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Master's Thesis No.

Resource-centric Modeling of Organizations

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Abstract

Every organization thrives to achieve its intentions, these intentions can be in any levels of 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 with 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.

This work develops web editor to support models and instances of *informally specified, resource-centric processes*.

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

Contents

List of Figures

List of Tables

List of Listings

1 Introduction

As said by Simon Mainwaring [1] "Creating a better world requires teamwork, partnerships, and collaboration, as we need an entire army of companies to work together to build a better world within the next few decades. This means corporations must embrace the benefits of cooperating with one another.", every organization knows the benefits in co-acting a process to achieve its desired intention. Human play an important role to collaborate and accomplish those tasks. Though organizations re-use data and tools during this collaboration work, the business logic can not be pre-defined due to involvement of human knowledge in decision making[SKL14]. Such type of processes are called *Informal Processes*.

Informal proceses are collaborative type, which means that participants of an informal process collaborate to accomplish its respective intentions. These participants are the resources that drives towards the accomplishment of an intention. Developing models for such *resource-centric informal processes* plays a critical role in executing informal processes. In this document, we explain how we realized developing an editor that creates models for resource-centric informal processes. Also we validate the developed prototype using a case study. This case study has been taken as an example scenario throught this document for better understanding of the reader.

1.1 Motivation

Intentions of informal processes are known before their enactment [SBLW15]. Achieving these intentions requires another important driving force *resources*, which can be anything from human actors, development environment, material resources etc. So we need an approach that supports modeling of informal processes along with provision for required resources. This can be achieved by associating capabilities with informal processes. In extension to the work of Sungur et. al. [SBBL14] where a meta-model and an overview of solution architecture has been presented, in this work the focus is to provide automated means to create resource-centric informal process and an ability to

[1] http://www.azquotes.com/author/9307-Simon_Mainwaring

create instances for those models. The reason for selecting meta-model approach is to preserve the essential information associated with informal processes such as intentions, context information, resource definitions etc. This work also provides automatic initialization and acquiring of inter-related resources during enactment of resource-centric informal processes.

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
4. Not well supported editors for executing abstract descriptions

Though there are *activity-centric* modeling and reusing of business processes such as Business Process Execution Language (BPEL) [2] and Business Process Model and Notation (BPMN) [3] are available, they are not suitable for certain type processes whose execution steps cannot be predicted in advance [SBBL14]. Also complemntary concepts such as automatic initialization and acquiring of interrelated resources are still missing in the existing work [SBLW15]. Another key thing to remember is informal processes are volatile in nature which is one of the important reason for challenges in developing an environment that supports informal processes.

[2] http://docs.oasis-open.org/wsbpel/2.0/OS/wsbpel-v2.0-OS.pdf
[3] http://www.omg.org/spec/BPMN/2.0/PDF/

1.3 Research Objectives

The main focus of this diploma thesis, is to realize the phase *Informal Process Modeling* described in approach *Exceuting Informal Processes (InProXec)* mentioned by Sungur et al. [SBLW15]. Coupled with the main focus during the development web editor the following research objectives provided in the Table 1.1 were also satisfied.

Research Objective	**Description**
RO. 1	*Intentions are traceable 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 1.1: Research Objectives

1.4 Outline

The remainder of this document has been organized into following chapters

Chapter 3 – Motivating Scenario: In this chapter, a motivating scenario has been taken and detailed explanation of each phases of the scenario has been provided. This aids reader to understand clearly the concepts of Intention-centric Organizational Modeling throughout the document.

Chapter 2 – Fundamentals and Related Work: In this chapter, basic concepts that are essential to understand this thesis work has been discussed.

Chapter 4 – Analysis of Resource-centric Organizational Modeling: This chapter provides detailed requirement analysis based on scientific facts published in existing work. This chapter also provides concrete introduction about some properties of the organizations.

Chapter 5 – An Approach to Resource-centric Organizational Modeling: This chapter discusses about the methodology followed in realizing the concepts of Intention-centric Organizational Modeling has been discussed and notations used to realize the Organization Modeling has also been discussed.

Chapter 6 – Case Study on Resource-centric Organizational Modeling: This chapter validates the approach presented in Chapter 5. This chapter also discusses detailed system architecture and also presents the experimental results. The abstract concepts motivating scenario discussed in 3 has been explained in a concrete way.

Chapter 7 – Conclusion and Future Work: This chapter summarizes the results of this thesis work and draws conclusion. This chapter also throws some light on the future work to be carried out in the field of Organizational Modeling.

2 Fundamentals and Related Work

This chapter provides the fundamental concepts and related work that are required to understand the presented approach discussed in Chapter5.The first section introduces definitions of terms that are used throughout this document. The second section provides a brief introduction about the basic concepts of this thesis work. The third and fourth sections present short description about works related to the presented approach. The last section focuses on concepts of Resource-centric Organizational Modeling and its notations. Though modeling notations are not part of implementation, it has been introduced to assist the reader in better understanding. The last section also discusses about the process and entity representation of the organizational modeling.

2.1 Definitions of Terms

Business Process A business process has been defined as the set of activities and tasks whose final output is accomplishment of a goal.These activities are performed in an organizational and technical environment [Wes12]. Based on the type of input and the operation of tasks, these processes can be categorized as management process, support process, research process, development process, etc. [SBLW15]

Business Logic Business logic refers to the activities that need to be done to execute the corresponding process.

Business Process Models Business process models are models to capture recurring procedures during a business process execution and enact them in a automated fashion for re-using those stored knowledge.

Business Process Engines Business process engines can enact the business process models automatically once the configuration of necessary infrastructure has been carried out [SBLW15].

Business Process Management Business process management (BPM) includes concepts, methods, and techniques to support the design, administration, configuration, enactment, and analysis of business processes [Wes12].

Business Process Management Life Cycle Business process management life cycle is the series of phases such as modeling, configuring, executing, and improving business process. These series phases are conducted as a cycle. [Wes12]

Informal Process The processes that human participate and create knowledge are called unstructured/informal/human-centric processes. In informal process, execution steps cannot be modeled or are not feasible to model before their enactments. This is because due to the dynamic changing behavior of execution steps of the informal processes. For Example software development process is an informal process, where required activities and order of their execution cannot be determined beforehand [SBLW15]. The four characteristic properties are: implicit business logic, varying relationships among resources, resource participation in multiple informal processes, changing resources [SBBL14].

Informal Process Essentials Informal Process Essentials (IPE) is an intention-based approach that enables describing process declartively, i.e., without describing how the intention is achieved, and providing only information about what has to be achieved [SBBL14].

Autonomous Agents Autonomous agents are those agents that enact informal processes based on the ad-hoc decisions, experience, and knowledge with the help of other involved resources [SBLW15].

Organizational Intentions Intentions are defined hierarchically, which can contain and extend sub-intentions.It is depicted by a double circle. The sub-intentions are refined starting from main intentions. Intentions are associated with capabilities or resources. An accomplishment of an intention changes state. An intention can extend another intention.

Organizational Resources That drive towards the successful execution of the process. key for achieving specified process goals In the context of our work, the definition of organizational resources refers not only the entities that are capable of doing work but also entities that have an impact on the outcome of the processes, e.g., software tools,

human performers, data etc.

Organizational 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].Describes a capability provided by a resource or required by an intention. The performers of an informal process have certain skills and roles to achieve the intention.

Actors Actors are type of organizational resources that drive execution of a process autonomously. Actors makes use of other resources as well to achieve *intention* and *sub-intention* of an informal process [SBLW15].

Strategies

2.2 Basic Concepts

Models are used in various fields like manufacturing, scientific, IT, etc.,. These models are mainly useful in re-using the predefined regular, intelligible and field-tested solutions. Such models has numerous benefits like performance improvement, reduced cost of operation and design, etc.,. Besides these processes there are processes which requires participation of human and performance of these processes depend on human knowledge, i.e., they are subject to change and carried out based on experience of previous knowledge. These processes are called *Informal Processes* and they do not have formal structured execution of steps for the enactment of processes.

The work by Sungur et. al [SBBL14] gives a comprehensive account of challenges in defining the business logic of informal processes as below:

- The structure of informal processes are not known before enactment of the processes
- Results in less flexible and less efficient solutions
- The cost of creation of well-defined business logic is too high

2.2.1 Informal Process Essentials

In this section, we provide an overview about the concepts introduced in the approach Informal Process Essentials (IPE) [SBBL14]. This thesis work realizes the concept of *resource-centric modeling of informal processes*, specified in the above approach by Sungur et al. As mentioned in the Section 2.1, resources are drivers to achieve intentions in the informal processes. In IPE approach, the author differentiates the resources based on the time the resources are needed in the informal processes as below :

- *Initial resources* which are required during the start of informal processes.
- *On-demand resources* that are required based on intentions during process enactment.
- *Actors* are the resources in IPE meta-model, that drive process execution autonomously.
- *Knowledge resources* resources that contain important information required for the enactment of a process. These are critical for guiding actors.

Informal Process Essentials (IPE) describes the following about informal process [SKL14]

- Describes the constituents informal process such as performers, data and software tools
- Describes how to make core element ready for the enactment of the informal process i.e resource providers

Predefining business logic would results in higher cost compared to making decisions by human performers during enactment [SKL14]. Sometimes, a process team may require participation of new resources with different roles and relationships from a different team [[MWMY11], [MWM+12]]. For example, in our motivating scenario we have two teams software development team and help desk team. To improve the user feedback portal, help desk team may require resources from software development team with a role of user interface web developer. Thus to satisfy requirement changes, resources are also changeable during process execution.

2.3 Human Centric Process

The role of humans in organizations has been evolving over time. The shift from "personnel" to "human resources" acknowledges the importance of humans as organizational

resources. There are incredible number of pressure on today's organizations [1] due to varying dynamic nature of organizations. For example, organizational changes like addition of new organizational alliances, new structures and hierarchies, new ways of assigning work, and a very high rate of changes like changes in the workforce, including employees' priorities, capabilities, and demographic characteristics. Thus it is impossible to do one hundred percent perfect forecasting of dynamically changing activities or processes in an organization.

In order to manage such a dynamic environment, organizations need skilled human resources with previous knowledge of handling unforeseen scenarios. Thus human resources are vital part of any organizations as they have skills of acute future orientation to understand changing organizational environment. Humans in an organizations carry out many important activities. Managers and Human Resource (HR) professionals organizes jobs of each and every human in the organization so that they can effectively perform these jobs. Thus humans in any organization are viewed as resources of the organization which is a contemporary part of Human Resource Management [2].

When there are multiple human resources working for a process, then there should be some sort of co-ordination and understanding between the humans which is called *collaboration* at an organizational level. Collaboration exists in every levels of an organization. For example at management levels of an organization, managers and HR professionals work together to assign employees their roles and task in the organization. This helps the employees of the organization adapts to its environment. In a flexible organization, employees roles and responsiblities changes dynamically based on the requirements and business priorities. Thus the need for network of representations between the human resources which sets up an environment to support collaborative work of business related process has been realized in the work [Can15]. The concept of *virtual human representation* is an extension of actor-concept described in *Informal Process Essentials* [SBBL14]. The developed prototype *Human Resource Representation* in the work [Can15] saves the information such as capabilities, roles, responsibilities etc. as a virtual human web ontology instance which can be re-used in web based environments.

These kind of human representation are highly helpful to organizations with dynamically changing processes. As these representations can describe and match resources with their capabilities based on the requirements. As we have mentioned in Chapter 1, in our context of resource-centric modeling humans are also considered as resources and we associate *capabilities* with every resources. Moreover, associating capabilities, with resources is helpful in situations like following instances. There can be instances

[1] http://www.siop.org/tip/backissues/tipjan98/may.aspx
[2] http://smallbusiness.chron.com/role-human-resource-management-organizations-21077.html

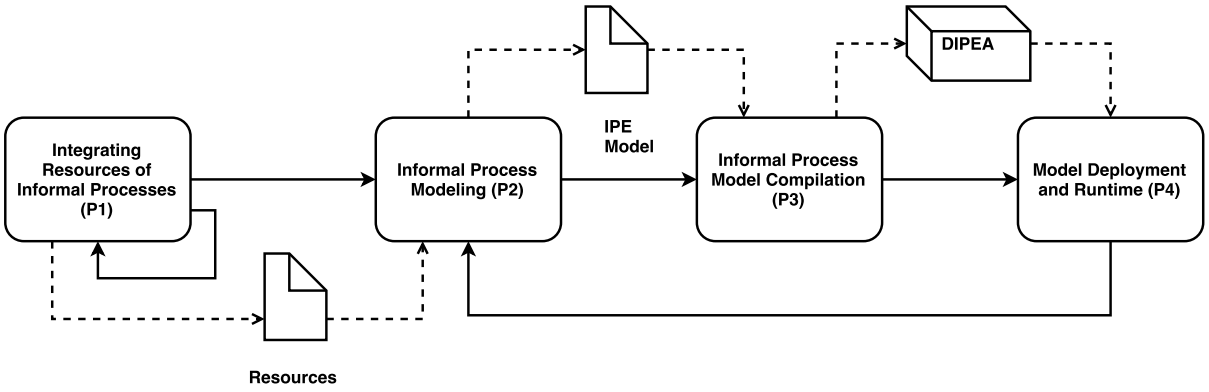


Figure 2.1: Steps of InProXec method [SBLW15]

where resources producing more accurate results for a processing task are preferred than resources which can produce higher throughput for a processing task. Thus we need to associate capabilities with each resources and need to automate the process of discovering and matching the resources with their capabilities based on their process.

2.4 Second Phase of InProcXec

In this section, we present the *InProXec* method, proposed by Sungur et al. in [SBLW15]. Since this thesis work is realizing *resource-centric informal process modeling* , the main focus of this section is on the second phase of InProXec. The method described in Figure 2.1, initializes informal process models in an automated fashion. In the following paragraphs, we present an overview of the method and overview about different phases of the method with a detailed overview about the second phase of the *InProXec* method.

As shown in the Figure 2.1, the InProcXec method consists of four different phases.

Integrating Resources of Informal Processes (P1) To model an informal process, we need information about the resources, these information are collected beforehand during process execution. There exist many services to acquire information about informal processes resources automatically. The final output of this phase is integrated resources which are required as an input to next modeling phase. Thus this phase sets up an environment required for modeling and execution of informal processes.

Informal Process Modeling (P2) This phase receives the resource definitions made available in the first phase P1 as an input. Based on this, business experts model informal processes using different IPE modeling elements. For example business experts create informal process models using resources aiming to achieve main intentions that contains

sub-intentions.

Informal Process Compilation (P3) Phase P2, describes only the intentions required to be achieved, corresponding required resources etc. But in phase P2, there is no facility to instantiate a functionality. Thus in third phase P3, the output of phase P2 is taken i.e IPE models and are transformed into intializable self-contained *Deployable Informal Process Essentials Archives(DIPEA)* [SBLW15] takes place. This results in DIPEAs enacting required informal process. To realize, phase P3 an *IPE Model COmpiler* also been introduced.

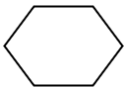
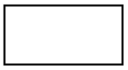
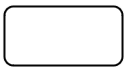
Informal Process Model Deployment and Runtime (P4) This phase employs *IPE Runtime* which parses DIPEAs and runs the executables contained in those archives. During this phase, the autonomous actors work towards intentions of informal processes using acquired resources and other involved resources.

2.4.1 Informal Process Modeling (P2)

2.5 Resource-centric Organizational Modeling

The Organizational Modeling element notation has been selected as per the guidelines mentioned in the paper by Daniel L.Moody [**Moody2009**]. 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.

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. Also a legend will be always shown in the modeling notation to denote the meaning of each shape [**Moody2009**]. As shape plays a primary role in discriminating between different element, 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 2.1.

Element	Definition	Notation
Intentions	Intentions are purposeful concrete steps taken to achieve expected outcomes . They reflect the actual intention of an organization.	
Capabilities	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 goal . 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 goals.	
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.	

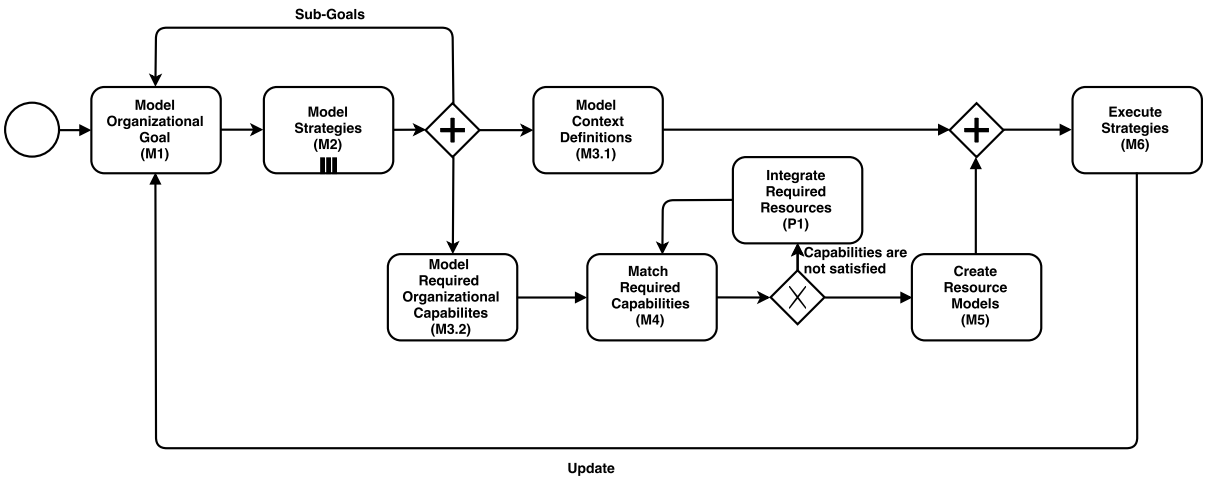


Figure 2.2: Process Modeling Diagram

Table 2.1: Informal Process Modeling Notation

2.5.1 Process Representation

Organizational Process Modeling depicted inFigure 2.2 captures required organizational capabilities that are satisfied by resource models to enable the achievement of organizational goals in certain context definitions through a strategy. It is a top-down approach, i.e., first goals are defined and then sub-goals are defined by refining main goal. Goals 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 Figure2.2.

The Organizational Process Modeling start with modeling of organizational goal (M1). Once the goal 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-goals from main goal 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 goals would be iteratively updated supported to strategy execution.

2.5.2 Entity Representation

The conceptual entity model of goals is shown in the 2.3. This model shows that top level goal is refined into sub-goals. A goal can be achieved through a strategy which is a plan of action designed to meet a goal. It also describes a set of interrelated resources which work together to achieve a collective goal. 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 goal-oriented approach based on goals.

Organizational Process Modeling has *Resources* which are used to achieve the goals. 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 goals 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 goals 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 goal. The goals can be refined by defining sub-goals, which can be defined recursively as independent informal processes. The goal-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 goal. After accomplishing the goal, 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*.

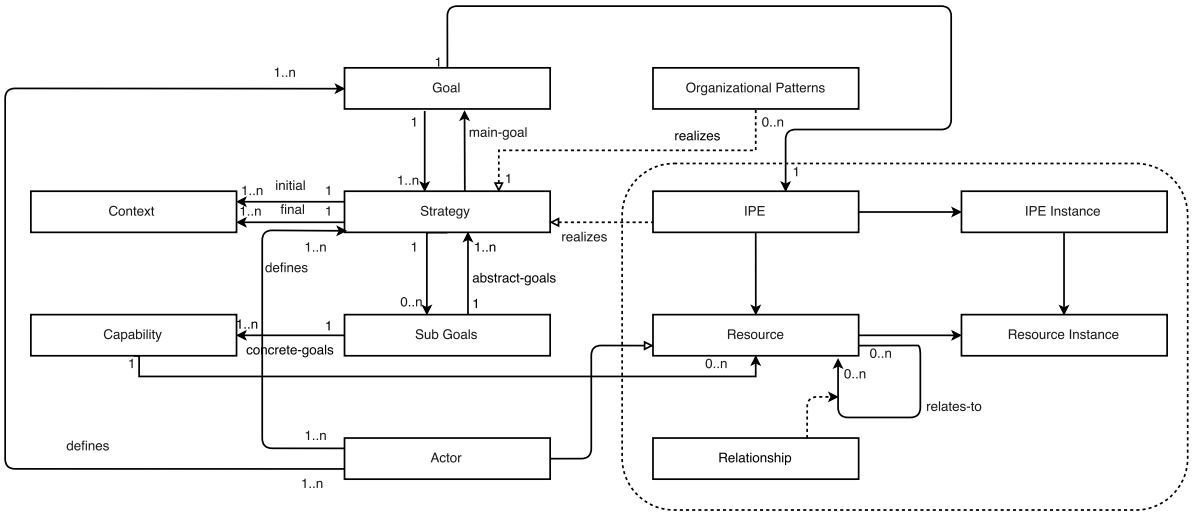


Figure 2.3: Organizational Modelling Meta-Model

3 Motivating Scenario

In order to realize the Organizational Modeling, the 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 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.

3.1 Overview

The motivating scenario provided in this chapter serves as a running example throughout this doucment, to help the reader in understanding the concepts better. We have taken a scenario of laptop manufacturing company, where the *main intention* of this resource-centric informal process is to increase the revenue of the company. The participating resources work towards one *main intention* and certain *sub-intentions*. Sub-intentions are part of main intention, which helps the resources to modularize and achieve the main intention. Also each sub-intention has certain type of relationship with main-intention. For example in our below described motivating scenario in Section 3.2 one of the sub-intention is to *expand sales geographically* . Before executing this sub-intention, few ground works like collection of laptop usage statistics such as average buying capacity of the consumers, average computer knowledge in the new area has to be done. Thus the execution of main intention i.e *increase revenue and number of unit sales*, requires collaboration of people with different skills and expertise. People who has

skills to collect and study statistics can serve as external resources. As new intentions may emerge dynamically the team working towards the achievement of main intention should also be ready to accommodate new resources with new capabilities and skills. There is also a software development team, which work towards achievement of one of the sub-intention *improve help desk*, i.e this team develops software that automatically attends and records user queries. The management of the project is done through the support of project management software called Redmine [1]. The participating human resources are members of business oriented social network called XING [2]

3.2 Resource-centric Organizational Modeling 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 goal 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. Goals connect initial context definitions with final context definitions [SBBL14]. The sub-goals are the intermediate goals which describes the expected outcome in a measurable form. Goals are reached through strategy implementation which is plan of action designed to meet a goal.

The example scenario ABC Ltd. helps in understanding the organizational modeling i.e., how organization's higher level goal can be achieved by amalgamation of specific, measurable and realistic sub-goals. . The whole view has been divided into Goal view and Strategy view. The *Goal View* shown in the Figure3.2 provides only the details of goal and its associated strategies. There can be multiple strategies followed to achieve a goal. The *Strategy View* shown in the Figure3.1 connects big picture of each strategy with individual goals 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 Figure3.1 depicts big picture of each strategy. Strategies are associated with both goals and capabilities. Capabilities are related to goals and resources. As each goal needs certain capability to successfully execute the goal they both are connected using the verb "*requires*". Resources are the potential holder of the

[1] http://www.redmine.org/
[2] http://www.xing.com/

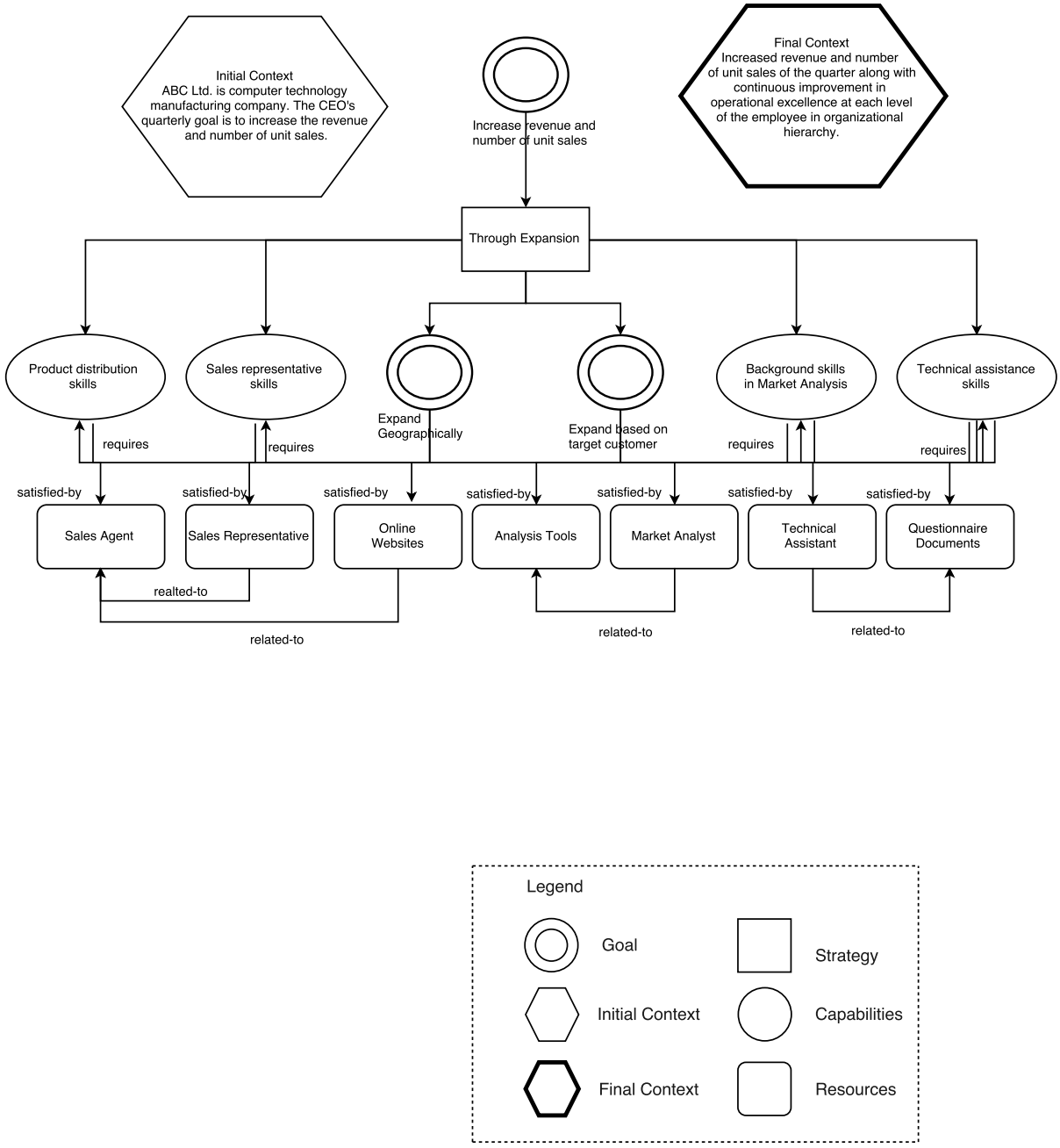


Figure 3.1: Strategy View

capability i.e., to satisfy a capability we need resources. The capability and its associated resources are linked using the verb "*satisfied-by*".

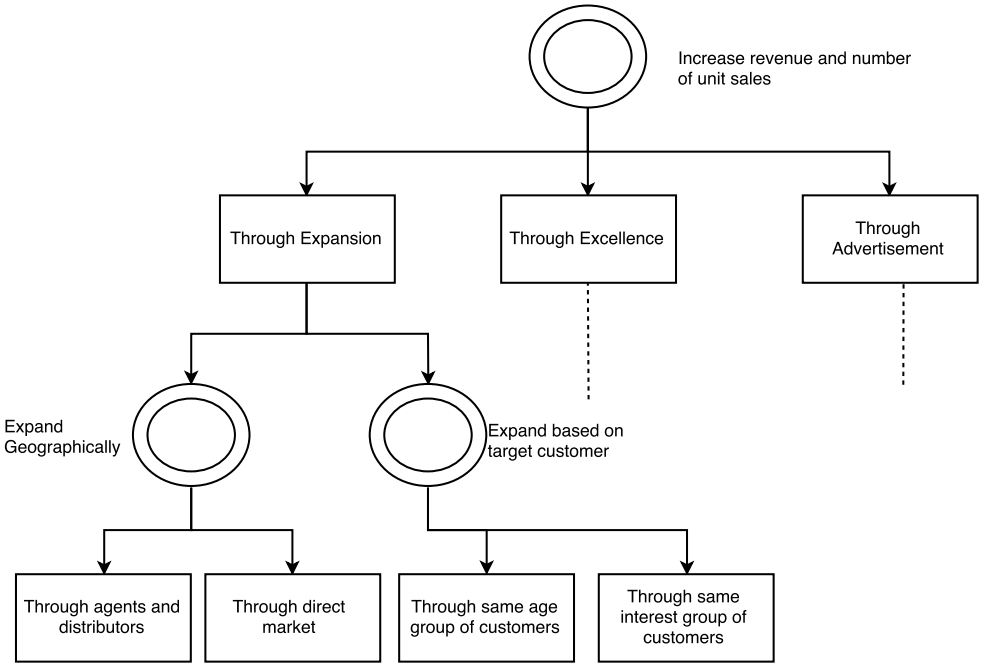


Figure 3.2: Goal View

3.3 An Abstract View of Entity Types

— This section discusses in details, about each entity types of the motivating scenario and their images—

3.3.1 Organizational Intentions

3.3.2 Organizational Strategies

3.3.3 Organizational Capabilities

3.3.4 Organizational Resources

Each resources has different types of relationship with other resources based on how they communicate with other resources [SBLW15]. For example in our motivating scenario described in Section 3.2 has one of the sub-intention as *through excellence*. This sub-intention can be achieved by providing skills improvement training to the employees or by recuriting newly skilled employee. Here the manager has permissions to decide whether to improve skills of existing employee or recruit new employee. But the team lead has restricted permission like what type of skills are required for the project based on decision of manager. The Informal Process Essentials (IPE) approach proposed by Sungur et al. [SBLW15], paves the way to create models with definitions of key actors e.g manager, team lead and definitions of suppoting resources such as Mediawiki [3].

A *resource organizer* is responsible for gathering definitions about the resources which are required by business experts for modeling [SBBL14].

3.3.5 Organizational Processes

3.3.6 Informal Process Instances

[3] http://www.mediawiki.org/

4 Analysis of Resource-centric Organizational Modeling

4.1 Properties of Organizations

—A short description about prooperties of organizations—

4.2 Requirement Analysis

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.

4.3 Literature Review

The approach *Adaptive Case Management*, proposed by Hermann et. al [HK11] bridges the gap between business processes management and flexibility in adapting knowledge intensive processes by defining activities and re-using created activity structure. When

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

the required activities changes dynamically, capturing them for re-use are not helpful [SBLW15]. Though the approach *Ad-hoc and Collaborative Processes* proposed by Dustdar et. al. overcomes the challenges in process aware collaborations, defining activities in a ad-hoc fashion does not support human actor in various cases [SBLW15]. Also the work proposed in Chapter 5 serves as a complementary to the above discussed two approaches. This is accomplished by enabling required actors and resources in different activities.

5 An Approach to Resource-centric Organizational Modeling

1. Integrating resources of Informal Processes and 2. Executing Informal processes

The model provides necessary concepts and relations for modeling the core elements of resource centric organizational modeling. Resources are abstract description which are made concrete during initialization of an instance. There are also resource specific views based on the participating resources' role.

5.1 Overview of Modeling Process

The Organizational Modeling element notation has been selected as per the guidelines mentioned in the paper by Moody [**Moody2009**]. 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.

Initializing resource-centric informal process models requires *acquiring* and engaging interrelated resources.

5.2 Evaluation of the Approach

The Table 5.1, provides an evaluation of the approaches. The description of each symbol used in the Table 5.1 is given as a legend.

Approach	**R1**	**R2**	**R3**	**R3**	**R5**
Strategy-Driven	-	-	+	-	+

Activity-centric System	
Activity-oriented System	
Artifact-centric System	
Capability-driven Development	
ArchiMate	
Subject-Oriented System	

Table 5.1: Evaluation of the Approach

Legend :

++ All or most requirements are met

+ A good amount of requirements are met

˜ Requirements are only partially met

- Requirements are marginally met

– Requirements are not met

5.3 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.

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.

5.3.1 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

5.3.2 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 5.1

- **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.

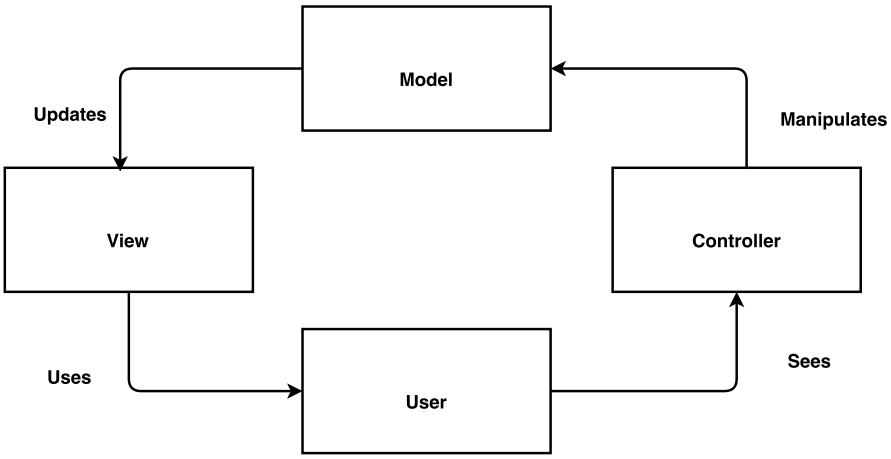


Figure 5.1: Relationship between developed web editor artifacts and MVC architecture components

Example: Component using MVC Pattern

The Figure 5.1 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.

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.

5.3.3 Using Reagent Framework

The Reagent Framework architecture has been reused Fig. 5.3 [1]

[1]Source: https://github.com/Day8/re-frame

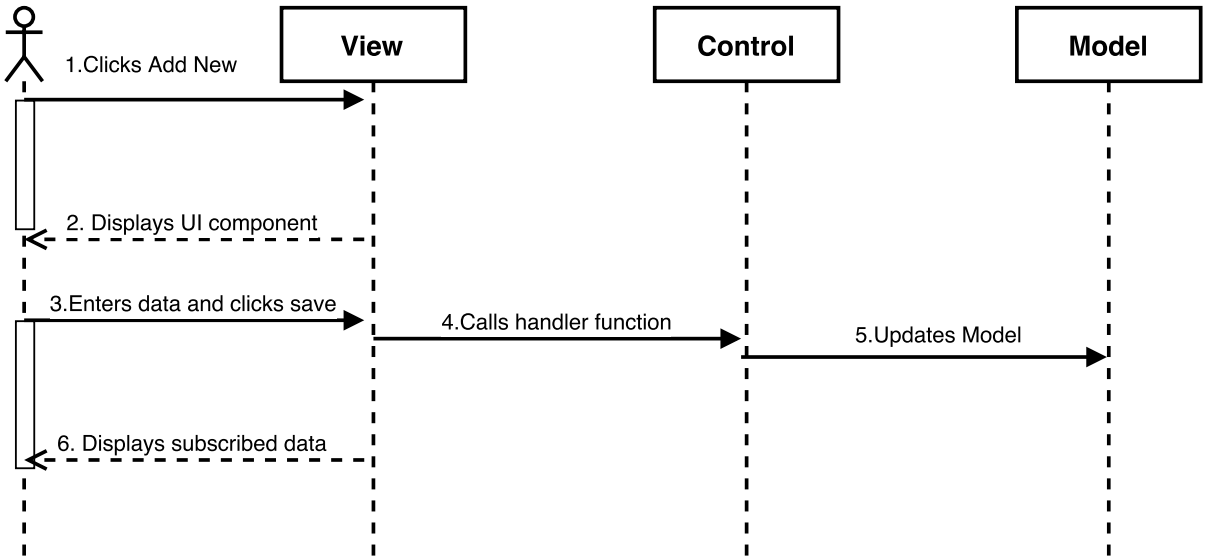


Figure 5.2: MVC Pattern of adding new entity

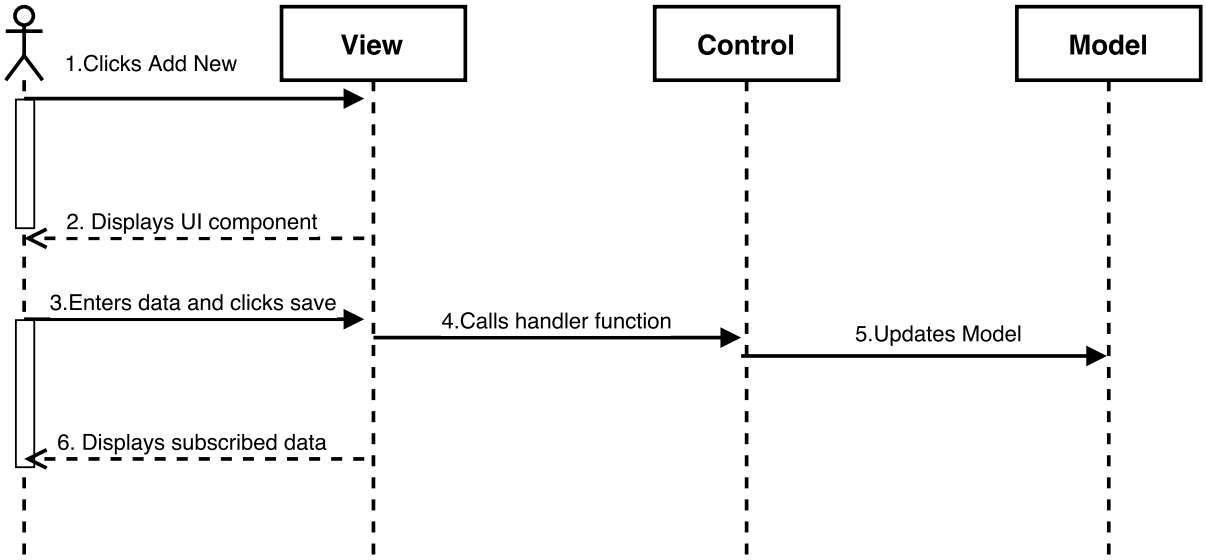


Figure 5.3: MVC Pattern of adding new entity

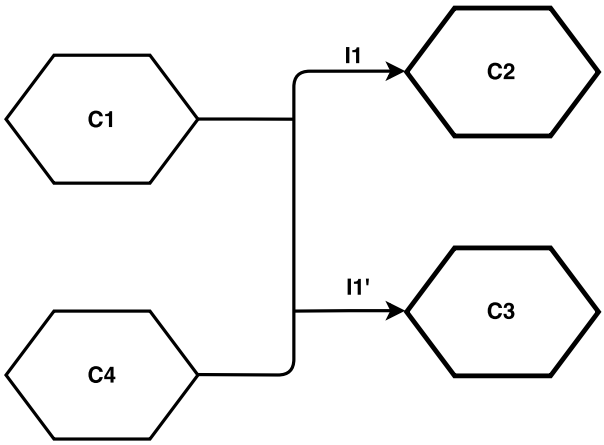


Figure 5.4: Context Intentions Relationship

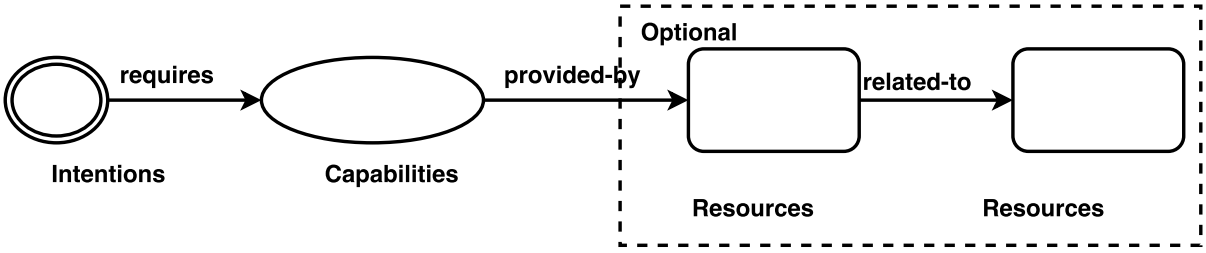


Figure 5.5: Relation between organizational capabilities and intentions

5.3.4 User Interface Diagram

5.4 Relationship between Entity Types

5.4.1 Context Intention Relationship

Intentions connect initial context definitions with final context definitions. 5.4

5.4.2 Capabilities Intention Relationship

Each organizational capability must be provided by a resource in the organization. Resource models are optional to make precise definitions of resources needed. The relationship between organizational capabilities and organizational intentions has been provided in the Figure

Each *intention* can require certain *capabilities* which are provided by *organizational resources*.

6 Case Study on Resource-centric Organizational Modeling

6.1 Architecture of the Case Study

6.2 Realization of Entity Type Views

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.

6.2.1 Realization of Entity Views

The XML Schema Definition of entity type has been provided in 6.1

6.2.2 Realization of Organizational Intentions

6.2.3 Realization of Organizational Strategies

6.2.4 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 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

Listing 6.1 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>>
```

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.

6.2.5 Realization of Organizational Resources

There are two keys, one for tosca repository and one for tosca modeling tool. Tosca repository url refers to winery and the other one refers to topology modeler. This 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. The topology modeler page of a specific service temple without knowing its id and namespace. This can be composed 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 editor 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.

6.2.6 Realization of Organizational Processes

6.2.7 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.

6.2.8 Realization of Requirements

6.3 Validation of Prototype

7 Conclusion and Future Work

There exists an overhead to configure, coordinate and engage different resources without automation during initialization. For example in our motivating scenario 3, one of the sub-intention is to improve the help desk for answering consumer queries. One of the strategy to achieve this sub-intention is providing facility to automatically record and answer some of the known basic queries from the consumer. To develop such an automatic help desk software we need different IT services and software developers need to be assigned and tasks has to be initiated. Though existing automation standards such as BPEL suggest to avoid such overhead by acquiring interrelated resources in priori, such complementary concepts of automatic initialization are still missing in this work [SBLW15]. Due to high cost of automating in modeling execution steps, in comparison to its less benefits [SBLW15], this work has not provided details of formal definitions like which execution steps has to be taken by which actors. This work of resource-centric informal process modeling provides complementary *informal* guides and definitions of intentions of the respective processes.

Future Work

Each resources can be related with other resources through *relationships* . This helps business experts to create models with logical resource structures. In this thesis work, we have addressed resource models without relationships and left the ones contain relationships as future work. This is due to the fact that relationships are optional entities in each model and also due to the broad context of this work [SBBL14].

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