■ If User Story executes in **_Peripheral domain._**

$$\text{Conceptual Model} = C_{interface} + C_{complementary\_central} + C_{ack} + \text{Associated Constraints}^{\#}$$

- ■ If User Story executes in **_Central domain._**

$$\text{Conceptual Model} = C_{interface} + C_{complementary\_central} + C_{complementary\_peripheral} + \text{Associated Constraints}^{\#}$$

$C_{interface}$ – interface concept, $C_{complementary\_central}$ – complementary concepts from central domain, $C_{complementary\_peripheral}$ – complementary concepts from peripheral domain, C_{ack} – acknowledgement concept

Experimental Results

Table1. Insurance domain User Stories found to be interacting with Banking and Healthcare domain

User Story	Description	User Story Domain	Interface and Complementary Concepts[#]
US_1	As Insurance Company, we want policyholders to make payment of premium online through internet banking.	Banking	**Payment($C_{interface}$)**, Premium, Risk, **Transaction(C_{ack})**
US_2	As a Claim Scrutinizer, I should be able to view insured's medical history in claims scrutiny screen.	Insurance	**Insured-Patient($C_{interface}$)**, Policy, Personal Details, Contact Details, Medical Report, Prescription, Disease, Healthcare provider
US_3	As Claims Manager, I want system to find out symptoms which are pointers to terminal diseases in health records furnished by customer.	Insurance	**Symptom($C_{interface}$)**, Disease, Insurance, Insurance policy, Syndrome, Organ

[#] $C_{interface}$ – interface concept, C_{ack} – acknowledgement concept
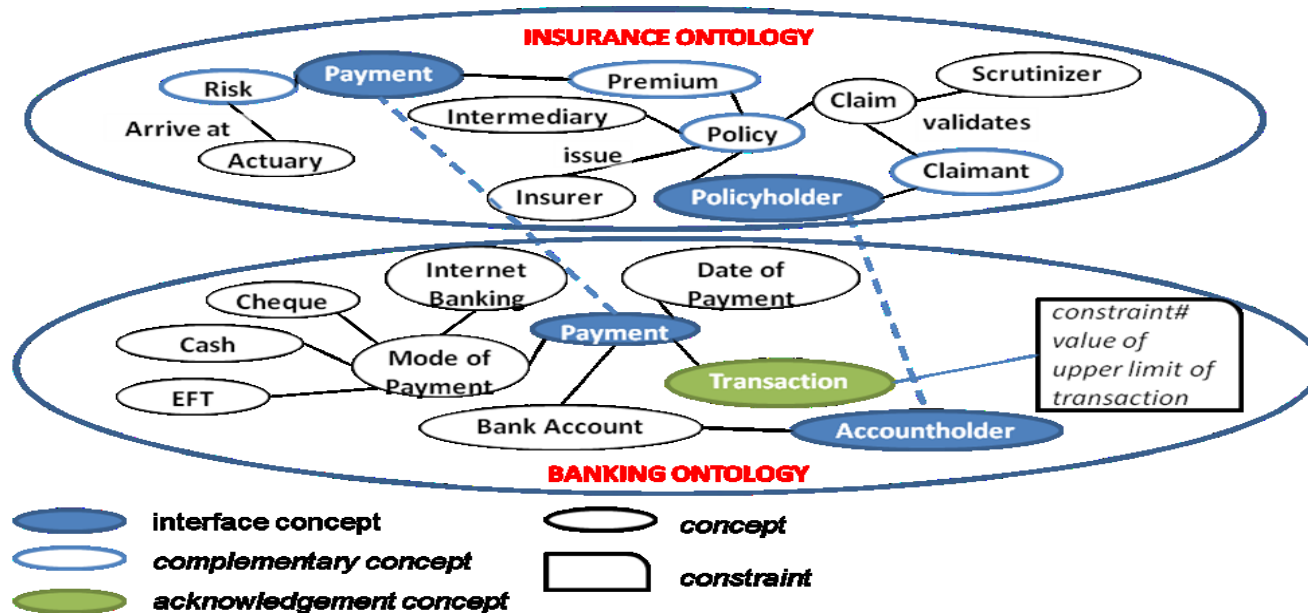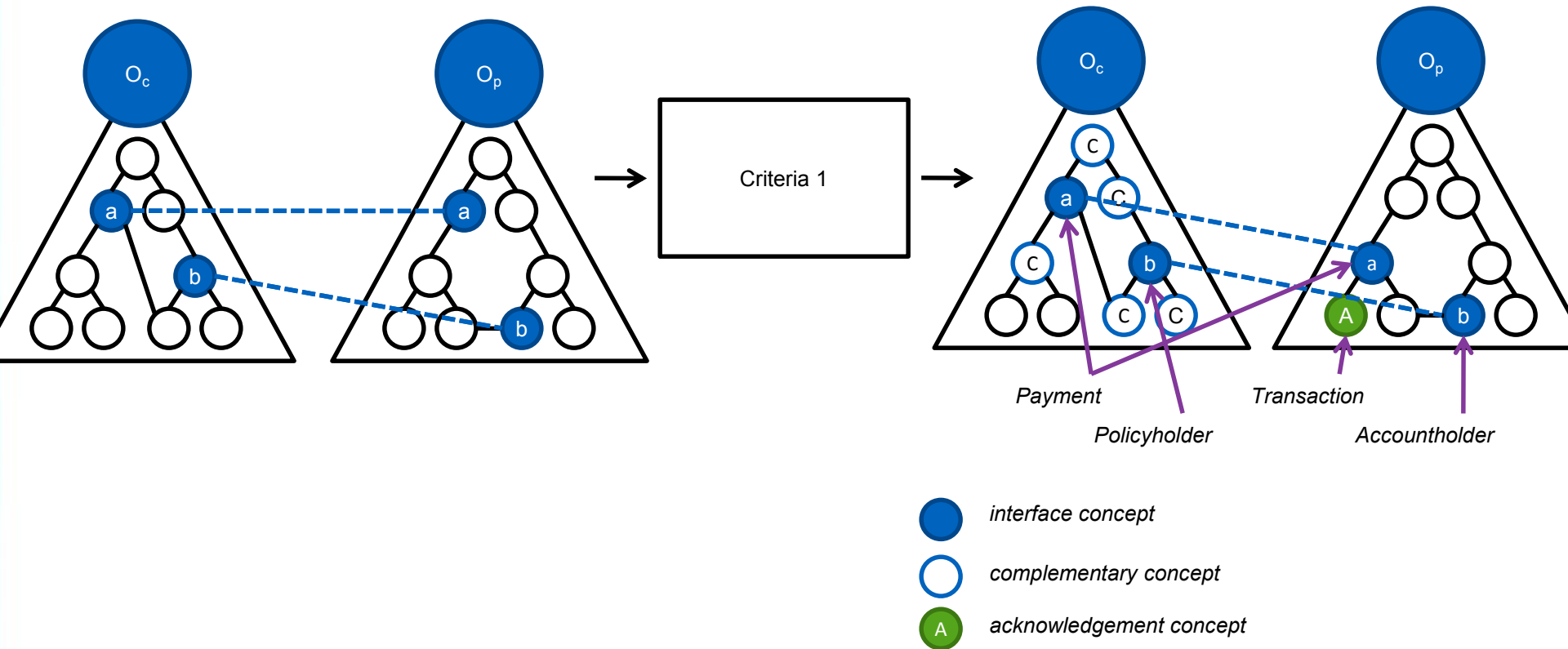

Conceptual model of US_1

Conclusion

- Method helps in explicitly visualize cross domain scope of requirements.

- Asking right questions to right people.

- Completeness of ontologies is a precursor.

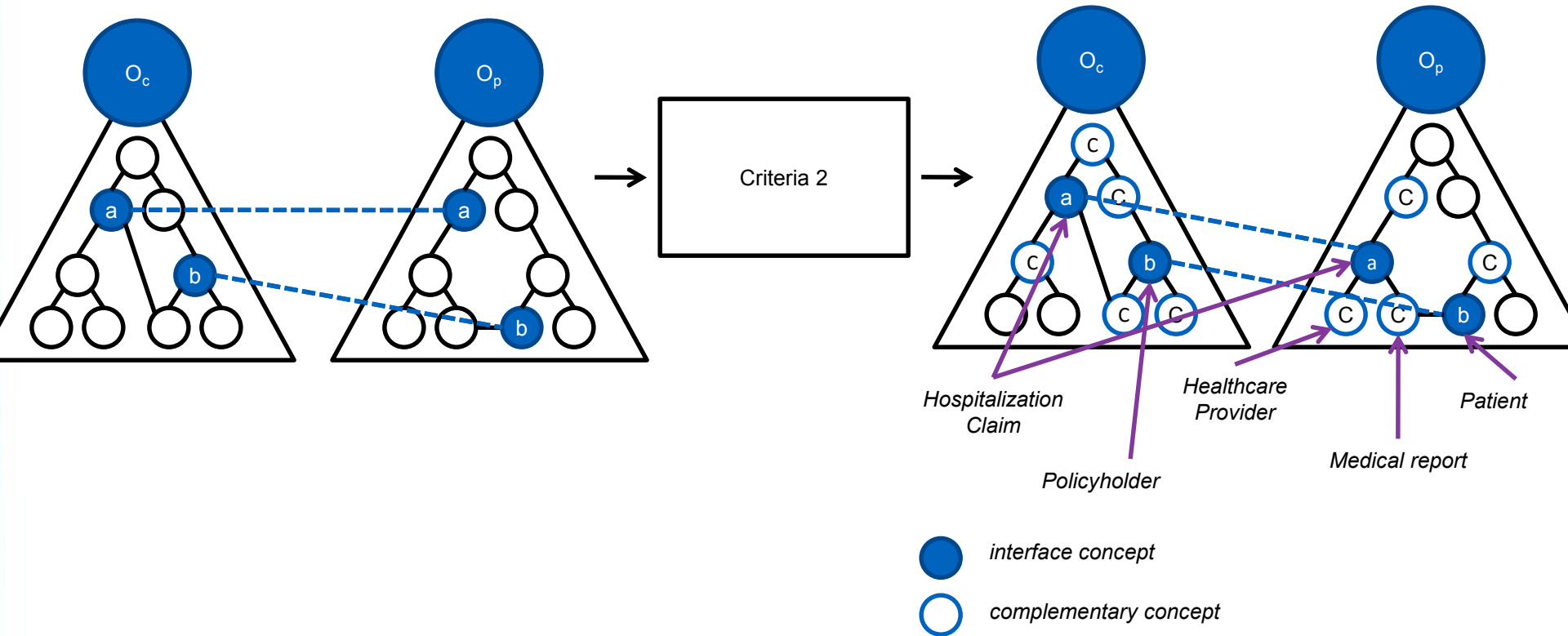- A step towards improving completeness of requirements.

Thank you

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Payment

Policyholder

Transaction

Accountholder

- ● interface concept
- ○ complementary concept
- Ⓐ acknowledgement concept

As Insurance Company, we want policyholders to make payment of premium online through internet banking.

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Hospitalization Claim

Policyholder

Healthcare Provider

Patient

Medical report

- ● interface concept
- ○ complementary concept

As a Claim Investigator, I want hospitalization claim verification functionality in the insurance application to investigate claim submitted by the policyholder.