An Interview Framework to Capture Process Conceptions in Modelling Situations

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Abstract. In process modelling it is not adequate enough to concentrate only on the mechanical process structure. We also need to be aware of mental aspects of the people involved. In this paper we are proposing an interview framework to capture process conceptions. Firstly we introduce the theories behind the framework: they are the Process Ontological Model, a classification of process models and a theory of basic modelling situation. Then an interview framework to capture process conceptions is proposed. Lastly we discuss about an example of using the framework as a tool in investigating process conceptions in customer requirements discovery. We are suggesting that by using the framework we are able to draw up a wider and more flexible approach to capture process conceptions in modelling situations.

Keywords: Process, modelling, ontology, requirements discovery.

1 Introduction

The fundamental intention to deal with the objective order of the real world is crucial to humans [1, p.48]. This is realized by group of methodological choices. We classify things, make abstractions, divide systems in parts and hierarchies, recognize feedback systems, and organize things in chronological order. A term “process” is used to describe interrelated events as a kind of phenomenon of flow or transformation of things and data. Process thinking has proved its power as a technique and it is widely applied in many areas of software engineering and closely related disciplines. For example in comprehensive information system development and evolution, business process modelling is an outstanding instantiation of process thinking. Most information systems have close relationship to real world processes and so process modelling gives one concrete starting point to match enterprise level functionality and software together. If we consider ‘process thinking’ a practical phenomenon in relation to information systems, we must observe its applicability both from customer’s and supplier’s point of view. A modelling situation is an intentional activity where different roles, knowledge, backgrounds and goals vary. Therefore it is not adequate enough to concentrate only on the mechanical process structure. Otherwise the problem of a missing common process is greeted.

In this paper we present a framework of interview method to identify the utilization of process thinking in modelling situations. The usage of the framework is intended for a researcher or a process engineer whose interest is to recognize application of process models by interviewing the process modeller. The framework should form a comprehensive theoretical background of an interview. It should give recommendations to general predefined questions, give a comprehensive framework to design the actual interview and help to generate ad-hoc questions during the interview.

This paper is composed as follows. In Chapter two we consider process thinking in the context of organizational processes. Then in Chapter three we introduce the theories that underpin the framework: they are the Process Ontological Model, an expanded classification of process models, and a theory of basic modelling situation are introduced. Then, in Chapter four we propose a general model of the framework. Lastly, in Chapter five summary and further research topics are proposed.

2 An Overview to Process Thinking

In this Chapter we give an overview to process thinking in the context of human organizations. We firstly consider general process definitions in Chapter 2.1. Then, in Chapter 2.2 we describe the problem of a common process.

2.1 General Process Definitions

A process is typically defined as a set of activities which take inputs and transforms them to outputs which are valuable to customer. Components like resources, roles, goals, control, feedback and monitoring are usually identified. We will call this kind of approach a mechanistic conception of process. Next we will give examples of commonly adopted process definitions.

An example of a general business process definition is Hammer's definition [2]. He states that a business process is a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer. This definition can be seen as a derivative of Adam Smith's (1723–1790) discovery that industrial work should be broken down into basic tasks. Hammer's original idea of business process is a core process which firstly provides customer expectations and during the process turns them to customer satisfaction. Support process which enables core processes to operate is usually discussed separately from core process or it is treated as a function or activity of the core process.

The standard ISO/IEC 12207:1995, Information technology–Software life-cycle processes [3], defines a process as a set of interrelated activities, which transform inputs into outputs. Davenport [4] defines a process as a specific order of work activities across time and place. There is a beginning and an end, which are clearly identified into inputs and outputs, and a structure for actions between them. Davenport's definition is a very structural approach and emphasizes the order of activities.

OMG Business Modelling Notation Specification [5] defines types of processes. An abstract process represents the interactions between a private business process and another process or participant. A business process contains one or more processes. A parent process is the process that holds a sub-process within its boundaries. A private business process is internal to a specific organization and is the type of process that has been generally called a workflow. A sub-process is process that is included within another Process.

Typically all process model theories give ether their own definition of a process or they refer to a process definition of related basic theory or standard. Depending on the use of the model, different definitions of a process emerge. The definitions differ because of their level of abstraction and different scope of application.

Alfred Whitehead's states that the world can be best understood as interrelated systems of larger and smaller events, some of which are relatively stable [6]. All events are related to one another and to the environments in which they occur. Events are always changing. Change represents the actualization of certain potentialities and the disappearances of others. The world does not simply exist, it is always becoming. Whitehead's approach is in the category of process metaphysics. We refer his ideas more detail in Chapter 3.2.

2.2 The Problem of a Common Process

Management tends to make the process straightforward and as simple as possible by using the viewpoint of a core process. In coarse level it is possible to achieve common understanding of a process. The problems emerge when more detailed support processes and workflows are modelled. In those cases different uncommon ways of thinking emerges. A modelling situation is an intentional activity where different roles, knowledge, backgrounds and goals vary. Although the goal would be the same, people don't necessarily follow a common process. Therefore it is not adequate enough to concentrate only on the mechanical process structure.

Certain modelling methods are used to model abstractions of the processes of the real world. There must be adequate common models, standards, and theories for the ground of development. However there are difficulties to achieve a common conception of the process in question. For example, a too detailed model is not flexible enough in practice, because there are situations where detailed process model does not support employer's view of the work and dynamically changing world around us drives us to update the process. To achieve more flexibility, we can raise the process model in a higher abstraction level. But in this case the model might not fulfil the employee's expectations because the model is not concrete enough. One key factor for success here is how well the common process model and its implementation match with the peoples' conceptions of it.

There is a tendency to solve this kind of disagreement by raising the abstraction level of the process model. However, in practice the modeller is not able to introduce a process model which as a common process model would be an answer from employer's practical viewpoints. Although he would be able to give a final decision, due to the use of the software system the process model become obsolete. The system in use promotes environmental changes [7].

3 The Theories behind the Framework

In this Chapter we introduce the basic theories behind the proposed framework. First we define a basic modeling situation and different ways of its using. Then in Chapter 3.2 we will introduce a Process-Ontological Model, (POM), according to which everything can be seen as processes. In Chapter 3.3 an expanded classification of process models is given.

3.1 A Basic Modelling Situation

A modelling starts when for some special purposes something is needed to be modelled. This creates a basic modelling situation, which consists of 1) *objects* to be modelled, 2) a *modeller*, who is doing the modelling, 3) a *model*, which is to be a result of the modelling, 4) different *relationships* between objects, modeller, and model, and finally, of course, 5) the *special purposes*, i.e. the goals, of the modelling. The basic modelling situation is then a four-place relation: *M*(object(*x*), modeller(*y*), model(*z*), purpose(*v*)), which is to be read: "an object *x* is modelled by *y* as *z* for the purpose of *v*." From this definition it follows that modelling is always an intentional activity.

The objects to be modelled form the *object domain*, i.e. the universe of discourse. The objects in the object domain do not have necessarily to be concrete things in space and time of which we are to have immediate sense perception, but can as well be abstract objects consisting e.g. expert's knowledge. Moreover, the objects to be modelled do not have to exist before the model of it is created. This situation happens, for example, when designing or planning something. A *modeller* is the subject of a modelling situation. In most cases a modeller consists of the group of persons having different expertises. The most important task for a modeller is to consider those features of the objects to be modelled which are relevant for the purpose of modelling. A *model* is a result of an abstraction that is used to represent the objects in the object domain. Abstraction is an epistemological process, where some relevant aspect of the objects in the object domain is separated. There are also other epistemological processes connected with creating a model, for example, *classification*, i.e. grouping the objects into classes on the basis of some of common properties; *generalization*, i.e. arriving at some general notion from the instances; *axiomatization*, i.e. by giving the basic propositions (truths) from which we can deduce other propositions (truths) the result of which is called an axiom system; etc.

Modelling relations consist of logical and epistemological relationships between the modeller, model, and an object domain. The *purpose* of the modelling determines the order of the modelling relations. Depending on the order of modelling relations, we can talk about the descriptive and the prescriptive use of the model. The model is used in a *descriptive* way, when we start from the object domain, and via the modeller we will end to the model, whereas the model is used in a *prescriptive* way, when we start from the modeller, and via the model we will end to the object domain. In many modelling situations both kinds of model is used. For example, from the given domain of objects we are firstly creating a descriptive model, which, in turn, we are modifying to a prescriptive model in order to make changes to that domain of objects.

3.2 The Process-Ontological Model

The most famous work of process philosophy is Alfred North Whitehead's *Process and Reality*, [6]. He believed that all events are related to one another and to the environments in which they occur. The world can best be understood as interrelated systems of larger and smaller events, some of which are relatively stable. Events are always changing. Change represents the actualization of certain potentialities and the disappearances of others. The world does not simply exist, it is always becoming.

Furthermore, according to Whitehead, the world is a process which is the becoming of actual entities (or actual occasions). They endure only a short time, and they are processes of their own self creation. There are also eternal objects to be understood as conceptual objects. They enter into the actual entity becoming concrete without being actualities themselves. Although novel actual entities are progressively added to the world, there are no new eternal objects. They are the same for all actual entities.

However, we will not make any detour into Whitehead's "process philosophy" here, since we will just adopt an idea that everything consists of processes, and that these processes are divided into eternal processes interpreted as concepts, and actual processes, which we will interpret to be events occupying a finite amount of a four dimensional space-time. Thus, the world is constructed out of events. Every event in space-time is overlapped by other events, i.e., events are not impenetrable. A space-time order results from a relation between events.

We shall also distinguish events in a living brain from events elsewhere [8]. So thoughts should be among the events of which the brains consist, i.e., each region of the brain is a set of events. These events are called mental events, which can be known without inferences and they consist of bundles of compresent qualities. Events, which are not mental, are called physical events, and they, if known at all, are known only by inference so far as their space-time structure is concerned.

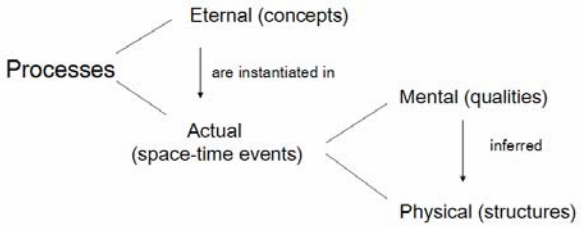

Fig. 1. The Process-Ontological Model

Accordingly, in our view, ontologically, everything consists of processes, see Figure 1. Among processes, firstly, there are eternal processes and actual processes. Eternal processes are interpreted as concepts, whereas actual processes are interpreted as space-time events. Eternal processes are instantiated in actual processes. Secondly, among actual processes there are mental events and physical events. Mental events consist of bundles of compresent qualities which can be known without inferences, whereas physical events, if known, are known only by inference as regards to their space-time structure. A more detailed description of this process-ontological model and its topological formalisation, see [9].

3.3 Expanded Classification of Process Models

A process model is an explicit description of a process. Becker-Kornstaedt has identified two types of software engineering process models [10]: prescriptive process models and descriptive process models. We extend here the types of process models to cover all organizational processes as follows. Prescriptive process models describe how a process should be performed. They are used to as guidelines or frameworks to organize and structure the way how activities should be performed. Descriptive process model describe a process as it takes or took place in reality.

Bandinelli et al. have identified five process types, see in [10]: 1) Desired process, 2) Official process, 3) Perceived process, 4) Actual process and 5) Observed process. *The desired process* is a model of intended process. It can be a documented vision or it takes place only in actor's mind. We extend here the actors to be as well process owners and stakeholders as all other persons, e.g. process performers, who would become involved with the process. Thereby there exist various models of desired process. The *official process* is a documented process to be followed by an organization. Some actors, like stakeholders and process owners, have more authority over the others to decide features of the official model. As a formalization of the desired process, it is typically found in organization's quality system documentation. A *perceived process* is an actor's subjective interpretation of the official process, leading to actual behaviour. An *actual process* takes place in real world. It is either an implementation of an official process or it has no official status. In both cases all process performers have subjective impression of the actual process. This interpretation is called an *observed process*.

We propose that each process type has also an opposite process type e.g. a) *undesired*, b) *unofficial*, c) *unperceived*, d) *non-actual* (possible) and e) *non-observed* process types. Therefore we can expand the original classification to cover also these opposite types as presented in Table 1.

Table 1: Expanded classification of process models

Process quality	**Quality values**	
Suitability to vision	Desired	Undesired
Official character	Official	Unofficial
Comprehensibility	Perceived	Unperceived
Physical character	Actual	Non-actual
Observability	Observed	Unobserved

The original classes and their opposite types state two categories of each class. The use of opposite process types expands the scope of the classification. For example processes based on tacit knowledge can now be categorized. We call this broadened model as an *expanded classification of process models*.

4 An Interview Framework to Capture Process Conceptions in Modelling Situations

In this Chapter we propose a framework to capture process conceptions in modelling situations. The framework is based on the theory of basic modelling situation, the Process-Ontological Model and the classification of process models presented earlier in Chapter 3. Although we will not have any methodological discussion about the actual interview itself, some recommendations will be given. The intended use of the framework is illustrated in Figure 2.

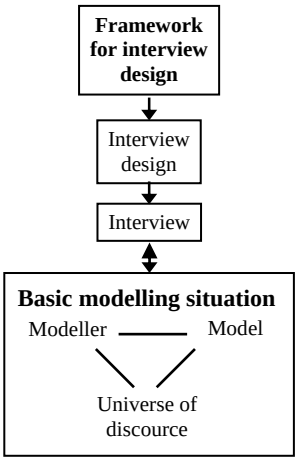

Fig. 2. The framework as a basis of interview design

The usage of the framework is intended for two purposes: Firstly, as a tool for researchers to e.g. classify, systematise, and valuate process models, and secondly, as a guide to design an interview to capture process conceptions in practical process modelling situations. Both of them need a comprehensive framework, and especially, when practical interview design is to be efficient and of good quality. The framework should give recommendations to general predefined questions, give a comprehensive framework to design the concrete interview and help to generate ad-hoc questions during the interview.

We have divided the framework into two parts: 1) General questions derived from the theory of basic modelling situation and 2) a cross reference table of the levels of the Process-Ontological Model and expanded process model types.

Proposed general questions are presented in Table 2. They are applicable to all process modelling situations. We suggest, that should be used as a warm up discussion with an interviewee. This way the interview starts naturally and the scope of discussion topic is managed. Another way of using general questions occurs when there is a chance to departure from intended course of the interview. With proper question a misguided interview can be restored to its appropriate course. The third way of using the general questions is to derive detailed predefined questions for the

interview beforehand. This can be done based on assumptions, experience or acquired knowledge about the domain.

Table 2. General questions based on the theory of basic modelling situation.

Identifier	Question
GQ1.	What is the goal of the modelling situation: prescriptive or descriptive?
GQ2.	Who are the actors and what is their role relative to object domain?
GQ3.	What is the goal of each individual actor?
GQ4.	What is the universe of discourse to be modeled?
GQ5.	What process models can be recognized?
GQ6.	What sources of process models can be recognized?
GQ7.	What modelling relations between the model, modeler and the object domain can be recognized?

Cross reference table of process model types and abstraction levels of the Process Ontological Model is presented in Table 3. We propose to use it in more detailed design of the interview and as an analysis framework of the results.

Table 3: Cross reference table of process model types and abstraction levels of the Process Ontological Model

		PROCESS MODEL TYPES				
		Suitability to vision: Desired / undesired process	**Official character:** Official / unofficial process	**Comprehensibility:** Perceived / unperceived Process	**Physical character:** Actual / non-actual process	**Observability:** Observed / unobserved process
ABSTRACTION LEVELS OF THE PROCESS ONTOLOGICAL MODEL	**Concepts**: What terms, concepts and models are used?					
	Mental: Who are the actors and how do they see the process?					
	Physical: What is the real actual process? What are outcomes of the process?					

A preliminary study based on general questions might be needed. Therefore the interview might be more successful, if it is done in two supplementary phases. When

designing an actual interview, white areas of the framework should be filled with concrete domain specific questions. We want to notify the importance of mental process. Some of the problems arousing from the "process thinking" are related to mental side the actual process. This interpretation is meaningful because from qualitative point of view, it means that mental events influence the process' capability to fulfill its expectations. Presented process types should be used to separate personal interpretations of the actual process.

5 Summary and Further Research Topics

In this paper, firstly, we considered different kinds of traditional definitions for processes and illustrated a problem of a common process connected with a mechanical view of processes. Secondly we introduced the underlying theories of the framework. A theory of basic modelling situation, the Process-Ontological Model and an expanded classification of process models were introduced. Then, in Chapter four we proposed a general theoretical framework for both to researchers and to a practical interview design to capture process thinking models, features and practices.

Our next plan is to perform actual interviews, where the framework will be tested. In our example we will concentrate on to develop an interview method to inspect process thinking in software engineering activities where customer requirements are discovered. More detailed we will focus to practical requirements engineering domain e.g. requirements capture and feasibility study of a software package in enterprise research planning (ERP) area. The intent is not to discover a certain enterprise process modelling or requirements engineering method but the way how software engineering experts (consultants) of a software house consider process thinking in a customer case. We want to find out, what kinds of process oriented models, features, practices, and theories consultative experts use and encounter in requirements discovery of ERP systems. The interviews would be focused to the work of software engineer who in this case is working as a consultant of a software house. His task is to find out and document what are customer's requirements and how they would be fulfilled with the available software.

We are suggesting that by using the framework we are able to draw up a wider and more flexible approach to capture process conceptions in modelling situations. It will give a common conceptual framework for the SE researches and for the SE practice.[1]

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