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Master's Thesis No.

Intention-centric Modeling of Organizations

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Abstract

Every organization thrives to achieve its intentions, these intentions can be in level of the organization like technical intentions that focus to satisfy technical level requirements, management intentions that focus to satisfy the management level requirements, and financial intentions to achieve financial level requirements. Intentions play critical role in many organizations because they motivate organizations towards the overall development. Therefore supporting and automating organizational intentions and associated components are absolute necessary for any organization. Current technologies and literature focus on diverse components like activity, strategy, artifact and capability but no or little focus on **Intention**, which is the starting gate to reach the trailing gates like activity, strategy and capability.

This Master thesis aims at providing means to design and realize the Intention-centric organizational modeling. We propose a motivating scenario to help the reader in easily acquiring the concepts and usability of developed web editor. The purpose of the web editor is to view/update existing intentions, strategies, capabilities and informal process instances and to add new data of type intentions, strategies, capabilities and informal process instances.

Key words: Intentions, Capabilities, Strategies, Informal Process Instances and Informal Process Models

Contents

1 Introduction 9
- 1.1 Motivation . . . 9
- 1.2 Problem Statement . . . 9
- 1.3 Contributions . . . 9
- 1.4 Outline . . . 9
- 1.5 Definitions of Abbreviations . . . 10
- 1.6 Research Objectives . . . 11

2 Motivating Scenario 13
- 2.1 Overview . . . 13
- 2.2 Organizational Intentions . . . 14
- 2.3 Organizational Strategies . . . 14
- 2.4 Organizational Capabilities . . . 14
- 2.5 Organizational Resources . . . 14
- 2.6 Organizational Processes . . . 14
- 2.7 Informal Process Instances . . . 14

3 Fundamentals of Organizational Modeling 15
- 3.1 Overview of Organizational Modeling . . . 15
- 3.2 Related Work . . . 15
- 3.3 Literature Review . . . 15

4 Requirements 17
- 4.1 Properties of Organizations . . . 17
- 4.2 Requirements Supporting Organizational Modeling . . . 17

5 Intention-centric Organizational Modeling 21
- 5.1 Overview of Modeling Process . . . 21
- 5.2 Organizational Modeling Notation . . . 21
- 5.3 Organizational Modeling Notation Example . . . 23
- 5.4 Organizational Modeling Process Representation . . . 26
- 5.5 Organizational Modeling Entity Representation . . . 27

6 Design 29
6.1 System Architecture 29
6.2 Entity Type Relation 29
6.3 User Interface Diagram 29
6.4 Design Methodology 29

7 Realization of Intention-centric Organizational Modeling 31
7.1 Basic Concepts 31
7.2 Specifications 31
7.3 Realization of Entity Views 34
7.4 Realization of Requirements 36

8 Validation and Evaluation 37
8.1 Validation of Components 37
8.2 Validation of Prototype 37

9 Conclusion and Future Work 39

Bibliography 41

List of Figures

5.1 Strategy View 24
5.2 intention View 25
5.3 Process Modeling Diagram 26
5.4 Organizational Modelling Meta-Model 27

7.1 Relationship between developed web editor artifacts and MVC architecture components 32
7.2 MVC Pattern of adding new entity 33
7.3 Flux Architecture [Fac16] 34
7.4 Reframe, derived data flowing [Tal16] 34

List of Tables

1.2 Research Objectives 11
4.1 Sub Requirements 19
5.1 Informal Process Modeling Notation 23

List of Listings

6.1 Entity data definition inside db.cljs 30

7.1 XML Schema Definition of Entity Type 35

1 Introduction

1.1 Motivation

1.2 Problem Statement

Every organization contains multiple entities like resources e.g humans, tools etc., intentions e.g revenue based intentions,quarterly intentions etc., strategies e.g the process to achieve the intention and capabilities e.g a resource that can provide a particular capability. Thus an organization needs an efficient mechanism to handle and manage these different types of entities. Though there are some existing tools which provide facility to manage resources in an organizations, they act either as a *Retrieval Service* i.e they are used only to view or retrieve resource engagers for resources or as an *Control Service* i.e they are used to run resource engagers. But there is not a service which provides both mechanism to retrieve and initiate the instances of each entities. The research work by Matthews et. al [MWMY11] clearly points out below as the major problems in adopting to a workspace collaboration tools.

1. **Lack of Methods**
2. **Methods that focus on individuals**
3. **Not well targeted groups**

1.3 Contributions

1.4 Outline

The remainder of the document is organized into following chapters

Chapter 2 – Motivating Scenario: In this chapter a motivating scenario has been taken which helps reader in realizing the Organizational Modeling throughout the document.

Chapter 3 – Fundamentals of Organizational Modeling: In this chapter previous work carried in organizations to model the goals has been discussed.

Chapter 4 – Requirements: Detailed requirements based on scientific facts and introduction about some properties of the organizations.

Chapter 5 – Intention-centric Organizational Modeling: In this chapter basics of Organizational Modeling has been discussed and notations used to realize the Organization Modeling has been discussed.

Chapter 6 – Design: In this chapter, proposed design is discussed.

Chapter 7 – Realization of Intention-centric Organizational Modeling: This chapter concentrates on detailed system architecture and also presents the experimental results.

Chapter 8 – Validation and Evaluation: Comparison of the Intention-centric Modeling of Organizations approach with the other approaches.

Chapter 9 – Conclusion and Future Work: Summaries the results of this thesis work and draws conclusion.

1.5 Definitions of Abbreviations

In this section, we list the definitions of abbreviations that are used in this document.

IPD	Informal Process Definitions
CTX	Contexts
INT	Intentions
XML	eXtensible Markup Language
INT	XML Schema Definition

1.6 Research Objectives

The research objectives of this thesis work has been provided in the Table 1.2.

Research Objective	**Description**
RO. 1	*Intentions are traceble in the different levels of the organizational hierarchy.*
RO. 2	*Linking intentions with capabilities and at the with resources enable us a cost estimation for each intention. Cost is estimated in a recursive manner.*
RO. 3	*Validity of an organizational intention is achieveable when the intention can be refined by defining sub-intentions, which can then be defined recursively as independent informal processes.*
RO. 4	*As each member of the organization aware of the higher level and lower level intentions. He can engage for these explicit intentions.*
RO. 5	*Different members of an organization participate to create organizational intentions, as a result intentions are shaped based on all members but directed by the executives.*
RO. 6	*Intention-specific solutions can be extracted as abstract reusable entities, organizational strategy patterns and can be re-used in muliple context definitions.*

Table 1.2: Research Objectives

2 Motivating Scenario

In order to realize the Organizational Modeling below motivating scenario has been taken and realized using the developed UI editor. This scenario also helps in testing the UI editor along with realizing the Organizational Notations. The motivating scenario has been chosen based on the advice provided in works ..... The figure of this example was taken from the context of manufacturing sector. The abstract intention of the organization is to increase the quarterly revenue and number of unit sales. In order to achieve this intention through Organizational Modeling Approach, as a first step we need to break the abstract intention into several strategies like

1. Increasing the revenue through expanding the market sales.
2. Through improving the excellence of the product which in turn brings back old and new customers.
3. Through increasing the advertisement which helps in customer knowing about the product.

2.1 Overview

- Each intention can be decomposed into sub-intentions - Intention canvas will only contain only sub intentions - In the canvas, when we select an intention, it will list possible strategies and let us create new strategies for that intention. Moreover, it will let us select the current active strategy. - Intentions will contain optional, necessary, and contradicting (xor) sub-intentions - Creating 2 types of capabilities, functional and cross-functional capabilities, cross functional capabilities contain other capabilities and these capabilities can be associated with organizational resources - Goals are not associated with capabilities - Strategies are associated with organizational capabilities - Goals realized through some strategies - We add cross-functional and (maybe functional capabilities) into

- As a result each informal process model is a strategy and will have cross-functional capabilities, resources (which will be created out of capabilities), a goal that the specific strategy

2.2 Organizational Intentions

2.3 Organizational Strategies

2.4 Organizational Capabilities

2.5 Organizational Resources

2.6 Organizational Processes

2.7 Informal Process Instances

3 Fundamentals of Organizational Modeling

3.1 Overview of Organizational Modeling

3.2 Related Work

3.3 Literature Review

4 Requirements

4.1 Properties of Organizations

4.2 Requirements Supporting Organizational Modeling

Organizational intention transparency (R1): A intention can be broken down into definitive actionable components, or sub-intentions, upon which individual resources can act. When these lower level sub-intentions are made achievable for individual resources, they can be combined to provide successful execution of higher level intention. Different organizational members can observe lower level and higher level intentions in their organizations. intentions are traceable in the different levels of the organizational hierarchy. This kind of transparency within an organization reduces inefficiencies in intention execution, and is a key factor in attracting and retaining high performers in the labor market [MHL+07].Requirement R1 has to be satisfied in the modeling time of the process itself as the framing of intentions, sub-intentions, strategies are done during the modeling time .

Organizational intention resource-based cost estimation. (R2):Linking intentions with capabilities and with resources enable us a cost estimation for each intention. Cost is estimated in a recursive manner. To incorporate the cost estimation of intentions, we have to understand the recursive structure of the intentions associated with capabilities.Since intentions are defined hierarchically, they can contain and extend intentions. Here strategy represents a means for achieving the intention. Further on, the cost of a strategy can be analyzed using the costs of derived intentions, and so on. Including resources cost in intention cost calculation is important. The recursion is stopped when the intention derivation process reaches the operational level. At the moment a intention is achieved, some resources should be allocated to maintain the desired state (intention maintenance costs)[MBH+10]. Allocation of resources is mainly done at the operational level, Requirement R2 has to be satisfied in the run time of the process.

Organizational intention achievability estimation. (R3): The sub-intentions are projections of their super intentions, and satisfaction of the sub-intentions ensures satisfaction of the super intentions. Hence validity of an organizational intention is

achievable when the intentions can be refined by defining sub-intentions, which can then be defined recursively as independent informal processes. Lower-level requirements can be validated against higher-level intentions, thus enabling validation of strategic alignment of higher level intentions. The objectives of business strategy are found in the highest levels of the intention model.[BCV06].Requirement R3 has to be satisfied during the modeling time of the process as intention achieveability estimations are done before starting the execution of the intention.

Intention oriented working style (R4): As each member of the organization is aware of the higher level and lower level intentions and he can engage for these explicit intentions. intention orientation is the degree to which a person or organization focuses on tasks and the end results of those tasks. Strong intention orientation advocates a focus on the ends that the tasks are made for instead of the tasks themselves and how those ends will affect either the person or the entire company. Those with strong intention orientation will be able to accurately judge the effects of reaching the intention as well as the ability to fulfill that particular intention with current resources and skills [Lac16]. The distinction between explicit knowledge of each sub intentions should not be seen as a division but rather as a continuum which aligns towards achieving the higher level intention . Thought Requirement R4 itself has sub-requirement of R1, R4 has to be done at the run time which makes it distinct from the Requirement 1.

Social organizational modeling. (R5): Different members of an organization participate to create organizational intentions, as a result intentions are shaped based on all members but directed by the executives. The social extension of a business process can be regarded as a process optimization phase, where the organization seeks efficiency by extending the reach of a business process to a broader class of stakeholders[BFV12].Requirement R5 would be done at the run time as the input from different members of the organization provided during the process execution.

Requirements	**Requirement Satisfaction Phase**	**Pre-requisites**
Requirement 1 (R1)	Modeling phase	1. Main intention can be refinable into sub-intentions. 2. Organizational members can view the intentions at different levels.
Requirement 2 (R2)	Deployment phase	1. intention cost estimation that includes all recursive sub-intentions and resources. 2. Cost estimation including the strategy.
Requirement 3 (R3)	Modeling phase	1. Each sub-intention should be achievable and valid.
Requirement 4 (R4)	Deployment phase	1. Satisfaction of R1. 2. Understanding of the intentions and how they can be reached.
Requirement 5 (R5)	Modeling phase	1. Satisfaction of R1. 2. The output of intention is based on the inputs provided by different members of the organization.

Table 4.1: Sub Requirements

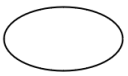
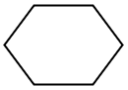
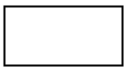
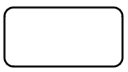
5 Intention-centric Organizational Modeling

5.1 Overview of Modeling Process

The Organizational Modeling element notation has been selected as per the guidelines mentioned in the paper by Moody [Moo09]. Also by observing the fact that business process modelers are already well-known with the present process modeling notations such as Business Process Modeling Notation 2.0 (BPMN) [Gro11] and ArchiMate notation [Gro13], the shape depiction of organizational model elements are designed similar to those existing process notations.

5.2 Organizational Modeling Notation

Due to the importance of shapes in expressing the information visually , the notations are chosen in such a way that each element of Organizational Modeling differ by shape. A legend has been provided with the modeling notation as per the guidelines mentioned in the article [Moo09]. The same study [Moo09] presents the importance of shapes in playing a primary role to discriminate between different elements. Hence the organizational model notations are represented through individual shapes like rectangle, double circle, elliptic etc.,. The description of each element in the Organizational Model Notation is shown in the Table 5.1.

Element	Definition	Notation
Intention	Intentions are purposeful concrete steps taken to achieve expected outcomes . They reflect the actual intention of an organization.Intentions are defined hierarchically, which can contain and extend intentions.It is depicted by a double circle. The sub-intentions are refined starting from main intention. intentions associated with capabilities are concrete intentions and intentions that are not associated with capabilities are abstract intentions. Abstract intentions are represented by dashed double circle and concrete intentions are depicted by a solid double circle.	
Capabilities	Organizational capability is the ability to provide business values like software applications, resources, and potential of the actor to make decisions even in changing situations [SGHZ12]. Capabilites are represented by a elliptical circle. Capability is an ability that should be possessed by an Actor or a Resource that work towards achievement of intention.	
Context	The environment that forms the setting for an event, statement, or idea, and in terms of which it can be fully understood. There are two Contexts: Initial and Final. The Initial Context is the situation which describes the driving forces that trigger the process to start. The Final Context is the expected situation once the process has finished.Both initial and final context are represented by an hexagonal shape except the final context has thick edges than initial context.	
Strategy	A method or plan chosen to bring about a desired future, such as accomplishment of a intention. Strategies are expressed by rectangles with sharp edges. In the conceptual Organizational Modeling, strategies are self-contained and loosely coupled elements.	
Resources	The people and tools needed to fulfill the middle objectives or those/that work towards the achievement of intention . Resources are represented by a rounded rectangle. Resources are linked to capabilities and actors.	

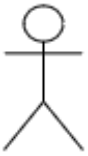
Actors	People who participate in the process. Actors are represented by a stick-man and they are linked to resource as actors can be resources. Actors define the strategy and intentions.	
Relationship	A relationship is used specify the fixed links between the elements of the model. Relationship between two elements is represented by a single direction line which represents a sequence.	

Table 5.1: Informal Process Modeling Notation

5.3 Organizational Modeling Notation Example

The concept of Organizational Model Notations can be explained with the following manufacturing scenario. ABC Ltd. is a budding computer technology company which designs, develops, manufactures and sells personal computers, tablets and laptops. The CEO's intention of the quarter is to increase the revenue and number of unit sales. The initial context describes the situation that motivates to start the process. The final context describes the situation that is achieved once the process completed successfully. intentions connect initial context definitions with final context definitions [SBBL14]. The sub-intentions are the intermediate intentions which describes the expected outcome in a measurable form. intentions are reached through strategy implementation which is plan of action designed to meet a intention.

The example scenario ABC Ltd. helps in understanding the organizational modeling i.e., how organization's higher level intention can be achieved by amalgamation of specific, measurable and realistic sub-intentions. . The whole view has been divided into intention view and Strategy view. The *intention View* shown in the Figure5.2 provides only the details of intention and its associated strategies. There can be multiple strategies followed to achieve a intention. The *Strategy View* shown in the Figure5.1 connects big picture of each strategy with individual intentions that has to be carried out. In Organizational Process Modeling, strategies are self-contained and loosely coupled. So that when we extract only the strategies from Organization Process Modeling it would be similar to Informal Process Essential Modeling.

The Strategy view in the Figure5.1 depicts big picture of each strategy. Strategies are associated with both intentions and capabilities. Capabilities are related to intentions

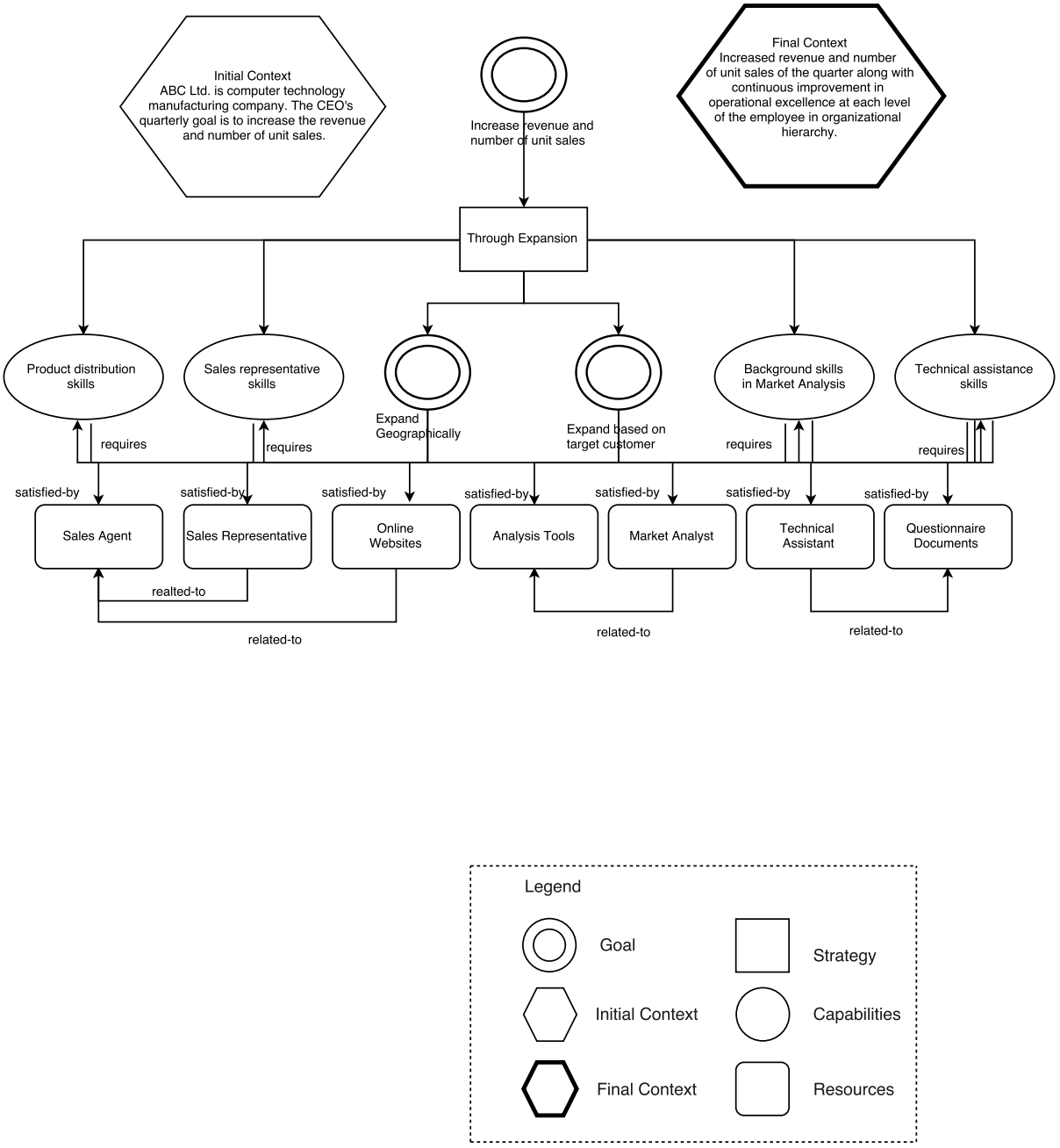


Figure 5.1: Strategy View

and resources. As each intention needs certain capability to successfully execute the intention they both are connected using the verb "*requires*". Resources are the potential holder of the capability i.e., to satisfy a capability we need resources. The capability and its associated resources are linked using the verb "*satisfied-by*".

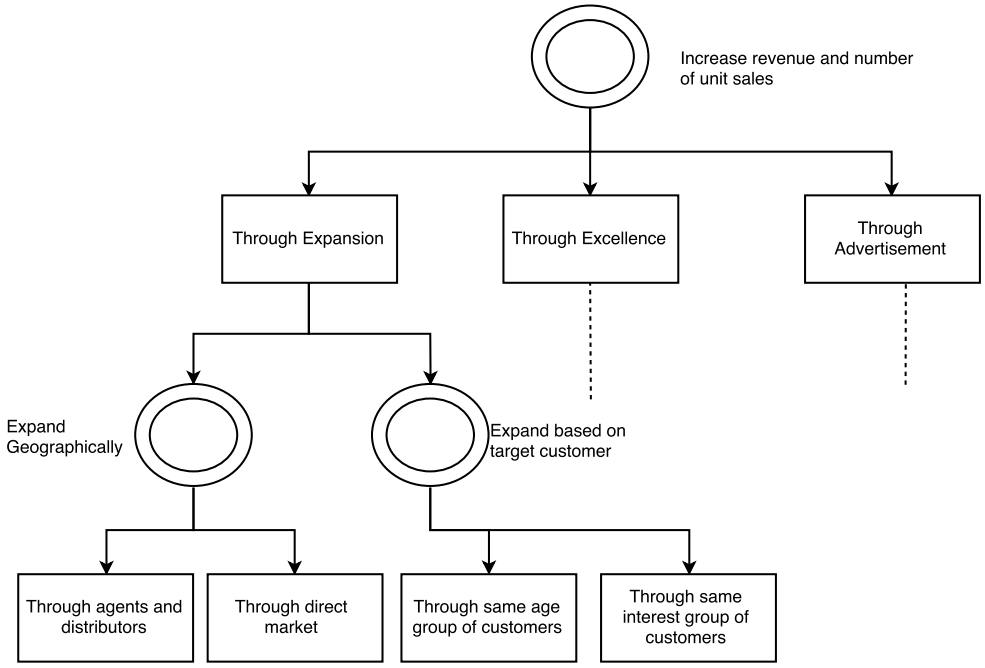


Figure 5.2: intention View

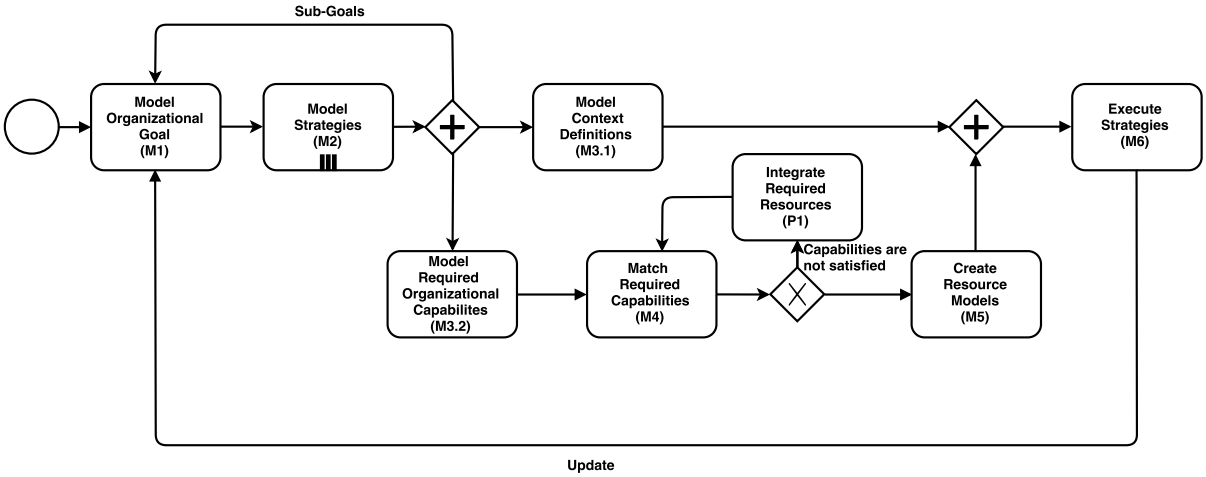


Figure 5.3: Process Modeling Diagram

5.4 Organizational Modeling Process Representation

Organizational Process Modeling depicted inFigure 5.3 captures required organizational capabilities that are satisfied by resource models to enable the achievement of organizational intentions in certain context definitions through a strategy. It is a top-down approach, i.e., first intentions are defined and then sub-intentions are defined by refining main intention. intentions connect initial context definitions with final context definitions through a strategy. To understand the definition of Organizational Process Modeling we need to interpret the Organizational Process Modeling Representation shown in Figure5.3.

The Organizational Process Modeling start with modeling of organizational intention (M1). Once the intention has been modeled, the second step is to model the strategies which can be a multi-instance strategy model(M2). The next step is to model the context definitions (M3.1), required organizational capabilities (M3.2) and refining the sub-intentions from main intention in parallel. Once the required capabilities(M4) are matched by required resources(P1), modeling of resources(M5) can be done. Based on created resource models (M5) and modeled context definitions(M3.1), strategies can be executed. The organizational intentions would be iteratively updated supported to strategy execution.

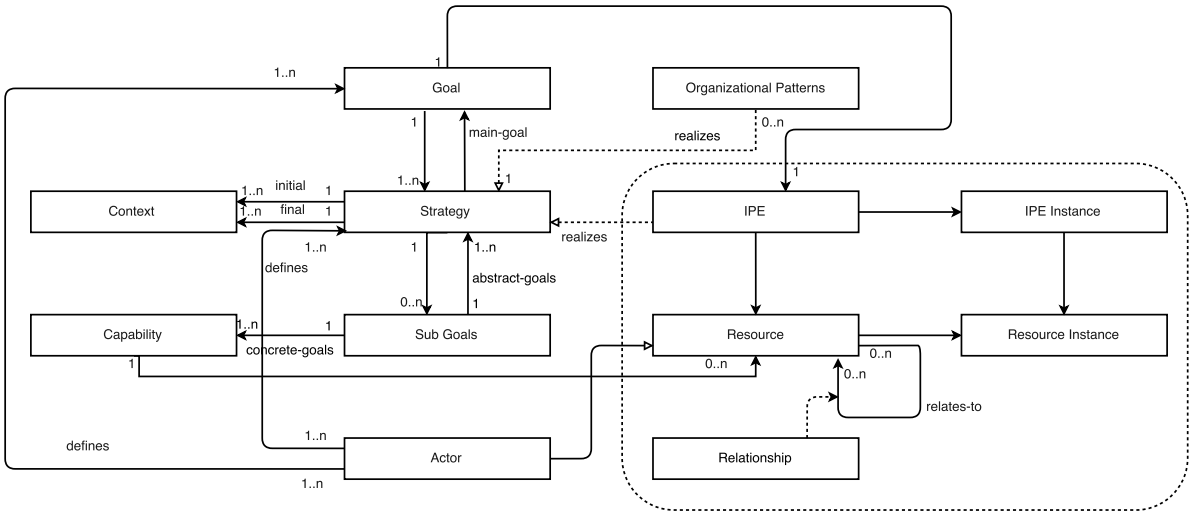


Figure 5.4: Organizational Modelling Meta-Model

5.5 Organizational Modeling Entity Representation

The conceptual entity model of intentions is shown in the 5.4. This model shows that top level intention is refined into sub-intentions. A intention can be achieved through a strategy which is a plan of action designed to meet a intention. It also describes a set of interrelated resources which work together to achieve a collective intention. As reported by Sungur et al. [SBBL14], the concept of IPE provides an agent-based approach i.e., human performers are considered as agents who execute the processes autonomously. Based on the approach [SBBL14] we provide a intention-oriented approach based on intentions.

Organizational Process Modeling has *Resources* which are used to achieve the intentions. Organizational Process Modeling is Resource-centric approach as they support processes by providing required resources and thrives to successfully execute the processes by using qualified autonomous agents, i.e., actors under certain *context definitions*. Resources can be anything like people, IT tools, data that are used to accomplish the objectives.Emerging intentions can result in the requirement of new capabilities, i.e., resources. A more specific type of resource is the type *Actor*, which typically refers to human performers who autonomously and collaboratively conclude an organizational process using other available Organizational Process Modeling Resources.Actors work towards the intentions defined in the process. Resource models are optional to make precise definitions of resources needed.

In Sungur et al [SBBL14] work, the concept of *Informal Process Support Model* IPSM has been introduced which is to make use of existing knowledge of human performers.

Here the initial creator of the model is experienced human performers. Based on their experience, they add relevant resources of an informal process. Each of the resources has inter relationships among the resources themselves. The models are generated at runtime based on the interactions and activities of corresponding human performers.

An informal process targets for accomplishment of a intention. The intentions can be refined by defining sub-intentions, which can be defined recursively as independent informal processes. The intention-based approach enables describing processes declaratively, i.e., without describing *how* the intention is achieved, and providing only information about *what* is achieved. Thus, to avoid predefined business logic in the representations of informal processes.

Each informal process starts from an initial context, i.e., *IPE Context* and aims to achieve a intention. After accomplishing the intention, there is a resulting context called as final context. Each Resource can be related to another Resource in the context of an informal process using predefined or custom *Relationships*.

6 Design

6.1 System Architecture

6.2 Entity Type Relation

6.3 User Interface Diagram

6.4 Design Methodology

On the left list we should have all organizational context definitions and on the right one only ones that are contained in an informal process. The dropdown box of the initial and final context defines the selection inside of an informal process, thus right side.

So, in db.cljs, we should have only a list of context definitions no :initial-contexts and :desired-final-contexts. Only :organizational-contexts and under this all available contexts. Under the left list, we present these elements. Right list should refer to the initial-context, final-contexts, etc. of the informal process model depending on the selection of the dropbox button. For instance if we have initial contexts selected on the dropdown box, we should present the initial contexts in the right list.

I have changed the code accordingly and provided you an example how you should change data from views.cljs. All data should be stored in db.cljs. This applies to the text fields of all elements. Whenever, we want to update something we need to update the map in db.cljs and this will be propagated to the views.

On the left side of each list item, you should present all available items of context definitions or intentions whatever type is selected there. On the right side only the ones contained in the respective informal process model. Inside of another entity, you should refer to other entities using their ids and these ids should be resolved using, for instance, intentions vector. You check each intention in the intentions vector, if it's id is the same as the id you are looking for it, you found it and you use the information about it.

Listing 6.1 Entity data definition inside db.cljs

```
:entity-data {:informal-process-definitions [IPD1 IPD2]
              :context-definitions [CTX1 CTX2 CTX3]
              :intentions [INT1 INT2]}
```

Please align it with the structure and names of the IPSM.xsd. Each variableName like this is written like variable-name. Each complex type is a map each attribute is a key value pair and each element in another element is another key value pair.

7 Realization of Intention-centric Organizational Modeling

This chapter discusses about how Intention-centric organizational modeling realized as an user interface editor. This also explains the realization of requirements described in Chapter 4. In the first section, we will first discuss the overview of basic concepts and then specify the design components required for the realization of this editor. The next section discusses about how the entity views in particular are realized. The last section covers in detail how individual requirement has been realized through the web editor.

7.1 Basic Concepts

The basic concepts section provides an overview about the architectural details like design patterns and frameworks of the developed web editor.

7.2 Specifications

In order to realize the web editor of Intention-centric Organizational Modeling, a formal inquiry has been done and concluded with the below specifications.

1. **Clojurescript** as the programming language
2. **IntelliJIDEA** as the IDE
3. **MVC** as the architecture pattern
4. **Re-frame** as the pattern for writing SPAs in ClojureScript, using Reagent

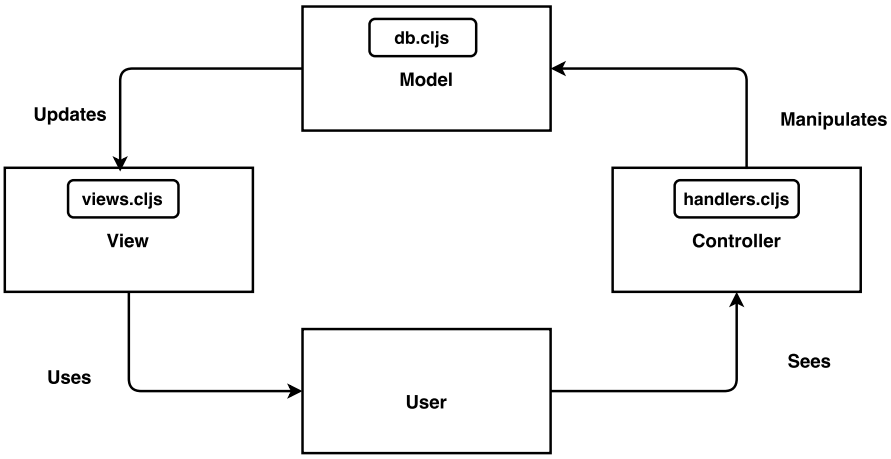


Figure 7.1: Relationship between developed web editor artifacts and MVC architecture components

7.2.1 MVC Architecture

The architecture of the UI editor is based on the **Model-View-Control (MVC)** design pattern. The MVC paradigm allows to separate business logic from the code that controls presentation and event handling [Ora16].Each entity view in the web page is made up of combination of at least on Model and View, and one or more Controls. The individual files which acts an Model, View and Controller has been shown in the Figure 7.1

- **Model** artifact stores the required data structure for web-editor. In the developed model artifact, the four main types of data stored inside the artifact are intentions, strategies, capabilities and informal process instances.
- **View** artifact contains HTML elements and HTML constructs that describe the way of displaying the data from Model to the user.
- **Control** artifact contains the handler functions which can only change the model. Even the initial values of the model are put inside the control.

Example: Component using MVC Pattern

The Figure 7.1 below shows the simplifed version of how the components interact with each other using the Model-View-Control (MVC) pattern, for the functionality adding new entity data. This functionality is same for all the types intentions, strategies, capabilities and informal proceess instances and below is the detailed explanation of each interaction.

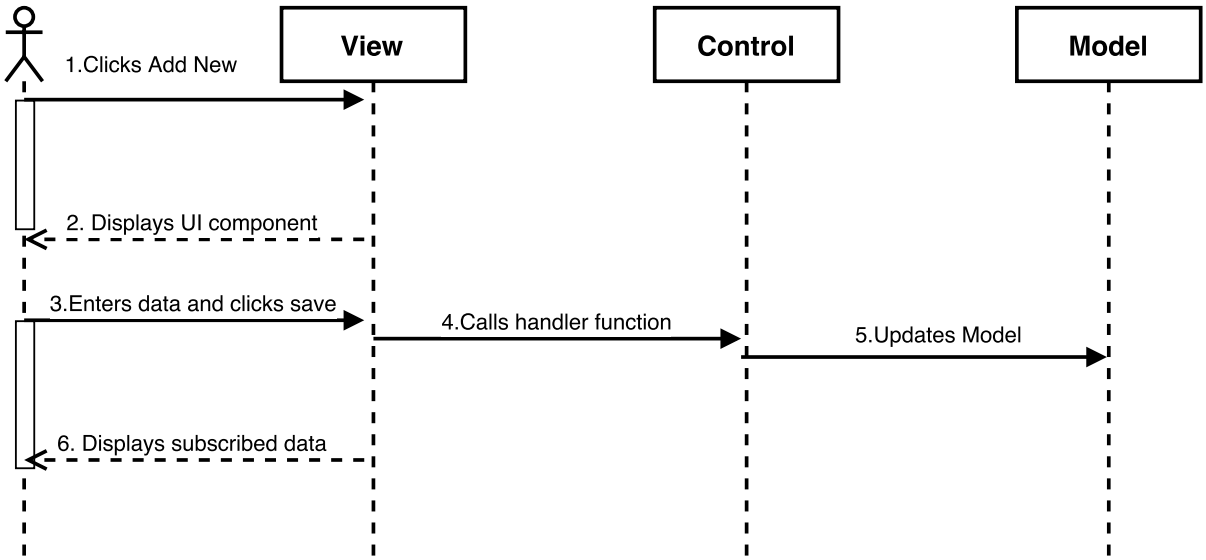


Figure 7.2: MVC Pattern of adding new entity

1. User clicks the tab **Add New** in the web editor.
2. View, in response to the user click displays the UI component for entering the new entity data details.
3. User enters the required basic details for adding new entity data and clicks save button.
4. View dispatches the data to Control, which can only modify the Model.
5. Control inserts/updates data into the model.
6. View displays the updated model as it has been subscribed to the model.

7.2.2 Flux Architecture

[Fac16]

7.2.3 Using Reagent Framework

[Git16]

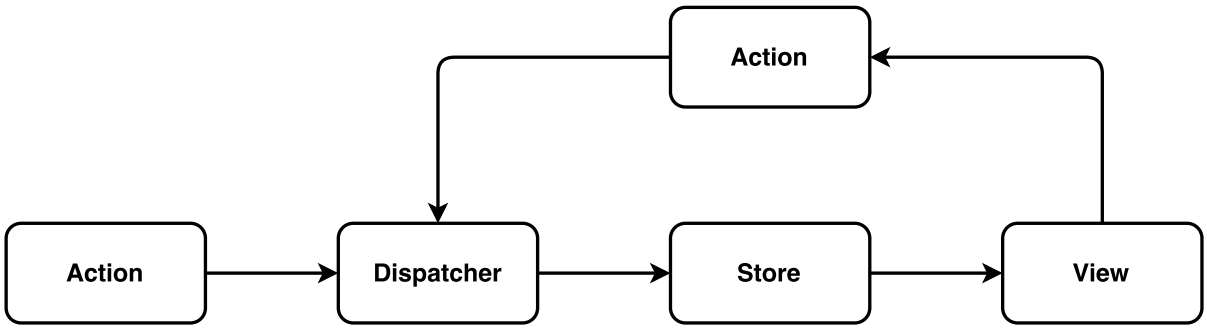


Figure 7.3: Flux Architecture [Fac16]

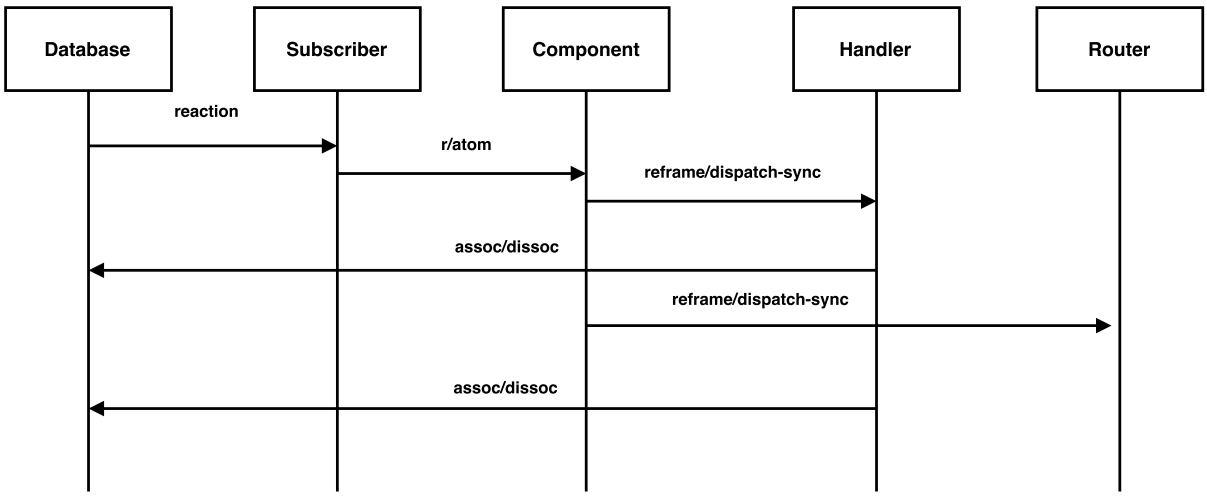


Figure 7.4: Reframe, derived data flowing [Tal16]

7.3 Realization of Entity Views

The XML Schema Definition of entity type has been provided in 7.1

7.3.1 Realization of Organizational Intentions

7.3.2 Realization of Organizational Strategies

7.3.3 Realization of Organizational Capabilities

There are two types of capabilities. Functional capabilities and cross-functional capabilities. Functional capabilities must be associated with instance descriptors. Cross-functional capabilities are capabilities containing multiple functional capabilities. We

Listing 7.1 XML Schema Definition of Entity Type

```
<xs:complexType name="tEntityType" abstract="true">
<xs:complexContent>
<xs:extension base="tExtensibleElements">
<xs:sequence>
<xs:element name="Tags" type="tTags" minOccurs="0"/>
<xs:element name="DerivedFrom" minOccurs="0">
<xs:complexType>
<xs:attribute name="typeRef" type="xs:QName" use="required"/>
</xs:complexType>
</xs:element>
<xs:element name="PropertiesDefinition" minOccurs="0">
<xs:complexType>
<xs:attribute name="element" type="xs:QName"/>
<xs:attribute name="type" type="xs:QName"/>
</xs:complexType>
</xs:element>
</xs:sequence>
<xs:attribute name="name" type="xs:NCName" use="required"/>
<xs:attribute name="abstract" type="tBoolean" default="no"/>
<xs:attribute name="final" type="tBoolean" default="no"/>
<xs:attribute name="targetNamespace" type="xs:anyURI" use="optional"/>
</xs:extension>
</xs:complexContent>
</xs:complexType>>
```

need to have the ability to add and remove instance descriptors for an entity type, e.g, resource definitions, informal process definitions, etc. An instance descriptor of a functional capability should refer to a resource definition meaning that a capability is provided by a resource definition. So an instance descriptor of a capability refers to a resource definition and we can manually add and remove resource definitions in general.

7.3.4 Realization of Organizational Resources

You should have 2 keys one for tosca repository and one for tosca modeling tool. Tosca repo url refers to Winey and the other one refers to topology modeler. You should only contain root contexts and additional suffixes such as service templates in a separate key in default db.Out of these a function should create corresponding url for topology modeling.You can’t compute the topology modeler page of a specific service temple without knowing its id and namespace.You are trying to compose it from different variables: :topology-modeler-url, :tosco-repository-url,:target-namespace, and :id.

```
{topology-modeler-url}?repositoryURL={encoded-tosca-repository-
url}&ns={encoded-target-namepsace}&id={encoded-id}#
```

What important is, at the end what you should have a view that is capable of adding, viewing, deleting and updating models aligned with the XSD schema. In general, separate entities should reference each other but not contain each other. For instance, a strategy containing a goal should use goals id to resolve it but not the actual goal.

7.3.5 Realization of Organizational Processes

7.3.6 Realization of Informal Process Instances

Informal process instances are separate entities similar to informal process models. They should be listed on the left side similar to informal process models. When one of the instance is selected by user, its properties should be presented on the right.

7.4 Realization of Requirements

8 Validation and Evaluation

8.1 Validation of Components

8.2 Validation of Prototype

9 Conclusion and Future Work

Hier bitte einen kurzen Durchgang durch die Arbeit.

Future Work

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