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Resource-centric Modeling of Organizations

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Abstract

In every field, starting from professional organization to education, human intelligence is one of the most important resource of that field. Despite its importance, it is difficult to systemize them as the human intelligence is something that perceives and acquires differently from human to human. Thus decision making for a similar problem is not going to be the same for every human or for every situations. Informal Process Essentials (IPE) is an approach, proposed to support and automate such unstructured processes. This approach provides neccessary modeling elements to create resource-centric process models. However, an editor to create descriptive models for such processes are still missing.

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. In our context, intentions are realized through strategies, which are associated with organizational capabilities, from which resources are created. 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 strategy, capability and resources. As a result IPE models are realized as strategy that is associated with capabilities, resources and intentions.

This Master thesis aims at providing means to design and realize the Resource-centric modeling of organizations. We propose a motivating scenario that helps the reader in easily acquiring the concepts and to validate the usability of developed web editor. The purpose of the web editor is to create/view/update intentions, strategies, capabilities and informal process descriptive models.

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

Contents

List of Figures

List of Tables

List of Listings

1 Introduction

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 - Simon Mainwaring

Every organization knows the benefits of co-acting a process in order to achieve its desired intention. Resources of an organization play an important role to collaborate and accomplish those tasks. Though organizations re-use data resources and tool resources during this collaboration work, business logics and decisions cannot be reused in certain types of processes. These type of processes are not structured like traditional processes because the process execution steps cannot be pre-defined due to its dynamic nature e.g processes that require involvement of human knowledge in deciding the execution steps[SKL14]. Such type of processes are called *Informal Processes*.

Humans play an important role in informal processes which makes the informal processes collaborative in nature. The participants of an informal processes collaborate to accomplish a task. These participants are the resources that drives towards the accomplishment of the task. Developing an editor to create models for such *resource-centric informal processes* is a part of realizing the automated execution of informal processes. In this document, we explain how we realized developing an editor that creates models for resource-centric informal processes. Along with this we also validate the developed prototype using a case study. This case study has been taken as an example scenario throughout this document that helps for better understanding of the concepts.

In this Chapter, the first section provides a detailed motivational reasons about why this diploma thesis work is relevant and what about this thesis work is new. The second section contains an overview about the problems in existing approaches and how this approach serves as an *complemenatry approach* to the existing work. The third section discusses about the contributions done in this work and the research objectives satisfied by this approach. The final section provides an overview about the following chapters. In our functioning system each informal process model is a strategy that has capabilities, resources that are created out of capabilities, an intention that has a specific strategy.

1.1 Motivation

Any task today has both well defined, predictable elements and less defined, more ambiguous elements where knowledge workers has power to implement their decisions[1]. For example, research and development projects are of these type where, *what to do next* cannot be decided much in advance. These type of processes are highly unpredictable in nature and this makes it quite challenging to support and automate these type of processes. This diploma thesis is a part in realizing the automation of such processes. These *unstructured/informal/human-centric processes* are called as *informal processes*[SKL14]. Any approach that supports informal process is required to be more autonomous because of their dynamic behavior of enacting a process, so the existing approaches available for traditional processes are not helpful in realizing the execution of informal processes.

Though the execution steps of informal processes cannot be determined beforehand, *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. These resources has to posses certain *capabilities* to qualify for executing the process. So we need an approach that supports informal processes along with the support of intentions, required resources, capabilities etc. This can be achieved by associating intentions with strategies, strategies with capabilities and informal processes with resources. In extension to the work of Sungur et. al. [SBBL14] where a descriptive model and an overview of solution architecture has been presented, this work focuses to provide web based editor to create resource-centric models of organizations. 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 means to initialize and acquire instances which can be further extended during enactment of resource-centric informal processes.

The developed editor serves as an *descriptive* web based editor tool, where the business experts can create models for informal processes, intentions, strategies, capabilities etc and do not comprise any functionality for acquiring the runnables. Instead this editor provides facility to plug-in the functionality for transforming the descriptive information about the entities into deployable information.

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[1]White, Michael. "Case management: Combining knowledge with process." BPTrends, July (2009).

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 efficient mechanisms 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 [SBLW15]. But there is not a service which provides both mechanism to retrieve and initiate the instances of each entities.

Informal processes are collaborative in nature, which means that participants of informal process collaborate with each other to accomplish its intentions[SBLW15]. Designing these collaborations and assigning participants their respective privileges, plays an important role during execution of the respective informal processes. 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 complementary 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.

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[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* (P2) described in approach *Executing Informal Processes* (InProXec) mentioned by Sungur et al. [SBLW15]. Coupled with the main focus, of developing web based editor the following requirements which are research objectives of this work, has been provided in the Table 1.1 are also satisfied by the developed prototype.

Requirements	Description
R1	*Organizational intentions transparency*
R2	*Organizational intention resource-based cost estimation*
R3	*Organizational intention achievability estimation*
R4	*Intention oriented working style*
R5	*Participative organizational modeling*
R6	*Re-use of organizational knowledge*

Table 1.1: Research Objectives

1.4 Outline

The remainder of this document has been organized into following chapters

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

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 organizational modeling throughout the document.

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 literature review of existing work.

Chapter 5 – An Approach to Resource-centric Organizational Modeling: This chapter discusses about the methodology followed in realizing the concepts of resource-centric organizational modeling has been provided.

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 approach to be discussed in following Chapter 5. 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 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

In this section, the definitions of terminologies that are used throughout this document has been provided.

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 and 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].

Intention - Intentions are defined hierarchically, which can contain and extend sub-intentions.It is depicted by a double circle in organizational notations. 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.

Resource - A resource can be a people or tool those/that drive towards the successful execution of the process. It is key for achieving specified process intentions. 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.

Capability - A 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.

Strategy - A strategy is a method or plan chosen to bring desired results, such as achievement of an intention or solution to a problem [1].

2.2 Organizational Modeling Notations

The Organizational Modeling element notation has been selected as per the guidelines mentioned in the literature [**Moody2009**] and these notations are taken from the thesis work [Sie15]. Though these notations modeling are not part of this diploma thesis, this has been mentioned in this section for the sole purpose of aiding the reader to understand the concepts much better through pictorial representations. 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 has been designed in the previous work [Sie15] 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**]. 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 by organizations or individuals to achieve an expected outcome.	
Capabilities	Capability is an ability that should be possessed by a resource that work towards achievement of one or several intentions.	

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[1]http://www.businessdictionary.com/definition/strategy.html

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 an intention.	
Resources	The people or tools those/that needed to fulfill the middle objectives or work towards the achievement of intentions .	
Relationship	A relationship is used specify the fixed links between the elements of the model.	

Table 2.1: Organizational Modeling Notations

2.3 Entity Types Representation

The conceptual model of entity types in organizational modeling are shown in the Figure 2.1. This model shows that among all the entity types, intentions are in the top level of hierarchy which can be further divided into *sub-intentions* and/or *strategies*. An intention can either contradict or be a sub intention of another intention. These type of sub-intention and contradicting intention has been explained in detail with a suitable example in Section 3.2.1. An intention can be achieved through a strategy, which is a plan of action designed to meet the intention. An intention can be achieved through none or many strategies. Strategies also describe none or many capabilities and processes required to achieve intention. The capabilities and processes can be further resolved into resources or resource models. Thus starting from defining intentions, we define strategies then required capabilities and process models. The capabilities and process models define the required resources.
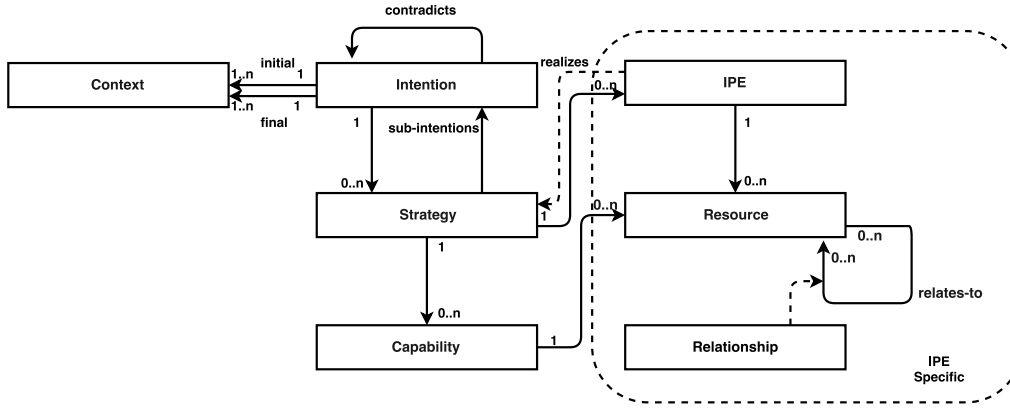
Figure 2.1: Organizational Modeling Entity Types Representation

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. 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*. As we mentioned before, in our context 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. Resource models are also provided in the developed prototype 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. The models are generated at runtime based on the interactions and activities of corresponding human performers. An informal process targets for accomplishment of an intention. The intentions can be refined by defining sub-intentions and/or strategies, which can then be further refined 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. As the author [SBBL14] suggests that this avoids need of predefined business logic in the representations of informal processes. Each resource can be related to another resource in the context of an informal process using predefined or custom *Relationships*. Informal Process Essentials are realized through strategies.

Each informal process starts from an initial context, i.e., *initial context* and aims to achieve an intention. After accomplishing the intention, there is a resulting context

called as *final context*. The beginning state before achieving intention is called as initial context and the end state after achieving intention is called as final context. Achieving the main intention takes from one state to another state.

2.4 Overview of Informal Process Essentials

In this section, we provide an overview about the concepts introduced in the approach Informal Process Essentials (IPE) [SBBL14]. 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 [2] 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

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 that are needed in the informal processes are 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.

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[2]http://www.nomagic.com/getting-started/modeling-benefits.html

- *Knowledge resources* resources that contain important information required for the enactment of a process. These are critical for guiding actors.

It has been mentioned in the approach [SKL14] that Informal Process Essentials (IPE) describes the following about informal process

- 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.

2.5 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 [3] 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

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[3]http://www.siop.org/tip/backissues/tipjan98/may.aspx

perform these jobs. Thus humans in any organization are viewed as resources of the organization which is a contemporary part of Human Resource Management [4].

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 to adapt 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. 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 following situation. There can be a situation 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.

2.6 Second Phase of InProcXec

In this section, we present an overview about the *Executing Informal Processes* (InProXec) method, proposed by Sungur et al. [SBLW15]. Since this thesis work is realizing resource-centric modeling of organizations, the main focus of this section is on the second phase of InProXec which is *Informal Process Modeling*(P2). The method described in Figure 2.2, initializes informal process models in an automated fashion. In the

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[4]http://smallbusiness.chron.com/role-human-resource-management-organizations-21077.html
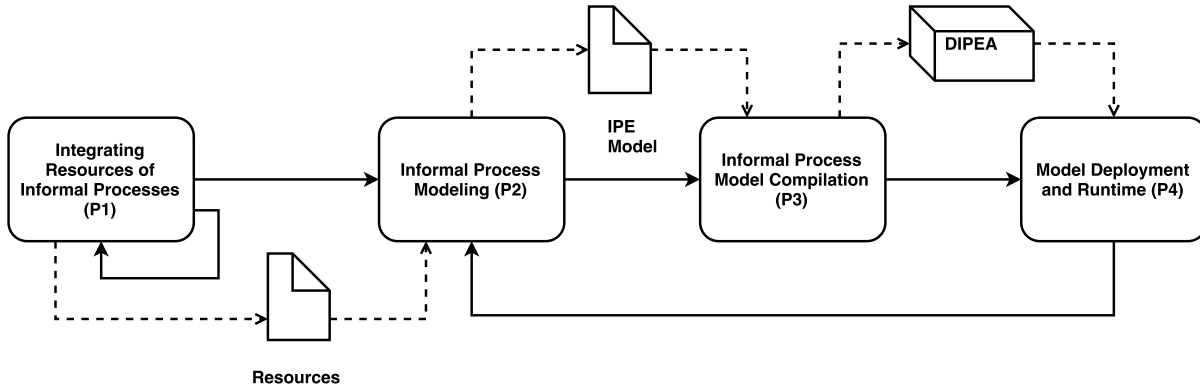
Figure 2.2: Steps of InProXec method [SBLW15]

following paragraphs, we present short overview about different phases of the InProXec method which has been decribed in detail in the article [SBLW15] and with a detailed description about the second phase of the *InProXec* method.

As shown in the Figure 2.2, the InProcXec method consists of four different phases.

Integrating Resources of Informal Processes (P1) - In order 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 and associated entities like strategies, intentions, capabilities etc., using our developed web editor. This phase has been explained in detail in the following sub section 2.6.1

Informal Process Compilation (P3) - The previous phase P2, describes only the intentions required to be achieved, corresponding required resources etc. But in phase P2, the functionality to instantiate acquirable entities are not included. 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.

2.6.1 Informal Process Modeling (P2)

This approach of Informal Process Modeling is directed towards modeling the informal process based on their intentions rather than their activities. The developed prototype serves as an holistic web based editor to create, view and update all the associated entities of informal process like intentions, capabilities, strategies etc., along with informal process. Also from our detailed explanation in previous sections about the importance of resources in organizational modeling and along with the fact that phase P2 receives resource defintions as input from phase P1 of InProXec method we can apprehend that resource definitions are the lowest level in the hierarchy of resource-centric organizational modeling approach. The sequence of steps to be carried out using the developed editor has been shown in the Figure 2.3. It is important to note that in the figure, only solid round edged rectangles are part of the developed editor. The tasks to be carried out in each of the steps in developed editor is described as below:

Model Context Definitions (M1) - The first step is to model context definitions, where we can model both basic properties like name and namespace of a context definition and entity specific properties like contained contexts, entity definitions etc., of a context definition.

Model Intentions (M2) - Similar to context definition modeling (M1), the second step (M2) is to model intentions. The context definitions created in step M1 can be used to specify initial and final contexts of an intention. Intentions can contain sub-intentions and contradicting intentions. These type of sub intentions and contradicting intentions are also modeled as intentions in this step and their type of relation to specific intention are mentioned.

Model Strategies (M3) - Once intentions are identified and modeled, the third step is modeling of strategy to achieve a specific intention. As mentioned earlier in Section 2.3, an intention can have multiple strategies.

Model Required Capabilities (M4) - After modeling of strategies, capabilities required to achieve an intention in a specific strategy is modeled. A strategy can require multiple capabilities which has been explained in detail with a suitable example in the following Chapter 3.

Create Resource Models (M6) - After matching the resources and capabilities i.e after finding the correct resource that has the capability to carry out the process, the resource
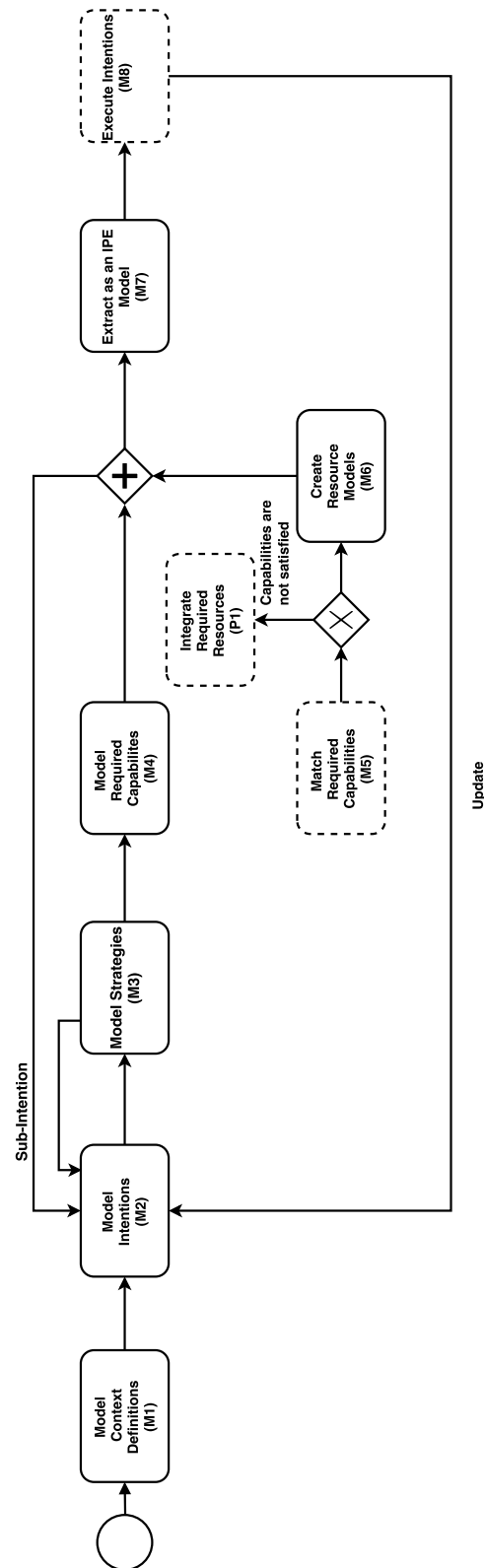
Figure 2.3: Organizational Process Modeling

models are created. The need for modeling a new intention may arise in parallel this has been explained with a suitable example in the following Chapter 3.

Extract as an IPE Model (M7) - After the completion of above mentioned steps, the modeled entities can be extracted as an IPE model which can be reused.

The other steps denoted in dashed round edged rectangle which are not part of developed web editor includes matching of required organizational capabilities that are satisfied by resource models to enable the achievement of organizational intentions in certain context definitions through a strategy. If there is no suitable matching capability then phase P1 of InProXec can be carried out again until a matching capability is found. If Capabilites are satisfied resource models can be created. The created resource models(M6) along with modeled capabilities can be extracted as an IPE Model(M7) which will be provided as input for the next step execution of intentions (M8). After the execution of an intention, the status of an intention is updated inside the specific intentions's property.

3 Motivating Scenario

In order to help in understanding the concepts of organizational modeling, a motivating scenario has been taken and explained through the notations mentioned in Section 2.2. This scenario also helps in validating the developed web editor in the following Chapter 6. The motivating scenario has been chosen based on the collected real life scenarios provided in the thesis work [Sie15]. The scenario of this example was taken from the context of manufacturing sector.

In this chapter, the first section provides an overview about the motivating scenario followed by second section that explains in detail about the motivating scenario. The third section provides an abstract overview about the entity types in the motivating scenario which will be explained in a concrete way, in the following Chapter 6.

3.1 Resource-centric Organizational Modeling Example

The concept of resource centric organizational modeling can be explained with the following scenario in a manufacturing organization. Consider a budding manufacturing company which designs, develops, manufactures and sells personal computers, tablets and laptops. The CEO's main intention of the quarter is to increase the revenue and number of unit sales. The initial context describes the situation before starting the execution of intention. The initial context also provides description that motivates to start the process. The final context describes the situation that is achieved once the intention executed 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 reach strategy implementations through achieving strategies which are plans of action designed to meet a specific intention.

The example scenario follows top-down approach of organizational modeling i.e.,organization's higher level intentions can be achieved by amalgamation of specific, measurable and realistic sub-intentions, strategies etc. The figure3.1 provides the details of intention and its associated strategies, sub-intentions. There can be multiple strategies followed to achieve an intention. In this type of process modeling, strategies
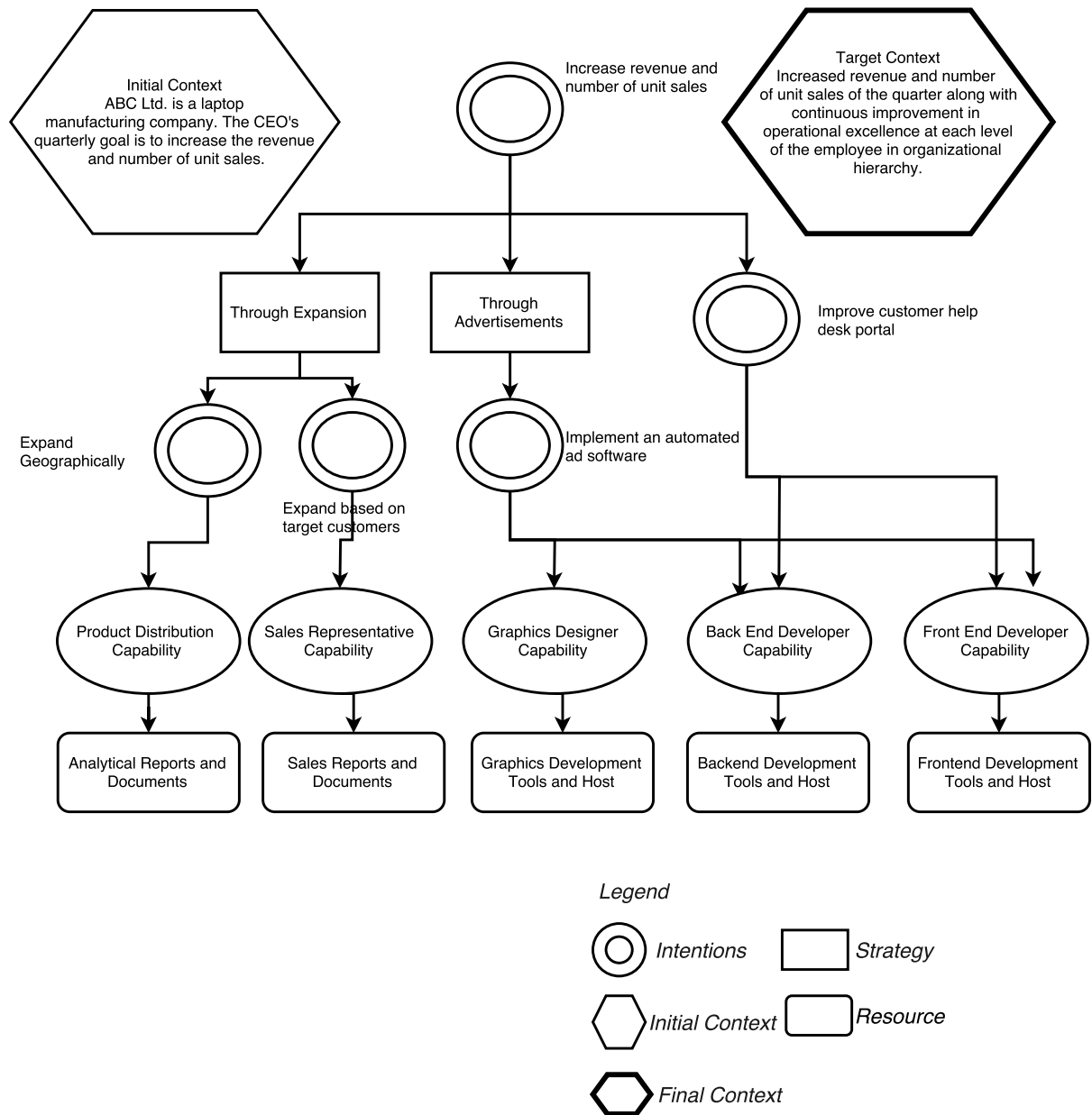
Figure 3.1: Motivating Scenario

are self-contained and loosely coupled. This is the reason when we extract only the strategies from Organizational Process Modeling it would be similar to Informal Process Essential Modeling.

In order to achieve this main intention through our organizational modeling approach, as a first step we need to break the intention into concrete levels like strategies, sub-intentions, process definitions, resource definitions etc. This intention can be achieved by following all of the below mentioned strategies and sub-intentions, which requires resources with matching capabilities.

1. Increasing the revenue through expanding the market sales.

2. Through increasing the advertisement which helps in customer knowing about the product.

3. Improving the existing customer help desk portal as it helps to maintain good customer relationship.

3.2 An Abstract View of Entity Types

This section discusses in details, about each entity types of the motivating scenario in an abstract way, which is further detailed using concrete steps in the following Chapter 6. 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 3.1 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. For example, there is a software development team, which work towards achievement of one of the sub-intention *improve help desk portal*, 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

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[1]http://www.redmine.org/

participating human resources are members of business oriented social network called XING [2].

3.2.1 Organizational Intentions

Intentions can contradict themselves, for example in our motivating scenario IT system managers are not willing to give up the systems they are working for a long time even if it is a better solution for organization as whole . This real life example scenario has been provided in the thesis work [Sie15] and also it has been suggested that such contradicting intentions has to be handled in some way. Thus our developed web editor has also provision to add both sub-intentions and contradicting intentions for any intention.

3.2.2 Organizational Strategies

Strategies are used to identify the most appropriate method of utilizing the capabilities. Strategies are associated with both intentions and capabilities. Capabilities are related to 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*".

3.2.3 Organizational Capabilities

Resources tends to posses certain capabilities that allow them to do something that they want or need to do something. Each organizational capability must be provided by a resource in the organization. Resource models are optional [3] to make precise definitions of resources needed.

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[2]http://www.xing.com/
[3]C.Timurhan Sungur, An Approach to Supporting and Automating Informal Processes

3.2.4 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 3.1 has sub-intention of *improve customer help desk portal*. 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 [4]. A *resource organizer* is responsible for gathering definitions about the resources which are required by business experts for modeling [SBBL14].

3.2.5 Organizational Processes

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

4 Analysis of Resource-centric Organizational Modeling

This chapter positions the thesis work with respect to the other existing approach. The first section provides detailed requirement analysis about the research objectives described in Chapter 1. The second section provides a detailed literature review about the existing approaches. This literature review is used to evaluate the proposed approach in the following Chapter 5.

4.1 Requirement Analysis

This section provides a detailed requirement analysis of research objectives mentioned in Chapter 1. The below mentioned requirements are part of the functioning system proposed in the following Chapter 5. Also the exact phase when each of the requirements get satisfied are provided in Table 4.1.

Organizational intention transparency (R1): An 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 means that the status of each intention can be accessed by members in different levels of the organizations. 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 phase itself as the designing of intentions, sub-intentions, strategies are done during the modeling time.

Organizational intention resource-based cost estimation (R2):Linking intentions with strategies enable us a cost estimation for each intention. This is because intentions are realized through some strategies, strategies are associated with organizational capabilities which in turn has been associated with organizational resources. Cost is

estimated in a recursive manner which has been explained in detail with an example in the following Chapter 5. To incorporate the cost estimation of intentions, we have to understand the recursive structure of the intentions associated with strategies. 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 sub-intentions, process definitions and so on. Including resources cost in intention cost calculation is important. This is achieved by associating resource models' cost with process models' cost. 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,hence requirement R2 has to be satisfied during the deployment phase.

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 strategy and then to independent informal process models. 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 can be found during the modeling time of the process models as intention achieveability estimations are done before starting the execution of the intention based on the related intentions.

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 . Though 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.

Participative 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. But the list of participants who can have the priviliges such as own/edit/follow/view access to the models can be determined beforehand.

Re-use of organizational knowledge (R6): Intentions specific solutions can be extracted as abstract re-usable entities, organizational strategy patterns and can be re-used in multiple context definitions. These field tested solutions are made as descriptive model informations which can be re-used. Re-using the informations as models from the previous executions trims out the model designing time [YHP00].

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)	Both Modeling phase and Deployment phase	1. Satisfaction of R1. 2. The output of intention is based on the inputs provided by different members of the organization.
Requirement 6 (R6)	Modeling phase	1. Satisfaction of R1,R2,R3,R4 and R5

Table 4.1: Requirements Satisfaction Phase

4.2 Literature Review

In the literature, several work has been done in order to support and automate the business processes such as strategy-driven [BJN+05], activity-centric[YMMS09], activity-oriented [Rei06], artifact-centric [CH09], capability-driven [SGHZ12], archimate [AIvH+15] and subject-oriented [FKSS13]. A detailed description about these approaches and their degree of satisfying the requirements mentioned in Section 4.1 has also been provided.

Strategy-Driven : This approach [BJN+05] defines business process in terms of goals and strategies in order to achieve the goals. It also uses map representation system that conforms goals and strategies. In this approach the details regarding visibility of goals has not been addressed, hence requirement R1 is not satisfied. Also details about cost of achieving a goal through a strategy has also been not addressed, hence requirement R2 is also not satisfied. The requirement R3 contradicts with the process rule of this approach which states that "There is no goal/strategy in the map that can be considered as the subset of another one". Requirement R4 is also not satisified due to the fact that this approach follows strategy driven modeling. Information about participation of different members has also not been metioned, hence requirement R5 is also not met. This approach addresses the requirement R6, as it supports reusability of the map components in different maps.

Activity-Centric : The activity-centric approach [YMMS09] also supports knowledge workers by providing shared activity constructs as a computational unit for organizing the work. This approach provides team level view of past and ongoing work and also supports propogation of completed activities to the existing activities. Hence requirement R1 is partially met. The information about cost of achieving a goal or activity has not been mentioned. Thus requirement R2 is not satisfied. In this approach, activities support objectives at various levels of granularity and thus requirement R4 is met. Since the main focus of this activity, it has not provided any information regarding working style based on goals instead working style is based on activities. Hence requirement R5 is also met. Cross activity overview pattern is one of the pattern described in this approach which does unifying work across the team members, hence reequirement R5 is addressed. Since this approach also supports reusable activity patterns requirement R6 is also met.

Activity-Oriented : The activity-oriented approach [Rei06] is traditional workflow management approach where the main focus unit is business process' activity rather than strategy. In traditional workflows the concept of "process view" from different levels of an organisation not addressed, thus requirement R1 is not addressed. The details about cost calculation is not mentioned, hence requirement R2 is also not satisfied. Though this approach does not support sub-processes directly, it provides support for

plugging in sub process extensions, this satisfies requirement R3. From goal oriented to activity oriented working style, so the working style is based on activities and not on goals. Thus requirement R4 is not addressed. Traditional workflow models like BPMN do not support participative modeling, but extensions like social-BPM supports social interactions. Hence requirement R5 is addressed. Re-using of existing activities is not addressed, thus requirement R6 is not addressed.

Artifact-Centric : The artifact-centric approach [CH09] combines business data as artifacts and business process in a holistic way. This approach clearly states that artifacts "views" is not addressed, thus requirement R1 is not satisfied. The requirement R2 which is about cost calculation is not addressed. This approach allows modularity and componentization of business operations at various levels, hence requirement R3 is satisfied. Requirement R4 is partially met as the process evolves through a series of intermediate goals. Requirement R5 is not met due to the fact that concept of social organizational modeling is not addressed. Requirement R6 is partially met because, only the concepts of modularization, componentization at various levels of abstraction has been discussed but reuse of components has not been addressed.

Capability-Driven : The capability driven approach [SGHZ12] also proposes to support the changing environment of organizations. But in this approach there is no information about the visibility of goals has been addressed. Hence requirement R1 is not met. This approach claims that, it overcomes the challenge of high cost in developing applications but there is no clear details about how cost calculation is done, hence requirement R2 is partially addressed. In this approach, the top goal is refined into a number of sub-goals, then each sub-goal is lined to one or several KPIs. Thus requirement R3 is met. Since visibility of goals is not addressed, the details about explicit goals which is requirement R4 is not addressed. Requirement R5 is not addressed as the concept of multiple resources working together is not described. Reuse and execution of capability delivery pattern has been addressed, this meets requirement R6.

ArchiMate : This approach [AIvH+15], investigates if ArchiMate modeling language tool can be used to model strategies and also addresses the properties of Archimate. This apporach provides visibility of whole process, supports "viewpoints" in different levels of modeling. Thus requirement R1 is addressed. Requirement R2 which is cost of achieving each goal is not addressed. The approach provides three levels of modeling i.e., business, application, and technology, thus requirement R3 is partially met. This approach provides visibility of whole process which supports explicit goals but ArchiMate modeling language is not very easy to use to model multiple strategies with goal concept, thus requirement R4 is partially met. Requirement R5 is addressed as it supports different resources participation at different levels. Requirement R6 is also addressed as re-use of existing models is supported.

Subject-Oriented : This approach [FKSS13] supports multi-agent business process models that improves efficiency of the business logics. In this approach, requirement R1 is partially addressed as S-BPM shows process view of who communicates with whom but not how the process advances or if it terminates at all. Requirement R2 which is cost of achieving each goal is not addressed. Requirement R3 is addressed as the main process net can be divided into sub-nets. Requirement R4 is not addressed, as the concept of explicit goals is not described. S-BPM emphasises "subjects" in a process as a decenrtalised, interacting entities thus requirement R4 is addressed. Requirement R6 which is about re-using of existing knowledge is not addressed.

Approach	R1	R2	R3	R4	R5	R6
Strategy-Driven	No	No	No	Partial	No	Yes
Activity-Centric	Partial	No	Yes	Partial	Yes	Yes
Activity-Oriented	No	No	Yes	Partial	Partial	No
Artifact-Centric	No	No	Yes	Partial	No	No
Capability-Driven	No	No	Yes	No	No	Yes
ArchiMate	Yes	No	Partial	Partial	Yes	Yes
Subject-Oriented	Partial	No	Yes	No	Yes	No

Table 4.2: Evaluation of the Approach

Legend :

Yes Requirement is addressed

No Requirement is not addressed

Partial Requirement is partially addressed

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 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 approach proposed in Chapter 5 serves as a complementary to the above discussed

approaches. This is because every existing approach satisfies one or few of the requirements even though not all requirements are satisfied. The Table 4.2, shows the number and extent of requirements satisfied by the existing approaches.

5 An Approach to Resource-centric Organizational Modeling

This section describes about the technical approach that have been taken to solve the problem mentioned in problem statement section of Chapter 1. This chapter also provides an outline of the design, the methodology and overall structure of the approach. The first section of this chapter provides an overview of modeling process approach. The second section compares and evaluates the approach to the existing approaches. The third section discusses the design methodology followed to realise this approach of developing a descriptive modeling web based editor. It also provides a brief description about the frameworks and libraries used. The third section discusses in detail about the *top-down approach*, which has been used to realise the resource-centric organizational modeling. The final section discusses in detail about the relationship between each entity types of this approach.

5.1 Overview of Modeling Process

The main focus of this approach is to develop a editor which can be used by business experts to model the informal processe. AS we mentioned before the input, the resource definitions required for the editor is made available from the first phase P1 of the InProXec approach. The resource models provided from this phase is of interrelated in type, which has been explained in detail in the following Section 5.4.2. The business experts develop informal process models through the editor using these resources to achieve main intention that contains sub-intentions, strategies etc. The reason for designing Informal Processes as models, because these models specify informal processes and provides means of execution for the phases P3 and P4 of InProXec.

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.

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

5.2 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.

5.2.1 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
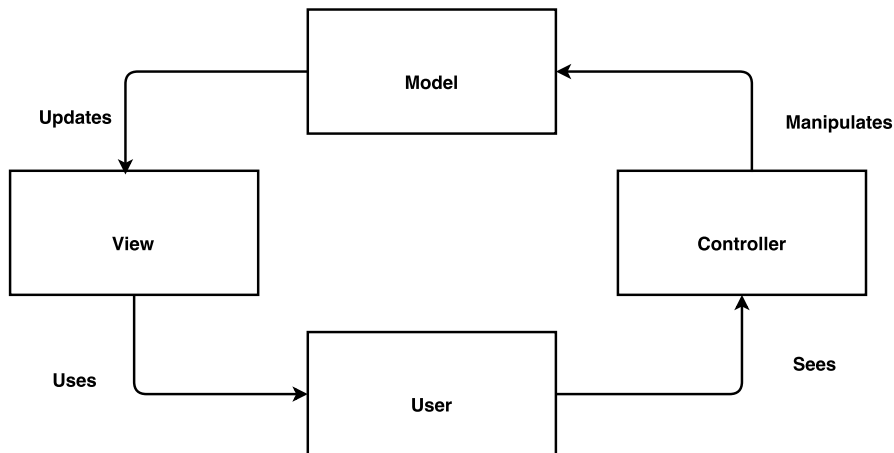
2. **IntelliJIDEA** as the IDE

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

3. **MVC** as the architecture pattern

4. **Re-frame** as the pattern for writing SPAs in ClojureScript, using Reagent

5.2.2 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.
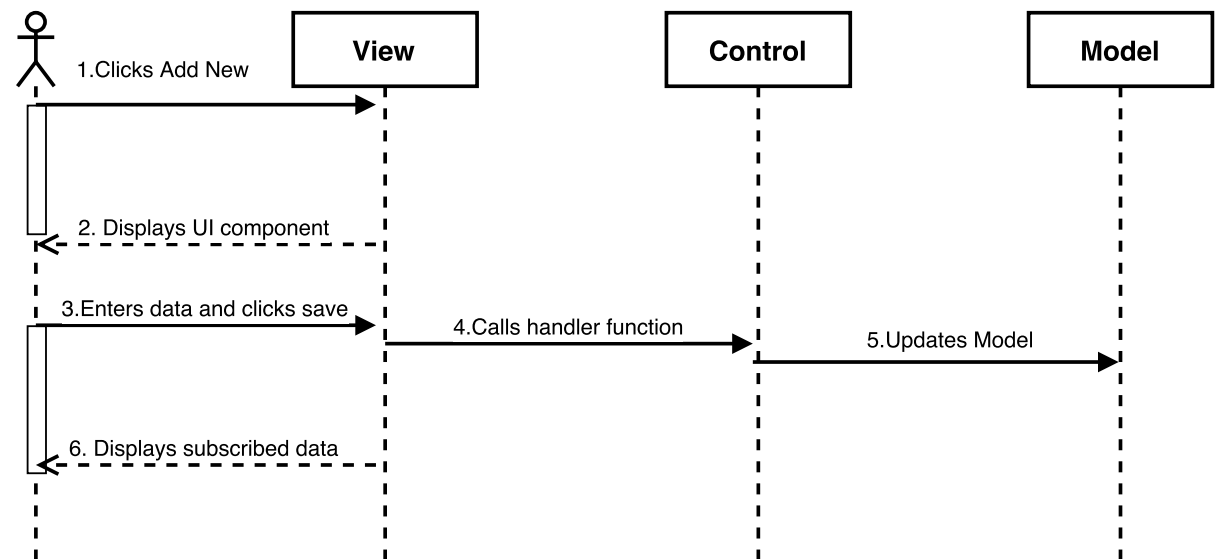 Even the initial values of the model are put inside the control.

Figure 5.2: MVC Pattern of adding new entity

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.

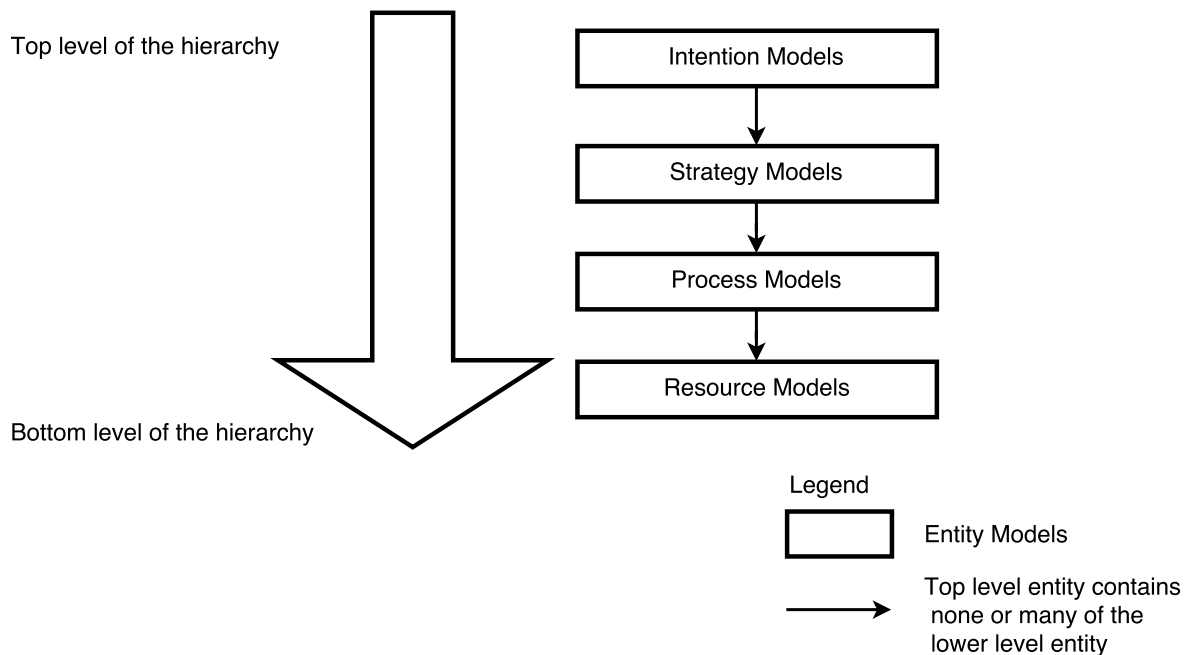6. View displays the updated model as it has been subscribed to the model.

Figure 5.3: Top Down Approach

5.2.3 Using Reagent Framework

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

5.2.4 User Interface Diagram

5.3 A Top-Down Approach

Intentions are defined hierarchically, intentions can contain and extend intentions which are called as sub-intentions. Intentions can contradict to itself as well. Intentions are associated with strategies, thus intentions can be realized through strategies. Strategies are associated with capabilities. These capabilities are of two types *functional capabilities* and *cross functional capabilities*. Functional capabilities are associated with resources and cross functional capabilities are associated with functional capabilities. Each informal process model is a strategy that has capabilities, strategies, resources that are created out of capabilities and intentions.

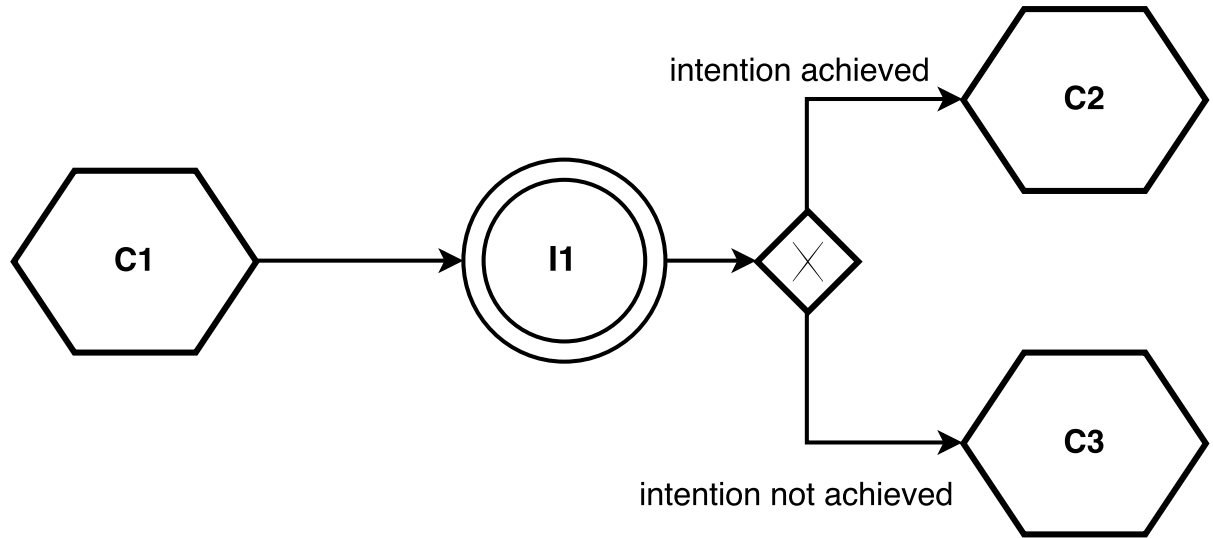[1]Source: https://github.com/Day8/re-frame

Figure 5.4: Context Intention Relationship

5.4 Characteristics of Entity Types

The entity types are modeled as descriptive informations, this is because models can be initialized and can be made runnable elements which are required in phases P3 and P4 of InProXec. An IPE model describes the main intention that reflects the informal process' main goal. Each intention may be refined into sub-intentions. The IPE model's initial context specified the triggers that signal when model's corresponding resources should be initialized and subsequently work towards the informal process' main intention[SDDL15]. The final context specifies conditions for determining the processes' main intention as successfully achieved.

5.4.1 Context Intention Relationship

Intentions connect initial context definitions with final context definitions Figure [2].

5.4.2 Capabilities Resource 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

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[2]C Timurhan Sungur, An approach to supporting and automating informal processes, May 2015
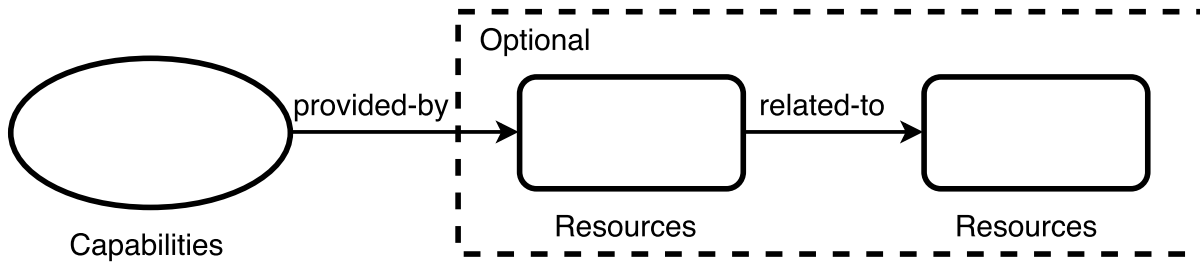
Figure 5.5: Capabilities Resources Relationship

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*. 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.

For cost calculations of instance descriptors:

For every unspecified instance cost, we go recursively to the lower levels. Assuming that we start our calculation from intentions, with an instance descriptor with id a. We start iterating through every contained achieving strategy, and for each achieving strategy, we iterate through their instance descriptors. In case the parent instance id of an instance descriptor contained in an achieving strategy „a", then this is relevant for us. In case it's already specified we directly add it to our summation and proceed with the next instance descriptor and then with the next achieving strategy. In case the cost of an instance descriptor of a strategy has not been specified, we specify it by calculating the cost of instance descriptors of associated informal process definitions. For informal process definitions, we use the cost resource definitions. But you can assume that in each instance descriptor of informal process definition, we already have the cost specified. So this is the end point of the recursion.

5.4.3 Acquirable Entity Types

6 Case Study on Resource-centric Organizational Modeling

In this chapter, we provide architecture of the functioning system as a first section. The section provides, implementation details along with the reason for making certain implementation decisions. The final section validates the system by analyzing the work the validating it with the proposed approach. This section also has some screen results as it helps in validating the functioning of the system as well.

6.1 Architecture of the Case Study

6.2 A Concrete View of Entity Types

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

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>>
```

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 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.

Smmarize each chapter.

Future Work

As discussed in Chapter 1, the developed web based editor developed as part of this diploma thesis, will be further extended such that it can generate deployable entities from the current descriptive information. These deployable entities will be further developed as compilable and executable entities in phases P3 and P4 of the InProXec[SBLW15]. Also extension of providing mobile support to this web editor are also part of 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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All links were last followed on June 26, 2016.

Declaration

I hereby declare that the work presented in this thesis is entirely my own. I did not use any other sources and references than the listed ones. I have marked all direct or indirect statements from other sources contained therein as quotations. Neither this work nor significant parts of it were part of another examination procedure. I have not published this work in whole or in part before. The electronic copy is consistent with all submitted copies.

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